

**SURVEY OF THREATENED
PLANT SPECIES IN SOUTH
EAST QUEENSLAND
BIOGEOGRAPHICAL
REGION**

QUEENSLAND CRA/RFA STEERING COMMITTEE

SURVEY OF THREATENED PLANT SPECIES IN SOUTH EAST QUEENSLAND BIOGEOGRAPHICAL REGION

DEPARTMENT OF ENVIRONMENT

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Disclaimer

The views and opinions expressed in this report are those of the author and do not necessarily reflect the views of the Queensland and Commonwealth governments. The Queensland and Commonwealth governments do not accept responsibility for any advice or information in relation to this material.

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SUMMARY

This report has been prepared for the joint Commonwealth/State Steering Committee that oversees the Comprehensive Regional Assessment (CRA) of forests in the South East Queensland CRA region.

The report was undertaken to provide information and data on the distribution, population attributes, ecology and threatening processes pertaining to threatened vascular plant forest species in the South East Queensland Biogeographical Region. Species included are those listed under the *Queensland Nature Conservation Act 1992* and those species identified by expert groups as warranting regional threatened status but currently not listed on the Queensland schedule. Thirty-two of the sixty-four target species are documented. Survey data for ten species are presented with information on distribution, population size and habitat parameters. The threats and conservation status of these species are assessed. The distribution and habitat parameters are presented for the other twenty-two species based on collated information from literature, Queensland Herbarium records, vegetation mapping site data (CORVEG) and consultation with botanists and naturalists.

1. CHAPTER ONE

INTRODUCTION

1.1 PREAMBLE

Queensland has a rich native flora with 8655 species of seed plants and ferns throughout the state (Henderson 1997). At present 324 of these species are considered to be facing a medium to high risk of extinction in the near to medium term future. Future management of these plant species needs to be based on sound scientific knowledge on how each species interacts with its environment and how the species responds to human impact on its environment. The lack of information on these threatened species is an underlying limitation to management of these species in Queensland.

The protection of threatened forest species is part of the State and Commonwealth Governments' commitment to the initiatives of the National Forest Policy Statement (Commonwealth of Australia 1992). Within the South East Queensland Biogeographical Region there are 143 endangered and vulnerable (including 26 pending inclusion in the Regulations) plant species listed on the schedules of *Queensland Nature Conservation Act 1992*. The amount of data on habitat and population size varies from species to species. One species (*Alectryon ramiflorus*) has a recovery plan currently being implemented, while others have species outlines supported by field survey data or are known mostly from herbarium records and anecdotal information. The majority of the species have not been methodically searched for and are known mostly from herbarium records collected during the last 150 years. There is a need to address this lack of information if commitments to the National Forest Policy statement are to be met. It was envisaged that the project would provide data on the distribution, population attributes, and threatening processes pertaining to the more poorly known threatened plant species in the South East Queensland Biogeographical Region.

1.2 OBJECTIVES

- to survey populations and other potential habitats for additional populations of each target species in the region.
- to obtain information on population structure and size and habitat parameters for each species.
- to document the current knowledge about each target species and the possible threats to the long term viability in the wild
- to assess the threats and conservation status of each species and make recommendations for management of existing populations.

2. CHAPTER TWO

METHODS

2.1 SELECTING TARGET SPECIES

Compilation of the list of species in the forested areas within the South East Queensland Biogeographical Region was based on locality information from the Queensland Herbarium database intersected with the bioregion boundaries. From this a total of 49 endangered and 94 vulnerable species listed on the schedules of the *Queensland Nature Conservation Act 1992* are recorded in the region. Of these 20 endangered and 41 vulnerable species have been recorded as occurring in State Forest or Timber Reserves (Table 2.1.1). The list of species in the region is relatively large. As it was not possible to examine all species given the time constraints of the project, a number of species were selected and targeted for survey work. Selection was based on:

- The amount of information available. The less information available, the more important it was to survey the species. Those species which presently have recovery plans or had been previously searched for directly or in association with other studies were considered of lesser priority.
- The visibility of the species in the field at the time of survey. Grass species are difficult to identify without fertile material and preliminary information indicated that those grass species on the list did not flower during the survey period. The orchid species were not studied as these are often cryptic and seasonal in occurrence, and require a high level of specialised expertise.

Within the time available a total of 10 species were searched for during this project. Outlines were prepared for a further 22 species, based on information available from Queensland herbarium records and vegetation mapping records (CORVEG), botanists, and amateur naturalists.

The species outlines presented in this report give a brief description of the species' morphology, distinguishing features and conservation status. Descriptions of species were compiled by consulting references, herbarium material and from discussions with botanists. Specimens at the Queensland Herbarium were examined and identifications were confirmed by comparison with the type material and consultation with relevant experts.

Field survey methods

Surveys were carried out during September to November 1997. Searches were initially undertaken at sites where the species in question had been most recently collected and for which useable locality information was available. Information was obtained from Queensland Herbarium records, site data from vegetation mapping, botanists, Department of Primary Industries Forestry Officers and amateur organisations. Subsequently, similar habitats in other areas were searched when time

was available. Where populations were not represented in Queensland Herbarium collections, voucher specimens were collected and deposited in the Queensland Herbarium.

When a population of a targeted species was located the following features were recorded:

- location details with Global Positioning Data
- habitat attributes within a 20 x 50 m plot placed within the population:
 - landform and land surface (McDonald *et al.* 1990).
 - soil type: Field texture was measured by the method described by Northcote (1971). Soil colour was recorded by comparing moist soil with colour charts (Revised Standard Colour Charts, Research Council for Agriculture, Forestry and Forestry and Fisheries, Japan, (1970)). Soil pH was measured using a TPS electronics WP-80 pH meter.
 - geology: as mapped on Queensland Department of Minerals and Energy 1: 250 000 geological series.
 - vegetation: Structure of associated vegetation (Walker and Hopkins 1990). Associated dominant and common plant species. (Plant nomenclature according to Henderson (1997)).
- an estimate of the area that the population covers based on a comprehensive search of the areas.
- a measurement of the populations of the targeted species. Populations were measured by one of two methods. If the site was small, or consisted of isolated clumps, a direct count of individuals plants was undertaken. For larger sites, or where it was impractical to do direct counts, density and abundance were estimated by counting individuals in transects placed through the populations. For these sites an estimate of the mean density and the variance are given with an estimate of abundance and 95 % confidence interval in Appendix 2. Each transect was placed in what was assessed to be a representative sample of the population.
- where practical, population characteristics such as breeding biology, age structure and response to disturbance and fire were assessed.

TABLE 2.1.1: ALPHABETICAL LIST OF THREATENED PLANT SPECIES RECORDED FOR STATE FOREST (INCLUDING TIMBER RESERVES) IN SOUTH EAST QUEENSLAND BIOGEOGRAPHICAL REGION.

| Botanical name | QNCR ¹ | ESP ² | Reports | SMP ³ | Current study |
|---|-------------------|------------------|---------|------------------|---------------|
| <i>Acacia attenuata</i> | V | V | | D | OL |
| <i>Acacia baueri</i> subsp. <i>baueri</i> | V | V | | | OL |
| <i>Acacia grandifolia</i> | V | V | | D | OL |
| <i>Acacia perangusta</i> | V | V | | D | OL |
| <i>Acacia</i> sp. (Binjour P.I.Forster PIF5734) | E# | | | P | |
| <i>Alectryon ramiflorus</i> | E | E | 4, 7 | D | |
| <i>Allocasuarina rigida</i> subsp. <i>exsul</i> | V# | | | P | S |
| <i>Archidendron lovelliae</i> | V | V | 3 | P | |
| <i>Arthraxon hispidus</i> | V | E | 8 | P | OL |
| <i>Boronia keysii</i> | V | V | 8,10 | P | |
| <i>Bothriochloa bunyensis</i> | V | V | | P | OL |
| <i>Clematis fawcettii</i> | V | V | 8 | P | OL |
| <i>Cossinia australiana</i> | E | | 4 | D | |
| <i>Cupaniopsis shirleyana</i> | V | V | 4 | P | |
| <i>Cycas megacarpa</i> | V | E | | D | OL |

| Botanical name | QNCR ¹ | ESP ² | Reports | SMP ³ | Current study |
|---|-------------------|------------------|---------|------------------|---------------|
| <i>Daviesia discolor</i> | V | V | | P | S |
| <i>Dodonaea rupicola</i> | V | V | | D | S |
| <i>Eucalyptus conglomerata</i> | E | E | 5 | P | |
| <i>Eucalyptus hallii</i> | V | V | 12 | D | OL |
| <i>Eucalyptus taurina</i> | V# | | | | OL |
| <i>Floydia praealta</i> | V | V | 4, 11 | P | |
| <i>Fontainea rostrata</i> | V | V | 4 | D | |
| <i>Fontainea</i> sp. (Binjour P.I.Forster PIF4687) | E# | | | D | |
| <i>Fontainea venosa</i> | V | V | 4 | | |
| <i>Haloragis exalata</i> subsp. <i>velutina</i> | V | V | | P | OL |
| <i>Lasiopetalum</i> sp. (Proston J.A.Baker 17) | E# | | | | OL |
| <i>Leucopogon recurvisepalus</i> | E | | | D | S |
| <i>Macadamia integrifolia</i> | V | V | 4 | P | |
| <i>Macadamia janseni</i> | V | E | 4 | P | |
| <i>Macadamia ternifolia</i> | V | V | 4 | P | |
| <i>Macadamia tetraphylla</i> | V | V | 4, 11 | P | |
| <i>Macrozamia lomandroides</i> | E | E | | D | S |
| <i>Macrozamia parcifolia</i> | V | V | | D | S |
| <i>Macrozamia pauli-guilielmi</i> | E | E | | D | S |
| <i>Marsdenia coronata</i> | V | | | D | OL |
| <i>Medicosma elliptica</i> | V | V | | P | OL |
| <i>Notelaea lloydii</i> | V | V | | P | OL |
| <i>Oldenlandia</i> sp. (Wietalaba N.Gibson 1344) | E# | | | P | S |
| <i>Parsonsia kroombitensis</i> | V# | | | D | |
| <i>Parsonsia larcomensis</i> | V# | V | | D | |
| <i>Paspalidium grandispiculatum</i> | V | V | | P | OL |
| <i>Phaius australis</i> | E | V | 8, 13 | D | |
| <i>Phaius tancarvilleae</i> | E | E | 8, 13 | D | |
| <i>Phebalium obtusifolium</i> | V | | 6 | D | |
| <i>Plectranthus nitidus</i> | E | E | | P | OL |
| <i>Plectranthus omissus</i> | E | E | | P | OL |
| <i>Plectranthus torrenicola</i> | E | E | | D | OL |
| <i>Prostanthera</i> sp. (Mt Tinbeerwah P.R.Sharpe 4781) | V | V | | P | S |
| <i>Pterostylis chaetophora</i> | V# | | | | |
| <i>Quassia bidwillii</i> | V | V | 4 | P | |
| <i>Rhodamnia</i> sp. (Calliope N.Gibson 1335) | E# | | | | S |
| <i>Romnalda strobilacea</i> | V | E | 4 | P | |
| <i>Sarcochilus fitzgeraldii</i> | E | V | | P | |
| <i>Sarcochilus roseus</i> | V | V | 11 | P | |
| <i>Sarcochilus weinthalii</i> | E | V | 11 | D | |
| <i>Sophora fraseri</i> | V | V | 11 | D | OL |
| <i>Thelypteris confluens</i> | V# | | | | |
| <i>Thesium australe</i> | V | V | 8, 14 | P | |
| <i>Triunia robusta</i> | E | E | 4 | P | |
| <i>Xanthostemon oppositifolius</i> | V | V | 4, 8 | D | |
| <i>Zieria</i> sp. (Binjour P.I. Forster PIF14134) | E# | | | | |

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2. Endangered Species Protection Act 1992 (C'wlth).

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Pending inclusion on the schedule of the Queensland *Nature Conservation (Wildlife) Regulation*.

OL = Species outlined in this report

S = Species surveyed Sept to Nov 1997 and outlined in this report

D = Draft Species Management Profile completed

P = Draft Species Management Profile in progress

3. CHAPTER THREE

RESULTS AND DISCUSSION

3.1 PREAMBLE

Outlines are presented of 32 threatened plant species, of which 10 species have been surveyed in some detail during the present project. The species are arranged alphabetically.

3.2 ACACIA ATTENUATA MAIDEN & BLAKELY

3.2.1 Summary

Acacia attenuata is restricted to coastal sandplains from just north of Bundaberg to Burleigh on the Gold Coast. It covers a range of approximately 400 km and encompasses an area of occurrence of approximately 12,000 km². It has been recorded from State Forest (SF) 898, Littabella, Poona and Cooloola National Parks, and Burleigh Knoll and Palmview Conservation Parks. The species is also reported to be present in the Mooloolah River National Park. No information is available on population size. Current or perceived threats to the continued survival of *A. attenuata* are considered to be loss of habitat and inappropriate fire regimes.

3.2.2 Species description and identification

The genus *Acacia* is placed in the family Mimosaceae. *Acacia* is widespread throughout the tropical and subtropical regions of the world (excluding Europe) with approximately 1200 species (Mabberley 1997). In Australia it comprises approximately 900 species of shrubs and trees, which are widely distributed throughout the continent with a large range of foliage and flower types.

Acacia attenuata Maiden & Blakely was formally described in 1927 from material collected near Beerwah, approximately 77 km north of Brisbane (Maiden & Blakely 1927). The botanical description of *Acacia attenuata* is as follows:

A slender shrub to about 3 m tall, retaining juvenile foliage for long period and even flowering and fruiting in juvenile state; branchlets somewhat angular, soon becoming terete, glabrous. Stipules very broad triangular, ca 0.4 mm long, early deciduous; pulvinus 3-5 mm long; phyllode more or less straight, apex obtuse mucronulate or occasionally acute, base attenuate, (9)10-14(17) cm long, 7-16 mm wide, 7-14(18) times as long as wide, glabrous; midrib prominent, curved and

approximating ventral margin 1/10 to 1/4 the length of the phyllode from the base; gland inconspicuous, immediately above the pulvinus. Heads of 20-35 flowers in glabrous axillary 6-14-branched racemes, the axis 5-7.5 cm long, the peduncles ca 7 mm long, bracteoles peltate; flowers cream-yellow, 5 merous. Pod flat slightly narrowed between seeds and raised above them alternately on each side, glabrous 8-10 cm long, 13-14 mm wide; seeds longitudinal, oblong, 6-7 mm long, 3-4 mm wide, the funicle encircling the seed (Stanley & Ross 1983). For a more detailed description refer to Pedley (1978). For an illustration see Maiden & Blakely (1927).

Acacia attenuata is most closely related to and strongly resembles *A. rubida* in retaining its juvenile leaves for a long period of time. However, *A. attenuata* differs from *A. rubida* by having more attenuated phyllodes, with the relatively smaller, different-shaped and strictly basal gland and a much broader pod. *A. attenuata* may be confused with the more widespread and common *A. falcata* but can be distinguished by its narrower, more or less, straight phyllodes and broader pods.

3.2.3 Current conservation status

Acacia attenuata Maiden & Blakely is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.2.4 Distribution and abundance

Acacia attenuata was not surveyed during the present study. *A. attenuata* is endemic to south east Queensland. It occurs on sandplains not more than 30 km from the coast with a range along the coast of approximately 400 km from just north of Bundaberg to Burleigh on the Gold Coast. It has never been recorded on any of the islands along the coast in this region.

Details from Queensland Herbarium specimens of *A. attenuata* are listed in Appendix 1.1. A total of 34 specimens have been collected from approximately 23 sites. Twelve of the earliest records (prior to 1960) give only a general locality, which is insufficient to accurately relocate the collection sites.

A. attenuata is recorded from Littabella National Park (N.P.) (2 records), Poona N.P. (2 records), Cooloola N.P. (1 record), Burleigh Knoll Conservation Park (C.P.) (1 record) and Palmview C.P. (1 record). The species is also reported to be present in the Mooloolah River N.P. with the endangered species *Eucalyptus conglomerata* (Drake 1995). *A. attenuata* has been recorded from SF 898 (Fty 1636) (1 record) where it is reported to be common at the site of collection (Queensland Herbarium database).

There is no information available on population sizes.

3.2.5 Habitat

A. attenuata is restricted to the coastal lowlands. It occurs on flats, low rises and at the edge of wallum swamps. The soils are sandy and mostly poorly drained. *A. attenuata* has been recorded growing in shrublands with *Leptospermum whitei* and *Baeckea frutescens*, wallum with *Banksia aemula* and *Eucalyptus robusta*, woodlands with *Corymbia trachyphloia*, *Eucalyptus umbra* and *Banksia oblongifolia*, and open forests of *Eucalyptus umbra*, *E. racemosa* and *Melaleuca quinquenervia*. *A. attenuata* has also been recorded on roadsides and in areas previously cleared of natural vegetation.

3.2.6 Life history and ecology

Acacia attenuata is a perennial shrub reaching 3 m high. The longevity of individual plants is unknown. The main method of reproduction is by sexually produced seeds. The species is not known to be capable of resprouting from the stem base or other underground organs.

Flowering has been observed from May to September. No pollinators have been reported for *A. attenuata*. However studies of pollinators of other *Acacia* species indicate they are primarily insect pollinated (Bernhardt 1989). Fruits have been recorded from August to September. The fruit splits soon after maturing, releasing the seeds. It is not known if the opening of the capsule forcibly ejects the seed or whether the seeds just fall to the ground. The seed has a fleshy attachment on the outside of the seed coat. It is suggested that such attachments promote secondary dispersal by ants (Berg 1975).

When released from the mature pods, seeds are dormant. As with most hard-seeded leguminous species, this dormancy is due to seed coat impermeability. The genus *Acacia* contains numerous species whose germination is promoted by heat from fire. With these seed characteristics, *A. attenuata* would accumulate a persistent seed bank in the soil during inter-fire periods. The length of seed viability in the soil is unknown.

Fire is a major environmental factor in Australia, particularly in dry sclerophyll forest. Different intensities, frequencies and seasonal occurrences of fire will effect the population dynamics of this species. Although little is known about the fire ecology of *A. attenuata*, it is suggested that fire plays an important role in the recruitment pattern of this species. There is no information available on this species' fire requirements.

3.2.7 Threats

There have been in the past large tracts of habitat cleared for urban development and agricultural development. Some habitat may have been lost with development of softwood plantations in the Beerwah and Maryborough areas. Clearing and drainage of habitat for urban development is continuing to occur especially in the south of its range on the Gold and Sunshine Coasts.

An inappropriate fire regime would lead to a decline in the ability of the species to maintain sustainable recruitment patterns. The limited knowledge about the effect of fire and species response makes it difficult to assess the total impact of varying fire regimes. However, too frequent a fire regime would certainly lead to a gradual decline in the population. Sufficient time would be required between fires to allow seedlings to flower and replenish the soil seedbank. Sufficient soil heating is also needed during fires to break seed dormancy and allow germination.

3.2.8 Management, research and conservation measures

Additional survey work is required to determine what populations remain and what would be the most appropriate course of action for conserving the species. Areas worthy of investigation include SF 915 (Fty 1592), SF 561 (Fty 1655) and the Burrum Coast National Park.

Fire intensity, frequency and seasonality are important factors in determining the long term population levels of most hard-seeded leguminous species. It is important to understand how *A. attenuata* responds to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

3.3 ACACIA BAUERI BENTH. SUBSP. BAUERI

3.3.1 Summary

The distribution of *Acacia baueri* subsp. *baueri* occurs from Bundaberg to Sydney. In Queensland *A. baueri* subsp. *baueri* is restricted to the coastal plain not more than 20 km from the coast with a range along the coast of approximately 320 km and with an area of occurrence of approximately 6,400 km². It has been recorded from SF 581 SA 1 (Beerwah) and from Burrum Coast, Mooloolah River, Cooloola and Moreton Island National Parks, and from Pine Ridge Conservation Park. No information is available on population size. Current or perceived potential threats to the continued survival of *A. baueri* subsp. *baueri* are considered to be loss of habitat and inappropriate fire regimes.

3.3.2 Species description and identification

The genus *Acacia* is widespread throughout the tropical and subtropical regions of the world (excluding Europe) with approximately 1200 species (Mabberley 1997). In Australia it comprises approximately 900 species of shrubs and trees, which are widely distributed throughout the continent with a large range of foliage and flower types.

Acacia baueri Benth. was formally described in 1842 from material collected somewhere along the east coast of Australia. The species belongs to the section *Lycopodiifoliae* which are a very distinctive group within the Acacias as they have their phyllodes arranged in regular whorls along the stem.

There are two subspecies of *A. baueri*, *A. baueri* subsp. *baueri* and *A. baueri* subsp. *aspera*. *A. baueri* subsp. *aspera* is chiefly known from the Blue Mountains, New South Wales and is not considered in this report. The botanical description of *Acacia baueri* subsp. *baueri* is as follows:

Erect shrub less than 0.5 m tall; branchlets terete, glabrous or with indumentum of sparse to moderately dense antrorse white hairs, sometimes tuberculate. Stipules up to 0.8 mm long, often absent; pulvinus 0.4-0.6 mm long; phyllodes 6-8(9) per whorl, very rarely scattered, straight or recurved in upper half, or only at apex, mucronate, slightly laterally compressed, 0.7-1.6 cm x 0.05-0.1 cm, glabrous or occasionally tuberculate, or with scattered white hairs similar to those of branchlets, obscure longitudinal nerve on each side of phyllode. Heads of 10-15 flowers, peduncles 0.2-1.5 cm long; receptacle pubescent; bracteoles ca 1 mm long with few hairs; flowers golden-yellow, 5 merous. Pods linear, sessile, up to 2.5 cm x 0.2-0.3; glabrous or with extremely sparse appressed hairs mainly at base, seeds longitudinal, more or less cylindric, 4-5.5 mm x 2-2.5 m. (Stanley & Ross 1983). For a more detailed description refer to Pedley (1972). For an illustration see Morrison and Davies (1991).

Acacia baueri subsp. *baueri* is a very distinctive *Acacia* with its phyllodes in whorls of 6 to 9 along the stem. For this reason it is unlikely to be confused with any other species within its range in Queensland.

3.3. Current conservation status

Acacia baueri is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth

Endangered Species Protection Act 1992. The species has not been assigned a national conservation status by ANZECC (1993)

3.3.4 Distribution and abundance

Acacia baueri subsp. *baueri* was not surveyed during the present study. *Acacia baueri* subsp. *baueri* occurs from Bundaberg to Sydney. In Queensland *A. baueri* subsp. *baueri* is restricted to the coastal plain not more than 20 km from the coast with a range along the coast of approximately 320 km from just south of Bundaberg to Burleigh Heads on the Gold Coast.

Details from Queensland Herbarium specimens of *A. baueri* subsp. *baueri* are listed in Appendix 1.2. Twenty-four specimens have been collected from approximately 16 sites. Nine of the earliest records (prior to 1970) give only a general locality which is inadequate to accurately relocate the collection site.

A. baueri subsp. *baueri* is recorded from Kinkuna and Woodgate sections of the Burrum Coast N.P. (3 records), Mooloolah River N.P. (1 record), Cooloola N.P. (1 record) and Moreton Island (1 record) N. P., and Pine Ridge Conservation Park(1 record). The species is also recorded from Fraser and North Stradbroke Islands. *A. baueri* subsp. *baueri* has been recorded on a roadside embankment from State Forest Scientific Area within SF 561 (Fty 1655) (1 record). Although not recorded *A. baueri* subsp. *baueri* is highly likely to be present in Noosa N.P. Recently *A. baueri* subsp. *baueri* has been recorded at the Tugun Refuse Tip (Gold Coast).

There is no information available on population sizes, however, it is generally reported as being rare or occasional at collection sites.

3.3.5 Habitat

A. baueri subsp. *baueri* is restricted to the coastal lowlands mostly on infertile, often seasonally waterlogged sandy soils in heathlands, shrublands and low open woodlands. Other species most commonly recorded at the collection sites included: *Banksia aemula*, *Banksia serrata*, *Banksia oblongifolia*, *Eucalyptus racemosa* and *Eucalyptus umbra*.

At the recent recorded site at the Tugun Refuse Tip it is growing on a low isolated rise in a broad dune swale with sapric sandy soil. The vegetation is a heathland. The common shrub and ground species included: *Banksia oblongifolia*, *Baeckea frutescens*, *Leptospermum semibaccatum*, *L. whitei*, *Leucopogon leptospermoides*, *Lepyrodia interrupta*, *Caustis recurvata*, *Restio tenuiculmis* and *Stylidium graminifolium*.

3.3.6 Life history and ecology

A. baueri subsp. *baueri* is a perennial shrub up to 0.5 m high. The longevity of individual plants is unknown. The main method of reproduction is by sexually produced seeds. The species is not known to be capable of resprouting from the stem base or other underground organs.

Flowering has been recorded from February to May, August and October to December. *A. baueri* subsp. *baueri* may flower at most times of the year, but the principal flowering season is spring to early summer. No pollinators have been reported for *A. baueri* subsp. *baueri*. However studies of pollinators of other *Acacia* species indicate they are primarily insect pollinated (Bernhardt 1989). Fruits have been recorded from June to October and December. The fruit splits soon after maturing, releasing the seed. It is not known if the opening of the capsule forcibly ejects the seed or whether

the seeds just fall to the ground. The seed has a fleshy attachment on the outside of the seed coat. It is suggested that such attachments promote secondary dispersal by ants (Berg 1975).

When released from the mature pods, seeds are dormant. As with most hard-seeded leguminous species, this dormancy is due to seed coat impermeability. The genus *Acacia* contains numerous species whose germination is promoted by heat from fire. With these seed characteristics *A. baueri* subsp. *baueri* would accumulate a persistent seed bank in the soil during inter-fire periods. The length of seed viability in the soil is unknown.

Fire is a major environmental factor in Australia, particularly in dry sclerophyll forest. Different intensities, frequencies and seasonal occurrences of fire will affect the population dynamics of this species. Although little is known about the fire ecology of *A. baueri* subsp. *baueri*, it is suggested that fire plays an important role in the recruitment pattern of this species.

3.3.7 Threats

There have been in the past large tracts of potential habitat cleared for urban development, especially on the Gold and Sunshine Coast. Clearing and drainage of habitat for urban development is continuing to occur especially in the south of its range on the Gold and Sunshine Coasts.

The limited knowledge about the effect of fire and this species' response makes it difficult to assess the total impact of varying fire regimes. However, too frequent a fire regime would certainly lead to a gradual decline in the population. Sufficient time would be required between fires to allow new seedlings to flower and replenish the soil seedbank. Sufficient soil heating is also needed during fires to break seed dormancy and allow germination after fires.

3.3.8 Management, research and conservation measures

Additional survey work is required to determine what populations are left and what would be the appropriate course of action for conserving the species. Information on population sizes, fecundity and general ecology is required. Areas worthy of investigation include any remnant wallum vegetation on the Gold and Sunshine Coast, and coastal wallum country between Maryborough and Tin Can Bay.

Gold Coast City Council should be encouraged to preserve the remnant heathland on the Tugun Refuse Tip Reserve. The Pine Ridge Conservation Park presently offers the most secure habitat of *A. baueri* subsp. *baueri* in the Gold Coast region. The population should be assessed and monitored.

Fire intensity, frequency and seasonality are important factors in determining the long term population levels of most hard-seeded leguminous species. It is important to understand how *A. baueri* subsp. *baueri* responds to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of this and other *Acacia* species.

3.4 ACACIA GRANDIFOLIA PEDLEY

3.4.1 Summary

Acacia grandifolia is endemic to south east Queensland where it occurs in an restricted area between Mundubbera, Coalstoun Lakes and Proston in the Burnett Pastoral District. It covers a range of approximately 100 km and encompasses an area of occurrence of approximately 4200 km². It has been recorded from six State Forests as well as along road verges, freehold and leasehold land. It is not recorded in any conservation reserve. No quantitative information is available on population sizes. However, anecdotal evidence indicates that it is common within its restricted range. The species is not threatened by extinction in the short to medium term. However, the species may be potentially threatened in the long term by clearing for agricultural development, grazing of domestic cattle and inappropriate fire regimes.

3.4.2 Species description and identification

The genus *Acacia* is placed in the family Mimosaceae. *Acacia* is widespread throughout the tropical and subtropical regions of the world (excluding Europe) with approximately 1200 species (Mabberley 1997). In Australia it comprises approximately 900 species of shrubs and trees, which are widely distributed throughout the continent with a large range of foliage and flower types.

Acacia grandifolia Pedley was formally described in 1978 from material collected in the Mundubbera area (Pedley 1978). The botanical description of *Acacia grandifolia* is as follows:

Tree up to ca 8 m tall; branchlets stout angular with dense whitish indumentum of erect hairs, extending to pulvinuses and peduncles. Pulvinus 6-10 mm long; phyllodes more or less straight, asymmetrically elliptic, 9-15 cm x 2.5-5 cm, ca 3-4 times as long as wide, up to 7.5 cm wide and twice as long as wide on young plants, indumentum of spreading hairs, 3(-4) longitudinal nerves more prominent than the rest, secondary nerves widely spaced, strongly anastomosing; gland basal, large. Spikes in pairs in upper axils, peduncles thick, 5-8 mm long, velvety; spikes dense, 5-10 cm long, rachis velvety; flowers golden-yellow, 5 merous. Pods flat, 6 cm x 0.6 cm; tomentose; seeds shining, longitudinal, ca 4 mm x 2 mm, rather thick; funicle pale yellow. (Stanley & Ross 1983). For a more detailed description refer to Pedley (1978).

Acacia grandifolia is closely related to and resembles *A. longispicata* and *A. crassa* (L. Pedley pers. comm.). *A. grandifolia* can be distinguished from these species by having broad phyllodes that are 3 to 4 times as long as wide with very conspicuous vein reticulum on the phyllode, and the nerve islands less than 3 times as long as wide. The other two species have narrower phyllodes that are 4 to 18 times as long as wide with a vein reticulum that is not very conspicuous and the nerve islands more than 3 times as long as wide.

3.4.3 Current conservation status

Acacia grandifolia Pedley is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. However, a change in the conservation status is pending, from Vulnerable to Rare on the Queensland schedule. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.4.4 Distribution and abundance

Acacia grandifolia was not surveyed during the present study. *A. grandifolia* is endemic to south east Queensland. It occurs in a restricted area between Mundubbera, Coalstoun Lakes and Proston in the Burnett Pastoral District. It covers a range of approximately 100 km and encompasses an area of occurrence of approximately 4200 km².

Details from Queensland Herbarium specimens of *Acacia grandifolia* are listed in Appendix 1.3. There are 28 specimens which have been collected from approximately 19 sites. Another 46 sites are recorded in the CORVEG database. The species is known from 6 State Forest areas (SF 210 Fty 702, SF 249 Fty 1693, SF 220 Fty 9980, SF 132 Fty 1348, SF 255 Fty 1025, SF 1344 Fty 1534) and on Brian Pastures Research Station. It is also recorded from leasehold land and road verges in the area. It has not been recorded in any conservation reserve. There is one record from the Dawson Range near Dingo approximately 250 km NW of the Mundubbera district. This record is based on juvenile material that is atypical of this species and needs to be confirmed when more material becomes available.

There is no quantitative data on population sizes. Originally *A. grandifolia* was considered to be an uncommon species within a narrow range. However, in recent times it has been found to be locally common and very abundant within the area (T. Ritchie pers. comm., P. Grimshaw pers. comm.).

3.4.5 Habitat

Acacia grandifolia grows in hilly terrain on hillslopes of varying aspects and slope, hillcrests, gullies and plains on usually shallow well drained soils, sandy loam to clay loam in texture derived from sandstones and acidic volcanics. The vegetation is tall woodland or open-forest with a range of floristic associations. The most frequently recorded tree species are *Eucalyptus crebra*, *Corymbia citriodora*, *C. trachyphloia* and *E. exserta*.

3.4.6 Life history and ecology

Acacia grandifolia is a small tree reaching 8 m high. The longevity of individual plants is unknown. The main method of reproduction is by sexually produced seeds. The species is not known to be capable of resprouting from the stem base or other underground organs.

Flowering has been observed from July to October. No pollinators have been reported for *A. grandifolia*. However studies of pollinators of other *Acacia* species indicate they are primarily insect pollinated (Bernhardt 1989). Fruits have been recorded from October to November. The fruit splits soon after maturing, releasing the seed. It is not known if the opening of the capsule forcibly ejects the seed or whether the seeds just fall to the ground. The seed has a fleshy attachment on the outside of the seed coat. It is suggested that such attachments promote secondary dispersal by ants (Berg 1975).

Seeds are dormant when released from the mature pods. As with most hard-seeded leguminous species, this dormancy is due to seed coat impermeability. The genus *Acacia* contains numerous species whose germination is promoted by heat from fire. With these seed characteristics *A. grandifolia* would accumulate a persistent seed bank in the soil during inter-fire periods. The length of seed viability in the soil is unknown.

Fire is a major environmental factor in Australia, particularly in dry sclerophyll forest. Different intensities, frequencies and seasonal occurrences of fire will effect the population dynamics of this

species. Although little is known about the fire ecology of *A. grandifolia* it is suggested that fire plays an important role in the recruitment pattern of this species. There is no quantitative information available on this species' fire requirements.

Anecdotal evidence indicates that this species proliferates in areas of disturbance. It is reported to have been transported in gravel used in maintenance of road verges within its present range (P. Forster pers. comm.). Pedley (1978) commented that grazing of domestic cattle may restrict the establishment of *Acacia* seedlings.

3.4.7 Threats

In recent years the species has been observed to be very common at a number of localities within its restricted range. The species' continued existence in the wild in the short to medium term does not appear to be threatened. However, with no populations within areas set aside for the conservation of the natural habitat, the species may be potentially threatened in the long term by the management of its habitat for other uses.

Populations on freehold and leasehold land are potentially threatened by clearing for agricultural development and by grazing of domestic cattle.

The species appears to respond favourably to some degree of habitat disturbance. However there is no information on the effect of varying levels of habitat disturbance.

The occurrence of fire in the habitat of *A. grandifolia* should not be viewed as being incompatible with the long term survival of the species. However the lack of ecological information about this species response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. If fires are too frequent, the plants will have insufficient time to build-up a soil seedbank to replace plants that have been killed in the fires, and this will lead to population declines.

3.4.8 Management, research and conservation measures

No populations are known to be in conservation reserves. Negotiations should be undertaken with landowners or Department of Natural Resources to reserve at least some of the population.

It is important to understand how *A. grandifolia* responds to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

The effect of grazing of domestic stock on the population dynamics of *A. grandifolia* needs to be assessed if grazing on crown land continues in areas where this species grows.

3.5 ACACIA PERANGUSTA (C.T. WHITE) PEDLEY

3.5.1 Summary

Acacia perangusta is endemic to south east Queensland. It is known from two disjunct localities approximately 240 km apart. *A. perangusta* has been recorded from the Maryborough - Hervey Bay area and from Rochedale, Victoria Point, Mt Cotton and Beenleigh in the Greater Brisbane area. It has been recorded from SF 1294 (Fty 1705) SF 682 (Fty 1579), SF 215 (Fty 821) and Springwood Conservation Park. No information is available on population sizes. Current or perceived threats to the continued survival of *A. perangusta* are considered to be loss of habitat, an inappropriate fire regime and grazing of domestic cattle.

3.5.2 Species description and identification

The genus *Acacia* is widespread throughout the tropical and subtropical regions of the world (excluding Europe) with approximately 1200 species (Mabberley 1997). In Australia it comprises approximately 900 species of shrubs and trees, which are widely distributed throughout the continent with a large range of foliage and flower types.

Acacia perangusta was originally described as a variety of the common species *A. fimbriata* (Brisbane golden wattle) (White 1939). In his revision of the Acacias of Queensland Pedley (1978) raised this variety to the rank of species. The botanical description of *Acacia perangusta* is as follows:

Shrub or small tree up to 6 m tall; branchlets reddish, slender, angular, glabrous. Pulvinus ca 0.5 mm long; phyllodes linear, apex acute or occasionally obtuse, 3-7.5 cm x 0.11-0.16 cm, 20-55 times as long as broad, glabrous, midnerve prominent; gland small but projecting from margin, 0.7-1.4 cm from base. Heads of 9-12 flowers in glabrous axillary 15-20-branched racemes, axis 2.5-3 cm long, peduncles 2-2.5 mm long; flowers lime-yellow, (4-) 5-merous, rather widely spreading. Pods slightly constricted between seeds and raised over them alternately on each side, 7.5 cm x 0.5 cm, glabrous and slightly glaucous; seeds longitudinal (Stanley & Ross 1983). For a more detailed description refer to Pedley (1978).

Acacia perangusta is clearly closely related to and is often confused with *A. fimbriata*. However, *A. perangusta* differs from *A. fimbriata* in having narrower glabrous phyllodes with the gland further from the phyllode base, glabrous flowers and narrower pods (Pedley 1978).

3.5.3 Current conservation status

Acacia perangusta is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.5.4 Distribution and abundance

Acacia perangusta was not surveyed during the present study. Details from Queensland Herbarium specimens of *A. perangusta* are listed in Appendix 1.4. Twenty specimens of *A. perangusta* have been collected from two disjunct localities approximately 240 km apart. As far as can be ascertained, this distribution pattern is natural and is not related to habitat reduction or fragmentation from human activity. It has been recorded from the Maryborough - Hervey Bay area

(5 specimens), and from Rochedale, Victoria Point, Mt Cotton and Beenleigh in the Greater Brisbane area (15 specimens).

Two specimens from the Brisbane area are from Daisy Hill State Forest (SF 215 Fty 821) and one from Springwood Conservation Park. The remaining twelve specimens are either from roadsides, freehold land or other land of unknown tenure. Daisy Hill State Forest is now a non-commercial forest and is presently managed by the Department of Natural Resources for recreational use. *A. perangusta* was noted as common at the site of collection in Daisy Hill State Forest in 1993.

Four of the five specimens from the Maryborough - Hervey Bay area have insufficient information to accurately locate the collection site. Butler and Neate (1996) reported that the distribution of *A. perangusta* in the Toogoom area is discontinuous and confined to forest remnants, road verges, fence lines, unimproved freehold land and on crown land utilised for extractive industries. It is not reported to occur in any conservation reserve in this area. *A. perangusta* is known from two state forest sites:

1) SF 1294 (Fty 1705) - Lenthall's Dam. This site was first recorded in February 1997. Recently it has been reported that *A. perangusta* is relatively common on the ridge north of the dam wall in eucalypt open-forest near a vine thicket community (J. Aridis, Department of Natural Resources). This species is also reported on freehold land downstream of the dam wall along the Burrum River (Moran 1997).

2) SF 683 (Fty 1579) This site is not vouchered, although specimen AQ587996 may have come from this site. Butler and Neate (1996) reported that *A. perangusta* is relatively common within the State Forest.

3.5.5 Habitat

In the Toogoom area, *A. perangusta* has been observed on ridges and slopes with gravelly thin topsoils (less than 30 cm deep) over lateritic rock layers (Butler and Neate 1996). The vegetation tends to be open-forests dominated by *Eucalyptus siderophloia*. Other tree species present included *Corymbia citriodora*, *C. intermedia* and *Lophostemon suaveolens*.

In the Brisbane area *A. perangusta* has been recorded on undulating terrain with gravelly/sandy soil, sandstone ridges and on alluvial soils along creek banks. The vegetation structure is a woodland or open-forest. The more frequent tree species recorded are *Eucalyptus tindaliae* and *Corymbia henryi*. Other tree species recorded at the sites include *E. carnea*, *E. planchoniana*, *E. fibrosa* and *E. microcorys*.

3.5.6 Life history and ecology

Acacia perangusta is a perennial shrub reaching 6 m high. The longevity of individual plants is unknown. The main method of reproduction is by sexually produced seeds. Butler and Neate (1996) reported *A. perangusta* can produce abundant seed within 2 to 3 years of germination. The species is known not to be capable of resprouting from the stem base or other underground organs.

Flowering has been observed from June to September. No pollinators have been reported for *A. perangusta*. However studies of pollinators of other *Acacia* species indicate they are primarily insect pollinated (Bernhardt 1989). Fruits have been recorded in October. The fruit splits soon after maturing, releasing the seed. It is not known if the opening of the capsule forcibly ejects the seed or whether the seeds just fall to the ground. The seed has a fleshy attachment on the outside of the seed coat. It is suggested that such attachments promote secondary dispersal by ants (Berg 1975).

Most *Acacia* species release their seed from the mature pods in a dormant state. Heating of the soil during the passage of a fire is the primary mechanism for breaking seed dormancy and allowing germination. With these seed characteristics, *A. perangusta* would accumulate a persistent seedbank in the soil during inter-fire periods. The length of viability of seed in the soil is unknown.

Individuals of *A. perangusta* have been observed to be killed by fire (Butler and Neate 1996). Fire is a major environmental factor in Australia, particularly in dry sclerophyll forest. Different intensities, frequencies and seasonal occurrences of fire will effect the population dynamics of this species. Although little is known about the fire ecology of *A. perangusta* it is suggested that fire plays an important role in the recruitment pattern of this species.

It has been noted that *A. perangusta* responds to soil disturbance and seedlings are grazed by domestic cattle (Butler and Neate 1996).

3.5.7 Threats

There have been in the past large tracts of habitat cleared for urban and agricultural development. Clearing of habitat for urban development is continuing to occur in the Maryborough - Hervey Bay and Brisbane areas.

Butler and Neate (1997) reported that in the Maryborough-Hervey Bay area that *A. perangusta* is subjected to grazing by cattle and suggested that this has severely depleted the population of *A. perangusta*.

The limited knowledge about the effect of fire and species response makes it difficult to assess the total impact of varying fire regimes. However, too frequent a fire regime would certainly lead to a gradual decline in the population. Sufficient time would be required between fires to allow seedlings to flower and replenish the soil seedbank. Soil needs to be heated sufficiently during fires to break seed dormancy to allow germination after fires.

3.5.8 Management, research actions and conservation measures

Survey work is required to determine which populations remain and what would be the appropriate course of action for conserving the species. In the southern end of its distribution there are within the vicinity of presently vouchered sites a number of local council reserves that need to be investigated.

Most of the populations in the southern part of its range are near or within urban areas. Future management of these habitat remnants will be important to the long term survival of the species in this part of its range.

It is important to understand how *A. perangusta* responds to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

Monitoring and research are also required to determine the long term effect of grazing of domestic stock on the species' ability to maintain a viable population.

3.6 ALLOCASUARINA RIGIDA SUBSP. EXSUL L.A.S. JOHNSON

3.6.1 Summary

Allocasuarina rigida subsp. *exsul* is known only from Mt Cooroora in SF 963, 2 km west south west of Pomona. Approximately 4000 plants are present in an area of approximately 1875 m². They grow in a shrubland community on very steep hillslopes with a southerly to easterly aspect. The soils are derived from trachyte and are shallow, dark sandy loams with a acidic reaction. Potential threats to the survival of *Allocasuarina rigida* subsp. *exsul* arise from human interference in the environment. These threats are inappropriate fire regime and physical disturbance. Monitoring the population to obtain information on the ecology of the species and to gauge the effect of pedestrian traffic on the population is recommended.

3.6.2 Species description and identification

The genus *Allocasuarina* is placed in the family Casuarinaceae. *Allocasuarina* is endemic to Australia where there are approximately 59 species distributed throughout the southern part of Australia with four species extending to north-east Queensland.

Allocasuarina rigida subsp. *exsul* L.A.S. Johnson was formally described 8 years ago (Johnson 1989) from material collected by Mr P. Sharpe from Mt Cooroora near Pomona. The species belongs to the section *Cylindropitys* (Wilson and Johnson 1989). The botanical description of *Allocasuarina rigida* subsp. *exsul* is as follows:

Dioecious shrub up to 1.5 m high with smooth, grey bark. Branchlets ascending, to 30 cm long, articles 10-15 mm long, 0.7-1.5 mm diameter, smooth, usually glabrous; phyllichnia angular to sometimes rounded, with median ridge; teeth 7-10, erect to slightly spreading, overlapping slightly only when young, 0.4-0.9 mm long, somewhat marcescent. Male spikes strongly moniliform, 1-7 cm long, rarely to 9 cm, 4-6.5 whorls per cm; bracteoles persistent; anther 0.7-1.2 mm long. Cones cylindrical to ovoid, pubescent; peduncle 2-9 mm long. cone body 9-19 mm long, 6-11 mm diameter. Samara 3.5-4.5 mm long (Wilson & Johnson 1989) (see **Plate 1**).

The characters used by Wilson & Johnson (1989) to distinguish *A. rigida* subsp. *exsul* from *A. rigida* subsp. *rigida* are presented in Table 3.6.1. There are three other rare or threatened species of *Allocasuarina* in the Sunshine coast area. These are *A. emuina* from Mt Peregian and surrounding coastal heathland, *A. thalassoscopica* from Mt Coolum and *A. filidens* from Mt Coonowrin and Mt Beerwah. *A. rigida* subsp. *exsul* is distinguished from these other species by having 7 to 9 teeth and usually smaller cones.

TABLE 3.6.1. CHARACTERS DISTINGUISHING ALLOCASUARINA RIGIDA SUBSP. EXSUL AND ALLOCASUARINA RIGIDA SUBSP. RIGIDA

| Characters | <i>A. rigida</i> subsp. <i>exsul</i> | <i>A. rigida</i> subsp. <i>rigida</i> |
|------------------------|--------------------------------------|---------------------------------------|
| Articles (length mm) | 10-14 | 10-25 |
| Articles (diameter mm) | 0.7-0.9 | 0.8-1.5 |
| Teeth (orientation) | erect to slightly spreading | recurved to suberect |
| Teeth (spacing) | overlapping slightly only when young | overlapping |
| Male spikes (shape) | strongly moniliform | shortly moniliform |

3.6.3 Current conservation status

Allocasuarina rigida subsp. *exsul* is presently not listed on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* or the Commonwealth *Endangered Species Act 1992*. However it is currently pending inclusion on the Queensland Schedule of threatened wildlife as 'Vulnerable'. It is proposed to be added to the schedule because it has a restricted distribution and is not in a formal conservation reserve.

3.6.4 Distribution and abundance

Details from Queensland Herbarium specimens of *A. rigida* subsp. *exsul* are listed in Appendix 1.5. The species is only known from a single location near the summit of Mt Cooroora, approximately 2 km west south west of Pomona. Detailed locality data for this site is presented in Appendix 2.1. The site is within State Forest SF 963 (Fty 517). The area is presently managed jointly by Department of Natural Resources and the Department of Primary Industries, Forestry. The base of the mountain supports forests of commercial timber species, but the summit of the mountain has no commercial timber values.

Previous reports on population size indicated that it was of only a few hundred individuals and that below average rainfall in the early 1990's had killed the majority of the population (P. Sharpe pers. comm.). The present study examined the upper slopes (ie. above the cliff lines) of Mt Cooroora and observed that *A. rigida* subsp. *exsul* is restricted to the south-eastern end of the mountain summit. The species is the dominant plant species in a shrubland above a cliffline over an area of approximately 1875 m². A population of approximately 4050 individuals was estimated. However because of the large confidence interval (± 2271) this estimate can only be used as a guide.

The population consists of a relatively mature even-aged stand of individuals all 1-1.5 m high. The population appear generally healthy. No seedlings of *A. rigida* subsp. *exsul* were observed at the site. Low levels of seedling recruitment are typical of serotinous species in habitats where fire has been absent for sometime (Specht 1981). Twenty-six (56 %) of the forty-six plants examined had large crops of mature cones along the stem.

No other likely habitats were examined during this present study. Other peaks in the area which have been investigated for this species in the past include Mt Ninderry, Mt Cooroy and the Glasshouse Mt Peaks (A.R. Bean & P.R. Sharpe pers. comm.).

3.6.5 Habitat

Mt Cooroora is an isolated trachyte plug. *A. rigida* subsp. *exsul* is confined to the steep rocky upper slopes of the mountain. The single site is situated 390 m above sea level with a easterly to southerly aspect and is exposed to the prevailing winds. The shallow soils are well drained brownish black sandy loams with a pH 4.6-4.8. The vegetation type is a mid-tall to tall shrubland with emergent low to mid-tall trees. *A. rigida* subsp. *exsul* is a dominant species in the shrub layer with *Xanthorrhoea latifolia*, *Monotoca scoparia* and *Leptospermum polygalifolium*. Scattered emergent trees of *Eucalyptus racemosa* and *E. exserta* are also present.

The date of the last prescribed burn for the state forest was approximately 1992, but it is unclear whether the *A. rigida* subsp. *exsul* population was burnt by this fire. The area is scheduled for a hazard reduction burn during winter of 1998.

On the eastern slope of Mt Cooroora there is a walking track which leads to its summit. There is substantial erosion and vegetation destruction along the walking track. Track maintenance has been undertaken in the last couple of years to reduce erosion and stabilise the track surface. Within the vicinity of the population of *A. rigida* subsp. *exsul*, the track in the past divided in two with one track traversing the northern end of the population while the other track passed along the northern edge of the population. The use of the track through the population has been discouraged and the area appears to be slowly regenerating.

On the mountain summit the main walking track leads northwest away from the population of *A. rigida* subsp. *exsul*. However, there are minor tracks down through the *A. rigida* subsp. *exsul* population to a cliff face. At present the damage to the habitat is minimal.

3.6.6 Life history and ecology

Very little is known about the life history and ecology of *A. rigida* subsp. *exsul*. The majority of the following information is extrapolated from our understanding of other species of *Allocasuarina* and *Casuarina*. A wide range of chromosome numbers have been observed along with differing degrees of polyploidy in a number of species of *Casuarina* species *s.l.*. Barlow (1959a & b) has reported a diploid number of 22 for *A. rigida* subsp. *rigida*.

A. rigida subsp. *exsul* is a dioecious shrub with an unknown life span. The main method of reproduction is by sexually produced seed. An isolated female plant of *A. rigida* subsp. *exsul* in cultivation has been observed to set a small quantity of viable seed (P.R. Sharpe pers. comm.). This suggests that *A. rigida* subsp. *exsul* is capable to some degree of apomixis. Apomixis has been reported to occur in other species of *Allocasuarina* and *Casuarina* (Barlow 1959a).

Allocasuarina spp. are reported to be wind-pollinated (Torrey 1983). The flowering period has not been recorded. Observations of *A. rigida* subsp. *exsul* during the survey in October 1997 found numerous female inflorescences present but an absence of male flowers. In south east Queensland *A. rigida* subsp. *rigida* has been recorded flowering in August and September. Other mountain species of *Allocasuarina* in the region have been observed to have their main flowering period from May to July.

As with other species of *Allocasuarina*, *A. rigida* subsp. *exsul* has serotinous fruit. The seeds are released only on the death of the parent plant or shoot supporting the cones. Fire or extreme desiccation are usually the major causes of such events. Detailed information on the period of retention of the seed in the cones is lacking for this species. However from field observations it would appear that the cones remain unopened for several years.

The longevity of the seed while retained in the fruit is unknown. Pannell and Myerscough (1993) have reported a gradual decline in viability of seed retained in fruit of *A. distyla* and *A. nana* over a period of 12 years. It is reported by Turnbull and Martensz (1982) that there is considerable variation in the viability of seed collected from Australian stands of *Casuarina s.l.*

Seeds of serotinous species generally show no form of germination dormancy once released from the protective fruits. In other species of *Allocasuarina* after the seed is released from the cone the seed coat readily absorbs water to produce mucilaginous gel on the seed surface. Turnbull and Martensz (1982) suggested this trait assists rapid germination in conditions where the water supply may be transient.

There are numerous reports on the germination and cultivation of *Allocasuarina* and *Casuarina* (Elliot and Jones 1982, Midgley *et al.* 1983). The seeds readily germinate given reasonable moisture and temperature conditions. A fresh sample of 346 seeds was exacted from 40 cones from the herbarium voucher taken from the population in October 1997. Seventy six seeds (22%) were found to lack a viable embryo, contain only a mass of white woody tissue. These seeds appeared well formed and were indistinguishable on their outward appearances from seeds with embryos. It is unknown what causes these woody seeds to form. Similar woody seeds have been observed in *A. emuina*, *A. thalassoscopica*, *A. littoralis* and *Casuarina equisetifolia*. The level of viability of seeds with embryos was high (225 seeds (83 % of seeds with embryos and 65 % of seeds sampled)).

The response of *A. rigida* subsp. *exsul* to fire is unknown, however it is believed that above-ground parts are fire-sensitive and are killed by fire. It is unknown whether it can regenerate from the root stock.

3.6.7 Threats

There is no quantitative data to indicate that the populations of *A. rigida* subsp. *exsul* have declined in the past or are presently declining. However, potential threats to the survival of *A. rigida* subsp. *exsul* arise from human interference in the environment. These threats are an inappropriate fire regime and physical disturbance by human visitation.

Fires are either unplanned (wildfires) or planned (hazard reduction burns). The occurrence of fire in the habitat of *A. rigida* subsp. *exsul* should not be viewed as being incompatible with the long term survival of the species. However the lack of ecological information about this species' response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. If fires are too frequent, the plants will have insufficient time to build-up a canopy seedbank to replace plants that are killed in the fire, and this will lead to population declines.

The shallow soils and low vegetation are sensitive to physical disturbance. Physical disturbance can lead to the trampling of seedlings, branches being broken off, general compaction and disturbance to the soil, and the introduction of exotic weed species. The present level of physical disturbance due to human visitation appears to be minor and unlikely to critically threaten the species in the short term. However the long term effect of such continued disturbance may lead to the modification of the habitat to the detriment of *A. rigida* subsp. *exsul*. The degree on physical disturbance is currently being informally monitored by Department of Natural Resources staff during routine track maintenance (P. Leeson pers. comm.).

3.6.8 Management, Research and Conservation Measures

It seems unlikely *A. rigida* subsp. *exsul* will be found at any other locations. In view of this, it is important that the single location be managed to afford long-term protection to the species.

Management presupposes knowledge about a species' response to particular management practices. There is little information available on the ecology and reproductive biology of *A. rigida* subsp. *exsul*. The forthcoming hazard reduction burn for the state forest is an ideal opportunity for the commencement of a monitoring program to obtain information on the species' response to fire. Physical disturbance by pedestrian traffic at the site should also be monitored.

The present track passes along the northern edge of the population. If there are planned changes to the walking track then it would be appropriate to relocate it away from the habitat of *A. rigida* subsp. *exsul*.

When assessed against the IUCN (1994) criteria for threatened wildlife *A. rigida* subsp. *exsul* falls into the category of Vulnerable, ie. it is facing a high risk of extinction in the wild in the medium-term future, as defined by criteria D.2. (ie. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5)). *A. rigida* subsp. *exsul* is presently being considered for inclusion on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* as Vulnerable. This status is considered to be appropriate. There appear to be few opportunities to improve the conservation status of this species in the long term.

3.7 ARTHRAXON HISPIDUS (THUNB.) MAKINO

3.7.1 Summary

A. hispidus has a wide distribution from tropical Africa to Asia. In Australia it occurs from northern New South Wales to Taroom and the Sunshine Coast in Queensland. Currently there are no data on population size and minimal habitat information. This lack of data hampers any attempt to conserve this species. A potential threat to the survival of the species is weed invasion of the habitat.

3.7.2 Species description and identification

The genus *Arthraxon* is placed in the grass family (Poaceae). *Arthraxon* occurs in the tropical and subtropical regions of the world with approximately seven species (van Welzen 1981). The genus is represented in Australia by two species. The botanical description of *Arthraxon hispidus* is as follows:

A slender, more or less tufted annual; stems decumbent, rooting at nodes; flowering culms ascending and up to approximately 60 cm tall, nodes hairy. Leaf sheaths with stiff spreading tubercular-based hairs; ligules short, ciliate; leaf blades narrowly ovate, apex acuminate, base cordate and stem-clasping, 2-6 cm x 0.7-1.5 cm long, glabrous or with tubercular-based hairs, margin scabrid or ciliate. Racemes 1-5, mostly 2-4 cm long, greenish to purple; sessile spikelet 4-5 mm long, lower glume as long as spikelet, approximately 9-nerved with tubercular-based bristles on nerves, upper glume scabrid on keel, lemma of lower and upper florets approximately 1/2-2/3 length of spikelet, lemma of upper floret with awn approximately 4-5 mm long; pedicellate spikelet reduced to pedicel or absent (Stanley and Ross 1983). For other descriptions and illustrations of this species refer to Vickery (1961), van Welzen (1981), Tohill and Hacker (1983) and Jacobs and Wall (1993a).

In Australia *Arthraxon hispidus* may be confused with *Oplismenus aemulus*. However, *A. hispidus* has digitate to subdigitate inflorescences whereas *Oplismenus aemulus* has racemose inflorescences.

3.7.3 Current conservation status

Arthraxon hispidus is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V

(vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*.

3.7.4 Distribution and abundance

Overseas *A. hispidus* has a wide distribution from tropical Africa to Asia. It has also been naturalised in Hawaii and eastern North and Central America (van Welzen 1981). In Australia it occurs between the North Coast and Northern Tablelands in New South Wales and Taroom and the Sunshine Coast in Queensland.

A. hispidus was not surveyed during the present study. Details from Queensland Herbarium specimens of *A. hispidus* are listed in Appendix 1.6. Fourteen specimens of *A. hispidus* have been collected in Queensland. It has been recorded from a number of scattered locations throughout south east Queensland. Most (11 of the 14) of the specimens were collected prior to 1960. The most recent collections have been made in 1995 on mound springs in the Taroom District and in 1997 from Carnarvon National Park in the Brigalow Belt South Biogeographical Region. It has been recorded from one State Forest (SF 274 Fty 1880) in the Kenilworth area in 1939 and from Noosa National Park in 1943 and 1946. There is an unvouchered record of *A. hispidus* occurring in Tewantin State Forest (SF 959 Fty 1295) at a locality with *Prostanthera* sp. (Mt Tinbeerwah P.R. Sharpe 4781) (C. Sandercoe pers. comm.).

3.7.5 Habitat

In the South East Queensland Biogeographical Region, *A. hispidus* has been recorded growing around a freshwater spring in coastal foreshore dunes, in shaded small gullies, on creek banks and on sandy alluvium in creek beds in open forests. Tothill and Hacker (1983) reported that the species may be found growing on the fringe of rainforest or in more open, wet eucalypt forest. Habitat information from overseas records this species growing in open to shaded grasslands, wood clearings, waste areas and often as a weed in rice fields and along deserted seashores (van Welzen 1981).

3.7.6 Life history and ecology

A. hispidus is a slender inconspicuous tufted annual. It has been collected fertile from March to May and July. Jacobs and Wall (1993) report that this species flowers during summer and autumn. There is no other information available.

3.7.7 Threats

The lack of information about present populations levels of *A. hispidus* and precise habitat requirements make it difficult to assess threats to this species.

Weeds such as mist flower (*Ageratina riparia*), crofton weed (*Ageratina adenophora*) and lantana (*Lantana camara*) may pose a threat to this species along creeks in its forested habitats. Weeds are also a potential threat in coastal habitats. A number of naturalised exotic species have been observed near the collection site in Alexandra Bay, Noosa (Batianoff and Franks (in press)).

Leigh *et al.* (1984) reported that the available habitat for *A. hispidus* had decreased due to clearing for agriculture.

3.7.8 Management, research and conservation measures

A. hispidus requires detailed surveys to assess previously recorded localities and to collect information on habitat requirements. Such a survey would need to be carried out during the flowering period from March to July.

3.8 BOTHRIOCHLOA BUNYENSIS B.K. SIMON

3.8.1 Summary

B. bunyensis is endemic to south east Queensland and occurs along the Great Dividing Range from Bunya Mountains to Mt Mistake. . The distribution of *B. bunyensis* has a range of approximately 140 km. There is currently no data on population sizes. The species appears to be fairly habitat specific growing on krasnozem soils derived from basalt in grassland or grassy woodlands at altitudes above 600 m. Potential threats to the survival of the species are weed invasion of the habitat and an inappropriate fire regime.

3.8.2 Species description and identification

The genus *Bothriochloa* is placed in the grass family (Poaceae). *Bothriochloa* is widespread in the tropical regions of the world with approximately 35 species (Mabberley 1997). In Australia the genus comprises 7 native and 2 naturalised species.

Bothriochloa bunyensis was formally described in 1982 from material collected on the Bunya Mountains, approximately 160 km north west of Brisbane (Simon 1982). The botanical description of *Bothriochloa bunyensis* is as follows:

Rhizomatous, erect or ascending, up to approximately 60 cm tall; culms with few branches, nodes glabrous. Leaf sheaths with few often tubercular-based hairs, usually on margin; ligules up to approximately 1 mm long; leaf blades linear, apex attenuate, up to 14 cm long, 0.15-0.35 cm wide, glabrous. Racemes 2-4, digitate or subdigitate, 5-10 cm long, rachis and pedicels with long more or less spreading whitish hairs; sessile spikelet 8-9 mm long, with densely bearded callus at base, lower glume as long as spikelet, with row of bristles on keels, upper glume slightly smaller than lower, lower floret with lemma approximately half as long as spikelet, upper floret with lemma approximately 4 mm long, with geniculate awn approximately 2 cm long, palea approximately 1 mm long; pedicellate spikelet reduced to lower glume with inrolled scabrous margin, 1-1.3 cm long (Stanley and Ross 1983). For a more detailed description refer to Simon (1982). For an illustration see Stanley and Ross (1983).

Bothriochloa bunyensis is similar to *B. biloba* in having bilobed awned lemmas, but it can be distinguished by having longer internodes on the rachis.

3.8.3 Current conservation status

Bothriochloa bunyensis is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.8.4 Distribution and abundance

B. bunyensis is endemic to south east Queensland where it occurs in the Bunya Mountains north of Dalby and on the Main Range north and south of Toowoomba. *B. bunyensis* was not surveyed

during the present study. Details from Queensland Herbarium specimens of *B. bunyensis* are listed in Appendix 1.7. A total of 11 specimens of *B. bunyensis* have been collected. Two sites are within State Forest lands (SF 1142 Fty 1126 SA 10 and SF 510 Fty 1416), one in the Main Range National Park and the rest within Bunya Mountain National Park. The distribution of *B. bunyensis* has a range of approximately 140 km. There is no information available on population sizes at these sites but *B. bunyensis* is reported to be relatively widespread in the grasslands on the Bunya Mountains (Fensham and Fairfax 1996b).

3.8.5 Habitat

B. bunyensis grows in relatively fertile krasnozems soils derived from basalt on upper slopes and hillcrests at altitudes of 600-1100 m. Vegetation structure is a grassland or woodland with a grassy understorey. The grasslands are mostly dominated by tussock grasses. The most common species is *Poa labillardieri*. Other grass species recorded in these grasslands include *Chloris ventricosa*, *Microlaena stipoides*, *Bothriochloa decipiens* and *Echinopogon nutans*. A detailed list of species present in the grasslands of the Bunya Mountains is given by Fensham and Fairfax (1996b). In woodland communities the common dominant trees are *Eucalyptus pilularis*, *E. saligna*, *Allocasuarina torulosa* and *Eucalyptus tereticornis*. The common grass species in the woodland communities were *Themeda triandra*, *Imperata cylindrica* and *Poa labillardieri*.

3.8.6 Life history and ecology

B. bunyensis is a perennial grass with a rhizome. The main methods of reproduction are by sexually produced seeds and by vegetative division of the rhizome. It has been recorded flowering from January to May. There is no information available about the viability or longevity of the seed.

The species appears to tolerate some habitat disturbance such as moderate levels of short-term grazing (Fensham and Fairfax 1996a). The above-ground parts of *B. bunyensis* are killed by fire but the species is capable of regenerating from the rhizome.

3.8.7 Threats

Potential changes in the species' major habitat which is the grasslands on the Bunya Mountains threaten the long term survival of *B. bunyensis*. The grasslands on the Bunya Mountains are gradually disappearing due to encroachment of the woody open forest and rainforest species (Fensham and Fairfax 1996a). Fensham and Fairfax (1996b) proposed that changes in fire regimes since European settlement have led to the increased decline in the grasslands.

The invasion of exotic plant species into the grasslands is also a threat to *B. bunyensis*. The introduced grasses kikuyu (*Pennisetum clandestinum*) and African lovegrass (*Eragrostis curvula*) are considered to have potential to become a major problem in maintaining the natural flora of the Bunya Mountain grasslands (Fensham and Fairfax 1996b). Kikuyu has already invaded two grassland patches displacing the native grasses and has been recorded in another two grassland patches (Fensham and Fairfax 1996b). Weed species present at SF 1142 (Fty 1128) that may threaten the integrity of the habitat of *B. bunyensis* are *Pinus* sp., moth vine (*Araujia sericifera*) and lantana (*Lantana camara*) (SMP DNR)¹.

3.8.8 Management, research and conservation measures

¹ SMP DNR = Species Management Profile for *Bothriochloa bunyensis*, Queensland Department of Natural Resources.

Appropriate fire management of the grassland habitat of *B. bunyensis* is required. However, rational management presupposes knowledge of the effect of certain decisions. Research is required to determine the optimum fire regime for *B. bunyensis* and the grassland communities as a whole.

Fensham and Fairfax (1996) recommended that kikuyu and African lovegrass be eradicated where possible from the grassland communities. Ongoing monitoring of the impact of weeds on the communities is required.

The grasslands on leasehold and State Forest lands are grazed by domestic stock. Although *B. bunyensis* appears to tolerate moderate levels of grazing by domestic stock the effect of long term grazing on the species and its habitat is unknown. Monitoring and research is required to determine the effect of grazing on the species' ability to maintain a viable population.

3.9 CLEMATIS FAWCETTII F. MUELL.

3.9.1 Summary

Clematis fawcettii is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from the Richmond River north to the Bunya Mountains in mostly closed forest communities on loam soils derived from basalts and mixed volcanic rocks at altitudes above 500 m. There is currently no data on population sizes. However the species is generally observed to be at low densities within the community in which it grows. Potential threats to the survival of the species are weed invasion of the habitat and an inappropriate fire regime.

3.9.2 Species description and identification

The genus *Clematis* is placed in the family Ranunculaceae and is cosmopolitan with approximately 295 species chiefly in the temperate regions of the world (Mabberley 1997). There are 10 species presently recognised in Australia.

Clematis fawcettii F. Muell. was formally described in 1876 from material collected near Lismore, northern New South Wales (Mueller 1876). The botanical description of *Clematis fawcettii* is as follows:

Weak climber with stems 1-2 m long, dioecious. Leaves biternately or triternately divided or if ternate then with the ultimate segments strongly lobed or toothed; petioles 2-6 cm long, petiolules 2-5 mm long; leaflet blades ovate, apex acute, base cuneate, margin more or less serrate and deeply lobed 0.6-4 cm x 0.5-3 cm, often more or less pubescent. Sepals white becoming pinky-mauve with age, narrowly lanceolate, apex acute, 0.8-2.5 cm long, more or less pubescent outside; stamens with filaments 2-6 mm long, anthers 0.7-1 mm long, without appendages; ovary puberulent. Achenes approximately 4 mm long, slender, awn 2-2.5 cm long (Stanley & Ross 1983, Briggs & Makinson 1990). For an illustration see Briggs and Makinson (1990).

Clematis fawcettii is distinguished from other *Clematis* species in the region by having biternately or triternately divided leaves or if ternately divided then the ultimate segments are strongly lobed or toothed, ultimate leaflets 3-75 mm wide, strongly reflexed sepals in male flowers and very narrow-ovate achenes less than 1 mm wide.

3.9.3 Current conservation status

Clematis fawcettii is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.9.4 Distribution and abundance

C. fawcettii is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from the Richmond River north to the Bunya Mountains. *C. fawcettii* was not surveyed during the present study. Details from Queensland Herbarium specimens of *C. fawcettii* are listed in Appendix 1.8. Collections have been made in the Tweed Range, New South Wales, McPherson and Great Dividing Ranges, and the Bunya Mountains in Queensland. There are records from Lamington National Park and from SF 151 Fty 824 while other possible sites are in the Main Range and Mt Barney National Parks and SF 750 Fty 1605, SF 327 Fty 1502, SF 401 Fty 1186, SF 661 Fty 1187, SF 735 Fty 1187 and SF 510 Fty 1416.

There is no information available on population sizes. *C. fawcettii* is usually reported as having only isolated or a few individuals at the collection sites. Observations indicate that it prefers to grow in small canopy gaps (W. McDonald pers. comm.).

3.9.5 Habitat

C. fawcettii has been reported growing on slopes at altitudes above 500 m in complex notophyll vineforest (warm and cool subtropical rainforest), on the margins of semi-evergreen vine thickets and at one site, in eucalypt open forest with scattered vine forest species. The species has been recorded on brown to chocolate loam soils derived from basalt and mixed acidic and volcanic rocks. Barry and Thomas (1994) noted *C. fawcettii* was usually found near streams in drier rainforests habitats.

3.9.6 Life history and ecology

C. fawcettii is a dioecious perennial, weak climber. The main method of reproduction is sexually produced seeds. It has been recorded flowering from October to December and fruiting in January, June and December. There is no information available about the viability or longevity of the seed. Elliott and Jones (1994) reported that seed of *Clematis* species is often difficult to germinate and that higher levels of germination are achieved with fresh seed. A single individual of *Clematis fawcettii* propagated from seed has been grown for 11 years (L. Bird pers. comm.). The plant continues to grow and flower every year. Another species of *Clematis* (*C. glycinoides*) has been found to be easily propagated from cuttings (K. Hall pers. comm.).

There is no information on the response of adult plants to fire. However, *C. fawcettii* is suspected to be fire-sensitive and killed by fire. There is no evidence to suggest that it is capable of regenerating from the rootstock. Therefore, regeneration after fire would rely on the successful germination of seed and survival of seedlings.

3.9.7 Threats

The sites on rainforest margins may be susceptible to the invasion of exotic weed species such as lantana (*Lantana camara*) (W. McDonald pers. comm.). Weeds such as mist flower (*Ageratina riparia*) and crofton weed (*Ageratina adenophora*) may pose a threat to this species along creeks and canopy gaps within the rainforest communities.

Fire may be a threat to those populations on the rainforest margins and in eucalypt open forest. However, the lack of information about the species' response to fire makes it difficult to assess whether fire would be a significant threat.

3.9.8 Management, research and conservation measures

Little information appears to be available about this species. Detailed surveys are needed to assess previously recorded localities and to collect information on habitat requirements.

There is little information available on the ecology and reproductive biology of *Clematis fawcettii*. The response of this species to disturbance and fire should be thoroughly investigated.

3.10 CYCAS MEGACARPA K. HILL

3.10.1 Summary

Cycas megacarpa occurs from the Many Peaks and Calliope Ranges south to near Kilkivan. The distribution of *C. megacarpa* has a range of approximately 240 km and encompasses an area of occurrence of approximately 28000 km². It is most commonly found on undulating to hilly terrain on gentle to steep slopes and hill crests in eucalypt woodland or open forest at altitudes of 40 to 500 m. The soils are generally well drained, shallow, often stony, sandy loam to clay loam. There is no quantitative data on populations. However, it has been reported as being rare to very common at collection sites. Current or perceived threats to the continued survival of *C. megacarpa* are considered to be loss of habitat, destruction of plants, illegal removal of seeds, seedlings and mature plants and inappropriate fire regimes.

3.10.2 Species description and identification

The genus *Cycas* is placed in the family Cycadaceae and occurs from East Africa to Japan and Australia (Mabberley 1997). It is estimated to contain approximately 40 species over its range with 27 species in Australia (Hill 1996).

Cycas megacarpa K. Hill was formally described in 1992 from material collected west of Miriam Vale (Hill 1992). The botanical description of *Cycas megacarpa* is as follows:

A small to medium sized cycad with an erect trunk to 3 m tall and 8-14 cm diameter, and a dense erect to rounded crown of leaves. Mature leaves are 40-110 cm long, glossy and mid to dark green. Each leaf consists of a stalk with 120 to 170 leaflets. The leaflets are linear, leathery and 12-20 cm long x 0.5-0.75 mm wide. The lowest leaflets are reduced to spine-like structures (approximately 0.5 cm long). The male and female reproductive structures develop on separate individuals. Male plants produce brown, hairy cylindrical cones 18 cm long x 17 cm diameter. The female plants produce loose open cone-like structures at the top of the plant. Two to four seeds are borne on hairy stalks up to 25 cm long, with a broad flat spear-shaped tip. As the seeds mature the stalks lengthen and spread outward from the top of the plant. Seeds are egg-shaped, greenish to light brown and 4-6 cm long x 3.5-4.5 cm diameter. For a more detailed description and illustrations refer to Hill (1992) and Jones (1993).

Prior to its formal description *Cycas megacarpa* had been previously referred to as *Cycas media* to which it is closely related. It can be distinguished from *C. media* by its usually more slender trunk, smaller leaves and larger seeds. *C. megacarpa* is also closely related to *C. ophiolitica* but differs by having uncrowded leaflets and larger seeds. The detail of these differences are presented in Table 3.10.1.

TABLE 3.10.1. CHARACTERS DISTINGUISHING *CYCAS MEGACARPA*, *CYCAS MEDIA* AND *CYCAS OPHIOLITICA*.

| Characters | <i>C. megacarpa</i> | <i>C. media</i> | <i>C. ophiolitica</i> |
|-------------------|---------------------|-----------------|-----------------------|
| Trunk (cm) | 8-14 | 10-18 | 14-20 |
| Leaf (length)(m) | 0.5-1.1 | 1.0-1.8 | 1-1.4 |
| Leaflet (density) | uncrowded | uncrowded | crowded |
| Seed size (cm) | 4-6 x 3.5-4.5 | 3-4 x 2.5-3.5 | 3-4 x 2.5-3.5 |

3.10.3 Current conservation status

C. megacarpa K. Hill is presently listed on the schedule of the Queensland *Nature Conservation 1992* as “vulnerable wildlife”. However, a change in conservation status from Vulnerable to Endangered on the Queensland schedule is pending. It is listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*. The species has not been assigned a national conservation status by ANZECC (1993).

3.10.4 Distribution and abundance

Details from Queensland Herbarium specimens of *C. megacarpa* are listed in Appendix 1.9. A total of 26 specimens of *C. megacarpa* have been collected from Many Peaks and Calliope Ranges, south of Gladstone, to near Kilkivan. Another six specimens collected from the Mt Morgan area have been identified as intermediates between *C. megacarpa* and *C. ophiolitica*. There are also 47 unvouchered locality records within its known range in the CORVEG database. Over its range it is recorded from two National Parks and from seventeen State Forest areas. Other localities are on road reserves, freehold and leasehold land. There is no quantitative data available on population sizes, although it has been reported as being rare to very common at the collection sites. The distribution of *C. megacarpa* has a range of approximately 240 km and encompasses an area of occurrence of approximately 28000 km².

3.10.5 Habitat

C. megacarpa is most commonly found in eucalypt woodland or open forest, and rarely in hoop pine dominant rainforest or on rainforest margins at altitudes of 40 to 500 m. It occurs on undulating to hilly terrain either on gentle to steep slopes and hill crests. The soils are generally well drained, shallow, often stony, sandy loam to clay loam in texture and derived from sandstones, fine grained sediments and acid and basic volcanic rocks. The more frequent tree species recorded with this species are *Eucalyptus crebra*, *Corymbia erythrophloia*, *C. citriodora* and *E. melanophloia*.

3.10.6 Life history and ecology

There have been no studies into the biology or autecology of *C. megacarpa*. The majority of the following information is extrapolated from our understanding of other cycads. However, it is also becoming increasingly clear that the reproductive processes and behaviour of different species within the same genus may differ considerably, so that information collected for one species cannot necessarily be extrapolated to another.

C. megacarpa is a dioecious, perennial plant that reproduces by sexually produced seeds. The longevity of the plants is unknown. Estimates of life span of other cycads range from 120 to 1500 years (Benson and McDougall 1993, Pate 1993). Coning has been recorded occurring in *C. megacarpa* from May to January. The factors controlling the level of reproduction are unknown.

There are reports suggesting a cyclical nature to the level of reproductive episodes (Jones 1993, Vorster 1995). It is suggested that variable rates of coning will in turn lead to variable rates of seedling recruitment. The level of survivorship from seed to adult is unknown. Other cycad species have been reported to have levels of 3-4 percent survivorship with the greatest mortality occurring from seed germination to seedling stage (Connell and Ladd 1993).

Traditionally cycads have been thought to be wind-pollinated (Chamberlain 1935), but evidence has been mounting that most cycad species are in fact pollinated by insects, specifically by beetles (Tang 1987, Norstog and Fawcett 1995). Ornduff (1991) reported small beetles and small weevils present on male cones of *C. media*. However, whether these insects are involved in pollination remains to be determined. He also observed that the cones were visited by small bees (*Trigona* sp.) which were collecting pollen.

The seeds have a light brown thin fleshy outer layer and fall from the sporophyll at maturity. It has been reported that the fleshy outer layer attracts animals which feed on this fleshy tissue and secondarily disperse the seed. Possums, kangaroos, wallabies and rodents have been reported as dispersal agents for *Macrozamia* species (Jones 1993).

The seeds of most cycad species will not germinate immediately on maturity, as the embryo requires an after-ripening period (Jones 1993). Jones (1993) reported that generally species of *Cycas* require an after-ripening period of six to twelve months and that germination usually takes twelve to eighteen months. The length of time that the seeds of *C. megacarpa* retain their viability is unknown. It is reported that *Cycas* seed in general has a limited period of viability (Jones 1993).

As germination occurs the micropylar end of the hard seed coat is ruptured by the emerging radicle, which turns down into the soil and grows rapidly. The greater part of the cotyledons remain inside the seed on the soil surface, absorbing all of the endosperm and transferring the food resources into the young root and developing underground stem of the seedling. Usually only one leaf appears initially at the soil surface some months after germination. The length of time taken from seed germination to maturity is unknown. The time taken to reach maturity for cultivated cycads ranges from 2 to 30 years (Jones 1993).

From field observations it is suggested that seeds and the early stages of the seedling development are fire-sensitive. The time required before the seedling can tolerate fire is unknown. Mature plants are not greatly affected by fire apart from the loss of the entire crown of leaves. There are some suggestions the some cycads may benefit from periodic exposure to fire (Zunckel 1995).

C. megacarpa is capable of resprouting from the base of the trunk if the growing tip is killed.

3.10.7 Threats

There is no doubt that past habitat alienation for agriculture in the species' geographical range has led to a decline in populations. Those populations on freehold and leasehold land are still potentially threatened by clearing for agricultural development.

The leaves contain toxic compounds which when ingested cause poisoning in domestic stock. Poisoning is often more prevalent in dry seasons when other feed is scarce. In the past landholders were encouraged to destroy cycads and many rural landholders continue to take measures to eradicate cycads from areas where domestic stock graze.

Cycads world-wide have become extremely desirable plants to collect. Cycad populations have also declined in the past as a result of removal of plants from the wild by nurserymen and cycad enthusiasts. *C. megacarpa* is potentially threatened by the illegal removal of plants from the wild.

Mature cycads generally cope very well with fire and as pointed out earlier may benefit from periodic exposure to fire. However, fire can certainly affect the recruitment of new individuals because the seeds and young seedlings of *C. megacarpa* are fire-sensitive. The limited knowledge available on the effect of fire and species' response makes it difficult to assess the total impact of varying fire regimes. However, too frequent a fire regime would lead to a gradual decline in the population as mature plants became senescent and there was a lack of recruitment of new plants.

3.10.8 Management, research and conservation measures

Field surveys should be conducted in areas where the species has been recorded in the past to assess population levels.

There is little information available on the role of fire in the ecology and reproductive biology of *C. megacarpa*. This needs to be understood if successful management techniques are to be developed for the effective conservation of the species in the wild. Research into the effect of fire on coning and seedling survival is required.

To reduce the illegally removal of plants and propagules of *C. megacarpa* from the wild, locality information on populations should not be supplied to persons who do not have appropriate permits from Department of Environment and Department of Primary Industries. Current legislation to prevent illegal collection of threatened species from the wild needs to be enforced.

3.11 DAVIESIA DISCOLOR PEDLEY

3.11.1 Summary

Daviesia discolor is known from two disjunct localities approximately 350 km apart, Blackdown Tableland, 180 km south west of Rockhampton and the Coast Range, approximately 70 km west of Maryborough. The Blackdown Tableland sites have not been assessed in the present survey. The total population of *D. discolor* is estimated to be 17800 plants in the Coast Range sites over an area of approximately 2.5 hectares. It grows in very tall open forests on hillcrests and gently to very steeply inclined hillslopes between 500-580 m above sea level. The soils are derived from rhyolite and are well drained, shallow, brownish black sandy loam to sandy clays with an acidic reaction. Potential threats to the survival of *D. discolor* arise from human interference in the environment. The main threat is an inappropriate fire regime. It has been recommended that populations be monitored to obtain information on ecology of the species and to gauge the impact of habitat management for grazing.

3.11.2 Species description and identification

The genus *Daviesia* is endemic to Australia and is the second most diverse genus in the pea family (Fabaceae) in Australia with 121 species distributed throughout the states. The centre of diversity is in south west Australia (Crisp 1995).

Daviesia discolor Pedley was formally described in 1977 from material collected on Blackdown Tableland, approximately 170 km west south west of Rockhampton (Pedley 1977). *D. discolor* is part of the *D. latifolia* group within the subtribe Mirbelieae (Crisp 1991). A botanical description of *Daviesia discolor* is as follows:

Multi-stemmed shrub to 2 m high, glabrous. Branchlets ascending, angular, ribbed. Phyllodes spirally arranged, ascending to widely spreading, linear-elliptic, more or less falcate, attenuate at both ends, articulate at base, 40-160 mm long, 4-11 mm wide, striate with fine, somewhat prominent, reticulate venation, thin, green, discolorous. Racemes 1 or 2 per axil, 3-8 flowered; rachis 2.5-10 mm long; bracts more or less appressed to pedicels, 3.5 mm long, Calyx 3.6-4.0 mm long, lobes 0.6-1.0 mm long, upper two very broadly triangular, lower three triangular, more deeply cleft. Corolla: Standard very broadly ovate, emarginate, 5.5-5.9 mm long, 6.5-7.3 mm wide, yellow with dull red markings surrounding an intensely yellow bilobed spot at the centre; wings obovate-oblong, rounded at apex, 5.4-5.9 mm long, 1.9-2.5 mm wide, yellow towards apex, dull red towards base; keel half very broadly obovate, scarcely acute, saccate, auriculate, 4.4-4.6 mm long, 1.9-2.1 mm wide, pale green with dull red tip. Pod obliquely broadly triangular, compressed, acute, with upper suture nearly straight, 7.0-8.5 mm long, 5.5-6.0 mm wide, thin-walled (Crisp 1991). (see **Plate 2 & 3**).

In the past *D. discolor* has been misidentified as *D. mimosoides* but is distinguishable from this species by its narrower, longer and discolorous leaves. *D. discolor* is closely related to and resembles the more common species *D. arborea* from northern New South Wales and southern Queensland. *D. discolor* can be distinguished from *D. arborea* by its habit, bark, inflorescence and flower features (Crisp 1991). Details of these differences are presented in Table 3.11.1.

TABLE 3.11.1. CHARACTERS DISTINGUISHING DAVIESIA DISCOLOR AND DAVIESIA ARBOREA.

| Characters | <i>D. discolor</i> | <i>D. arborea</i> |
|---|-------------------------------|--------------------------------------|
| Habit | multi-stemmed shrub | shrub or small tree |
| Bark | not corky and furrowed | bark corky and furrowed |
| Rachis length (mm) | 2.5-10 | 10-27 |
| No. of flowers per raceme | 3-8 | 8-15 |
| adnation and shape of upper two calyx lobes | free, very broadly triangular | united, truncate with emarginate lip |

3.11.3 Current conservation status

Daviesia discolor is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.11.4 Distribution and abundance

Details from Queensland Herbarium specimens of *D. discolor* are listed in Appendix 1.10. Altogether 10 specimens of *D. discolor* have been collected from two disjunct localities approximately 350 km apart. As far as can be ascertained, this distribution pattern is natural and is not related to habitat reduction or fragmentation from human activity. It has been recorded from Blackdown Tableland (seven specimens), 180 km south west of Rockhampton and the Coast Range (3 specimens) near Biggenden, approximately 70 km west of Maryborough. The Blackdown Tableland sites have not been assessed in the present survey but it is believed that *D. discolor* occurs within both the National Park and State Forest areas on the tableland. Notes on herbarium specimens indicate the species was common at one of the sites in 1990.

D. discolor has been observed at 2 sites (Mt Walsh N.P. and SF 1344 (Fty 1534)) on the Coast Range which are approximately 1.5 km apart. Detailed locality data for each site is presented in Appendix 2.2. The estimated populations for the two sites are presented in Table 3.11.2. The total population of *D. discolor* at the two sites is estimated to be 17800 plants over an area of approximately 2.5 hectares. The population within Mt Walsh National Park is the larger of the two populations with 90 % of the total population.

TABLE 3.11.2. ESTIMATED ABUNDANCE AND AREA OF OCCUPANCY FOR *DAVIESIA DISCOLOR* SITES ON THE COAST RANGE.

Where abundance was estimated by random transect sampling a mean value and lower and upper 95% confidence limits are given.

| Site | Date sampled | Population | | | Density | Area occupied (m ²) |
|---------------|--------------|-------------|--------|-------------|---------|---------------------------------|
| | | lower limit | mean | upper limit | | |
| Mt Walsh N.P. | 21 Oct 97 | 12 296 | 16 000 | 19 704 | 1.6 | 10 000 |
| SF 1344 | 21 Oct 97 | 1 224 | 1 800 | 2 376 | 0.12 | 15 000 |
| | Total | 13 520 | 17 800 | 22 080 | | 25 000 |

The populations consisted of individuals up to 1.5 m high. No seedlings were observed in burnt or unburnt areas of the populations. Both populations appear generally healthy.

3.11.5 Habitat

On the Blackdown Tableland *D. discolor* is reported to occur on sandy soils derived from sandstone and on lateritic clay soils at elevations of 600-900 m above sea level (Crisp 1991).

The Coast Range sites are situated in mountainous terrain on hillcrests and gently to very steeply inclined hillslopes generally with a southerly to easterly aspect and at elevations between 500-580 m above sea level. The soils are well drained, shallow, brownish black sandy loam to sandy clays with a pH 5.5-6.1. The geology is mapped as Johnngboon Rhyolite.

The vegetation community is a very tall open forest. The common canopy species are *Corymbia trachyphloia* and *Eucalyptus acmenoides*. Other tree species present included *Eucalyptus major*, *E. montivaga* and *E. decolor*. The shrub and ground cover at the two sites contrast in density. The Mt Walsh N.P. site has a dense shrub and ground cover with the common species being *D. discolor*, *Logania albiflora*, *Lophostemon confertus* and the ferns *Calochlaena dubia* and *Pteridium esculentum*. The site in SF 1344 which appears to be the drier of the two sites has a much more open shrub and ground layer. The common species present included *Jacksonia scoparia*, *Imperata cylindrica*, *Podolobium ilicifolium* and *Themeda triandra*. No exotic weed species were observed at either site, although *Lantana camara* is a common weed in the vicinity of these populations.

The Mt Walsh N.P. site was undisturbed, while cattle grazing is presently occurring in the vicinity of the population within SF 1344. There was no evidence that *D. discolor* was grazed by cattle.

3.11.6 Life history and ecology

There have been no studies into the biology or autecology of *Daviesia discolor*. The majority of the following information is extrapolated from our understanding of other species of *Daviesia*. *D. discolor* is not known to be in cultivation but a number of *Daviesia* species are cultivated at Australian National Botanic Gardens, Canberra (Wrigley and Fagg 1996, Elliot and Jones 1984). *Daviesia* is readily propagated from scarified seed (Wrigley & Fagg 1996). Seed of some species can be difficult to obtain because of the destruction of immature pods by insects (Elliot and Jones

1984). Some species have been grown from cuttings, but it is often difficult to obtain suitable material. Vigorous young growth which has just started to become firm seems the most suitable (Elliot & Jones 1984). General requirements for cultivation of *Daviesia* are for a well-drained light to medium soil, in a situation that receives partial to full sun.

Daviesia discolor is a phyllodenous shrub with an unknown life span. The main method of reproduction is by sexually produced seeds. *D. discolor* has been recorded flowering from August to September and fruiting in October. Possible pollinators were not observed during the field work. However, the Fabaceae family is principally a bee-pollinated family (Kalin Arroya 1981).

Soon after maturing the pod splits to release a single seed or possibly two. The opening of the fruit forcibly ejects the seed. The dispersal distance achieved by this mechanism is unknown. I have not seen mature seed of *D. discolor*, but from the examination of immature seed it appears that this species has a fleshy attachment on outside of the seed coat. Such attachments are known in many genera in the Fabaceae and it is suggested that these structures promote secondary dispersal of seed by ants (Berg 1975).

Other species of *Daviesia* as with most leguminous plants release their seed from the fruit in a dormant state (Elliott and Jones 1984, Auld and O'Connell 1991). It is highly probable that *D. discolor* produces similar seeds. For most hard-seeded leguminous species the dormancy is due to seed coat impermeability. The germination of such seeds involves the breaking of the seed dormancy by heat or the gradual decay of the seed coat. With these seed characteristics *D. discolor* would accumulate a persistent soil seed bank during inter-fire periods. The longevity of such a soil-stored seed bank is unknown.

The above-ground structures of *D. discolor* are killed by fire. However, regeneration can occur from the rootstock and lateral roots (see **Plate 4**).

3.11.7 Threats

Fires are either accidental (wildfires from lightning strikes or fires from surrounding agricultural lands) or planned (hazard reduction burns). The occurrence of fire in the habitat of *D. discolor* should not be viewed as being incompatible with the long term survival of the species. However the lack of ecological information about this species response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. If fires are too frequent, the plants will have insufficient time to build-up a soil seedbank to replace plants that are killed in the fire. Even though this species is capable of regenerating from rootstocks a high fire frequency would eventually lead to population declines.

There is no evidence to suggest that the grazing of cattle in the habitat of *D. discolor* affects the species directly. However, the use of the habitat for cattle grazing may indirectly affect the species though the use of regular fires for the promotion of grass in the understorey.

3.11.8 Management, Research and Conservation Measures

There is no quantitative data to indicate that the populations of *D. discolor* have declined in the past or are presently declining. However, appropriate management practices need to be put into place to ensure the long-term survival of *D. discolor*. The main habitat management issue is assessing the impact of present fire and grazing regimes. The lack of understanding concerning the ecological requirements of this species is a major shortcoming for future management of the habitat. Research should be encouraged to determine relevant aspects of the biology and ecology of *D. discolor*.

Monitoring should be designed to gather fundamental information to determine the effects of management on population and community dynamics.

Further surveys are needed in the populations on the Blackdown Tableland to consolidate the available information with respect to known populations and potential threats to these populations.

D. discolor assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Vulnerable, ie. is facing a high risk of extinction in the wild in the medium-term future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5). The present status of Vulnerable for *D. discolor* is considered to be appropriate.

3.12 DODONAEA RUPICOLA C.T. WHITE

3.12.1 Summary

Dodonaea rupicola is only known from the South East Queensland Biogeographical Region. It has a distributional range of approximately 10 km in the area between Caboolture and Beerwah. It is known from 4 populations; 3 are within areas gazetted for conservation purposes; 1 is within State Forest lands but in an area with no commercial timber values. The total area of occupancy is approximately 17 hectares. The largest known population is within Glasshouse Mountains National Park. *D. rupicola* occurs on low rocky hillslopes on shallow, acidic, silty clay loam to loams which are generally well drained. The vegetation community varies in structure from open shrubland to tall woodlands. The potential threats to the survival of *D. rupicola* arise from human interference with the environment. These threats are an inappropriate fire regime and the invasion of weed species.

3.12.2 Species background, description and identification

Dodonaea belongs in the family Sapindaceae and is predominantly an Australian genus with 60 of the 69 species currently recognised endemic to Australia. The genus is well distributed in all states and grows mostly in shrubland, woodland and open forest communities (West 1984). A few species are used as ornamental plants in horticulture, fodder in meat production and a pollen source for honey production (Lazarides and Hince 1993). The colourful fruits of the genus resemble the fruits of *Humulus lupulus* (hops) which is used in the brewing industry. The common name Hopbush is applied to *Dodonaea* because of this resemblance, although these genera are not in any way closely related (Closs 1993).

Dodonaea rupicola C.T. White was formally described in 1926 from material collected on Saddleback Mountain, approximately 48 km north of Brisbane (White 1926). The botanical description of *Dodonaea rupicola* is as follows:

Dioecious spreading shrub 0.6-1 m high. Branchlets terete to slightly angular, covered in spreading long soft white hairs. Leaves imparipinnate 1.5-3.5 cm long (excluding petiole); petiole 3-8 mm long, densely covered with spreading long soft white hairs; rachis 1-1.5 mm broad, winged. Lateral leaflets 10-18, opposite, oblong to oblanceolate, 4-9.5 mm long, 2-4 mm wide, dark to olive-green above, paler below, densely covered with long spreading hairs, margin entire or sometimes undulate, recurved or revolute, apex acute, midvein prominent below, impressed above; terminal

leaflet lobe-like, otherwise as in lateral leaflets, Inflorescence a panicle composed of monads to botryoids, terminal. Flowers unisexual, pedicels 2-2.5 mm long covered with spreading long soft white hairs. Sepals 4, lanceolate or sometimes ovate-lanceolate, 2.5-4 mm long, 1-1.5 mm wide, acute, persistent, mostly covered with long spreading soft white hairs. Petals absent. Stamens 8, approximately equal in length to the sepals. Ovary 4-carpellate, obovate, ca 1-1.5 mm diameter, densely covered with long spreading white hairs. Capsule 4-winged, dehiscent, transverse-elliptic in lateral view, 7.5-9 mm long, 12-15 mm diameter, densely covered with long spreading hairs, red-brown at maturity; wing extending 3-4 mm beyond body of carpel, margin undulate, extending from base to apex of carpel. Seed 2-4, lenticular, approximately 2 mm diameter, black, dull, aril absent (West 1984) (see **Plate 6**).

D. rupicola is closely related to and resembles the more widespread species *D. vestita* but can be distinguished by the larger leaves, the shorter pedicels, the shorter filaments and anthers and the smaller fruits. Details of these differences are presented in Table 3.12.1.

TABLE 3.12.1. CHARACTERS DISTINGUISHING *DODONAEA RUPICOLA* AND *DODONAEA VESTITA*.

| Characters | <i>D. rupicola</i> | <i>D. vestita</i> |
|------------------------------------|--------------------|-------------------------------|
| leaf length (cm) | (1.5)2-3(3.5) | (0.8)1-2(2.2) |
| pedicel length (mm) | 2.0-2.5 | (7.5)8-12(13) |
| staminal filament length (mm) | 0.2-0.3 | 0.5-0.6 |
| anther length (mm) | 2.1-2.6 | 3.3-4.0 |
| Capsule (length x diameter)(mm) | 7.5-9 x 12-15 | (8.5)9-13(15) x (16)18-23(24) |

3.12.3 Current conservation status

Dodonaea rupicola is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.12.4 Distribution and abundance

A compilation of Queensland Herbarium records of *D. rupicola* is presented in Appendix 1.11. *D. rupicola* is represented in the herbarium by twelve specimens. Three of the records lack sufficient information to relocate the collection site. The first collection with adequate information was made in 1926 from Saddleback Mountain just north of Caboolture. Another seven specimens have been collected from this site with the last collection made in 1974. A second locality was recorded in 1977 when it was found on Wild Horse Mountain approximately 10 km north of Mt Saddleback, near Beerburrum. Recent field work has confirmed that *D. rupicola* is still present on Wildhorse and Saddleback Mountains. A third population has been located on a peak beside Tibrogargan some 5 km WNW of Wildhorse Mountain. This peak is locally known as Mt Cooee. Site data for all three localities is presented in Appendix 2.3. Other potential locations searched include the slopes of Mt Tibberoowuccum, Mt Miketeebumulgrai and the low hills between Mt Beerburrum, Mt Tibberoowuccum and Mt Tibrogargan. Other areas that warrant further searching include Round Mountain and Tunbubudla. As far as can be ascertained, the current distribution pattern is natural and is not related to habitat reduction or fragmentation from human activity. The sites on Saddleback Mountain and Mt Cooee are within areas gazetted for conservation purposes under the control of the Queensland Department of Environment while the Wildhorse Mountain site is part of State Forest lands (State Forest Park No. 24) managed from the Department of Primary Industries, Forestry.

The plants on Wildhorse and Saddleback Mountains were scattered over a relatively large area. These areas were systematically searched and direct counts of individuals were undertaken to obtain a measure of present population size. There are 2 sites on Mt Cooee. The population at site 1 on the crest of the mountain was estimated using 50 random quadrats along a 100 m transect through the population. At site 2 on the north west lower slope of the mountain the population was counted. The population data is presented in Table 3.12.2.

TABLE 3.12.2. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR *DODONAEA RUPICOLA* SITES.

Where abundance was estimated by random transect sampling a mean with lower and upper 95% confidence limits are given. N.P. = National Park; S.F. = State Forest.

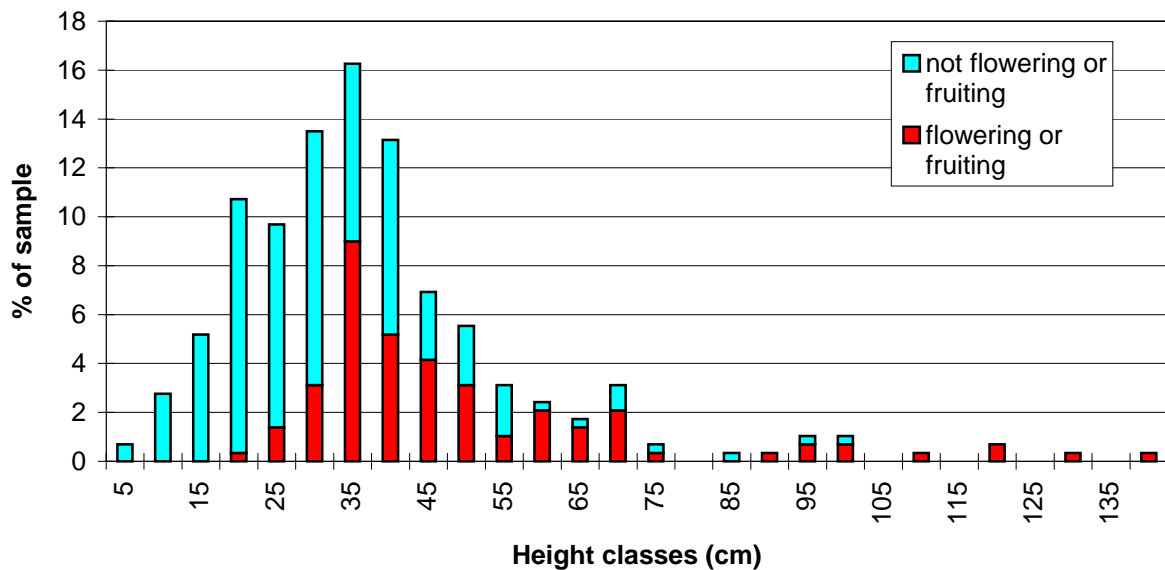
| Site | Date sampled | Population | | | land tenure | Area occupied (m ²) |
|-----------------|--------------|-------------|--------|-------------|-------------|---------------------------------|
| | | lower limit | mean | upper limit | | |
| Mt Cooee site 1 | 23 Sep 97 | 853 | 42 650 | 230 925 | N.P. | 10 000 |
| Mt Cooee site 2 | 15 Dec 97 | | 65 | | N.P. | 200 |
| Mt Saddleback | 15 Dec 97 | | 657 | | N.P. | 90 000 |
| Wild Horse Mt | 15 Dec 97 | | 549 | | S.F. | 75 000 |
| | Total | | 43 921 | | | 175 200 |

The population estimate for Mt Cooee site 1 of 42650 plants is has an extremely large standard error, making the estimate of little value. *D. rupicola* was observed to be very variable in its density through the habitat. The number of individuals in a 4 m² quadrat varied from 1 to 196 revealing a extreme patchy distribution. Within the 50 quadrats 853 plants were recorded. Although the population estimate on Mt Cooee is unreliable, it is still evident that the majority of the presently known population occurs on Mt Cooee. From field observations of the population it is considered that a more reasonable population size estimate would be between 10000-20000 individuals. However this needs to be confirmed with more critical sampling of the site.

The populations on Mt Cooee and Mt Saddleback are in legally gazetted conservation reserves and are relatively undisturbed. The other population on Wild Horse Mountain is within State Forest and has been impacted on by development of an access road to the lookout on the summit and the construction of a telecommunication tower half way up the slope.

It is difficult to obtain an understanding of the age structure of a population from a brief survey. However, measurements of plant heights to the nearest 5 cm were used as a guide to the age structure within the population on Mt Cooee. The heights were grouped into classes of 5 cm intervals. Plants that were flowering or had evidence of recently flowering were also noted. A summary of this data is presented in Figure 3.12.1. The heights range from 5 to 140 cm with the most common size class 32.5-37.5 cm. There is a large proportion of individuals in the smaller size classes with more than 50% of the sample less the 47.5 cm high, although there is a lack of individuals in the smallest size classes (less than 4 % less than 12.5 cm). There has been a high level of recruitment in the past but this does not appear to be occurring at the present time. It could be suggested the recruitment is not a continuous event but occurs as discrete events triggered by some unknown factor. Thirty-seven percent of the plants sampled were flowering or had just flowered. Flowering had occurred over a wide range of size classes. The smallest size class with flowering individuals was 17.5-22.5 cm tall.

FIGURE 3.12.1: SIZE CLASS DISTRIBUTION OF *DODONAEA RUPICOLA* POPULATION AT MT COOEE SITE 1.



3.12.5 Habitat

The sites are situated on low isolated hills on crests and moderately to steeply inclined slopes of varying aspects and at elevations between 40-160 m above sea level. There are large areas of rock outcrop at three of the known sites. The soils on the rocky sites are shallow, well drained, black loams with a high organic content and a pH 5.3-5.7. The soils on the more wooded areas are greyish yellow brown to dull yellow brown, silty clay loams to sandy loams with a pH 5.7-5.9. The geology is mapped as Tertiary trachyte, comendite, trachyrhyolite, mangerite, syenite.

The vegetation community in which *D. rupicola* is found varies in structure from open shrubland on the rocky outcrops to tall woodlands on the areas where the soils are deeper. The common species present in the shrublands included *Acacia hubbardiana*, *Xanthorrhoea latifolia*, *Leptospermum microcarpum*, *Calytrix tetragona* and *Lophostemon confertus*. The common tree species in the woodland sites are *Eucalyptus tindaliae*, *Corymbia trachyphloia* and *E. crebra*.

The Mt Saddleback site is undisturbed apart from an old quarry site on the edge of the population. The quarry has been allowed to naturally regenerate. *D. rupicola* is one of the species that has colonised the quarry floor. The exotic weeds *Melinis minutiflora*, *Lantana camara* and *Melinis repens* are present near the summit of the mountain but are presently not a dominant part of the vegetation.

There is no human disturbance at either of the sites on Mt Cooe (Plate 5), although site 3 is near the National Park boundary and adjacent to the firebreak along the park boundary. *Lantana camara* is present but not dominant within these sites.

On Wildhorse Mountain there is a public lookout at the summit. Access is by a concrete vehicular track that leads from the carpark at the base of the mountain to the summit. There is also a telecommunication tower approximately halfway up the mountain on the south western side with a track leading to it from the concrete track. Both tracks dissect the habitat of *D. rupicola*. A number of exotic weed species were observed around the lookout on the summit and on the disturbed soil at the edge of the concreted track. These included: *Conyza sumatrensis*, *Ageratum houstonianum*,

Baccharis halimifolia, *Cenchrus echinatus*, *Lantana camara*, *Melinis repens*, *M. minutiflora*, *Richardia brasiliensis* and *Pennisetum* sp..

3.12.6 Life history and ecology

There have been no studies into the biology or autecology of *Dodonaea rupicola*. The majority of the following information is extrapolated from our understanding of other species of *Dodonaea*. *D. rupicola* is known to have been cultivated by members of The Society for Growing Australian Plants (Closs 1993). Most species of *Dodonaea* can be propagated from seed or cuttings. For the best strike rate cuttings are best taken from semi-hardwood (Dixon 1993, Closs 1993). Seeds usually require pretreatment by soaking in very hot water prior to sowing. Elliot and Jones (1984) report the germination is fairly rapid for most species with seedlings often appearing after 14 days, but they can take up to 7 weeks to germinate.

Dodonaea rupicola is a dioecious perennial shrub with an unknown life span. The main method of reproduction is by sexually produced seeds. *D. rupicola* has been recorded flowering in April, June, November and December and fruiting in April, June, August, September and December. All species of *Dodonaea* are considered to be wind pollinated (West 1993). Pollen seems to be released only under climatic conditions favourable for wind pollination to be successful, ie. warm, dry and usually windy days (West 1993).

The light dry fruits are 4-celled and winged. However, the fruit does not appear to assist in the dispersal of the seed as the fruits dehisce tardily at maturity which occurs within 1 or 2 months of flowering. The number of seeds maturing on each plant varies greatly (West 1984). The levels of seed viability are unknown. Many *Dodonaea* species exhibit parthenocarpy (ie. the development of seedless fruits).

The seeds of most species of *Dodonaea* appear to be released from the fruit largely in a dormant state (Closs 1993). The seed dormancy mechanism is not understood. However, the dormancy appears to be broken by the treatment of the seed with heat (Closs 1993). This suggests that the dormancy is due to seed coat impermeability. With these seed characteristics *D. rupicola* would accumulate a persistent soil seed bank during inter-fire periods. The longevity of such a soil-stored seed bank is unknown.

Plants of *D. rupicola* are suspected to be fire-sensitive and killed by fire. There is no evidence to suggest that it is capable of regenerating from the rootstock. In the past on Wildhorse Mt *D. rupicola* has been observed prior to fire to be an uncommon species in the shrub layer but after fire it has become a common species in the understorey (B. Stark pers. comm.). Seedling recruitment may be promoted by fire in the habitat. Consequently, estimates of plant abundance at sites should not be used to assess conservation success at sites unless such estimates are continually made over time or related to the age of the population since it was last burnt.

3.12.7 Threats

With our limited knowledge of the species it is difficult to determine the stability of the populations and what possible threats there are to the long term existence of *Dodonaea rupicola* in the wild. However extinction of all three populations seems highly unlikely within the next few decades, especially with the majority of the known population within existing conservation reserves in the Glasshouse Mountain National Park.

Anecdotal evidence suggests that fire plays a role in the maintenance of the population levels of *D. rupicola* in its habitat. However the lack of ecological information about this species makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. If fires are too frequent, the plants will have insufficient time to build-up a soil seedbank to replace plants that are killed in the fire, and this will lead to population declines. If fires are too infrequent then adult plants will become senescent and the soil seedbank may decline to the point where there are insufficient levels of fecundity to maintain population levels. Therefore inappropriate fire regimes are a potential threat to the species.

A number of exotic weed species have been recorded from Wildhorse Mountain and also from the relatively undisturbed habitat of Saddleback Mountain. There is the potential for these exotic plant species to encroach on the habitat of *D. rupicola*. The impact that such a weed species invasion could have on *D. rupicola* is unknown. However, it can be assumed that weeds would change the vegetation structure and lead to increased competition for available habitat resources. Therefore another potential threat to the species is the invasion of weed species into the habitat.

3.12.8 Management, Research and Conservation Measures

Appropriate management practices need to be put into place to ensure the long-term survival of *D. rupicola* in the wild. However, management presupposes knowledge about the effect of decisions on the species. There is a need to establish monitoring projects to determine the impact of particular management decisions.

Information on the effect of fire on the population dynamics of this species is required. More detailed data on reproductive ecology is required especially in relation to seed germination. This needs to be understood in the long term if successful management techniques are to be developed for the effective conservation of the species.

Although weeds are not a current threat their level and distribution should be monitored within the habitat of *D. rupicola*.

Dodonaea rupicola assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Vulnerable, ie. is facing a high risk of extinction in the wild in the medium-term future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5). The present status of Vulnerable for *D. rupicola* is considered to be appropriate.

3.13 EUCALYPTUS HALLII BROOKER

3.13.1 Summary

Eucalyptus hallii is endemic to south east Queensland where it is known between Bundaberg and Howard. It has a distributional range of approximately 45 km and encompasses an area of occurrence of approximately 1300 km². Presently the main area for this species is on freehold, vacant crown and State Forest lands (SF 840 Fty 1633). The species is present in Burrum Coast National Park. There is no quantitative data on population sizes. Current or perceived threats to the continued survival of *E. hallii* are habitat loss and changes in soil hydrology.

3.13.2 Species description and identification

The genus *Eucalyptus* is placed in the family Myrtaceae and has approximately 700 species mostly which are endemic to Australia but several species extending to parts of Malesia and the Philippines (Chippendale 1988).

Eucalyptus hallii Brooker was formally described in 1975 from material collected near Goodwood, approximately 30 km south of Bundaberg (Brooker 1975). The botanical description of *Eucalyptus hallii* is as follows:

A tree to 28 m high with smooth bark on the trunk and branches. The bark is orange to pinkish-grey when fresh, then turns to a mottled grey or dark grey with age. The juvenile leaves are lance-shaped to ovate, measure up to 15 cm long by 8 cm wide and are arranged in pairs along the branches. The slightly glossy green or grey-green, adult leaves are lance-shaped or sometimes sickle-shaped. They measure up to 15 cm long by 2.5 cm wide. The white flowers are grouped into axillary clusters of up to seven on laterally flattened stalks that reach 1 cm in length. Mature flower buds are egg or club shaped, measure up to 9 mm long and have a rounded or cone-shaped cap. The seed capsules are obconical, 5-8 mm long by 5-7 mm in diameter, with 3 chambers. For a more detailed description refer to Brooker (1975) and Chippendale (1988). The species is illustrated in Brooker and Kleinig (1994).

Eucalyptus hallii is a distinctive species and difficult to confuse with other species within its narrow range. *E. bancroftii* is another smooth bark species in the area. *E. hallii* can be distinguished from this species by its ovoid buds with hemispherical or conical operculums, and it grows in drier and slightly more elevated sites than *E. bancroftii*.

3.13.3 Current conservation status

Eucalyptus hallii is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.13.4 Distribution and abundance

E. hallii was not surveyed during the present study. Details from Queensland Herbarium specimens of *E. hallii* are listed in Appendix 1.12. Altogether 22 specimens of *E. hallii* have been collected. Three CORVEG sites have also been recorded but are presently not vouchered. *E. hallii* has a distribution from the Bundaberg of south to Howard and from Childers east to the coast. There is a

single record from Fraser Island. However, investigations have not confirmed this locality and it is considered highly unlikely to be present on the island (Mr A.R. Bean pers. comm.). The species is conserved in Burrum Coast National Park (Kinkuna, Woodgate and Burrum River sections). Presently the main extent of this species is on freehold, vacant crown and State Forest lands (SF 840 Fty 1633). The distribution of *E. hallii* has a range of approximately 45 km and encompasses an area of occurrence of approximately 1300 km². Extensive surveys have been undertaken by Erskine (1992). However, there is no quantitative data available on the number of individuals in the wild.

3.13.5 Habitat

Eucalyptus hallii is most commonly found in open eucalypt forest or woodland at altitudes of 5 to 70 m. It occurs in coastal areas on low flat to undulating terrain on gentle slopes and broad rises. The surface soils are generally grey sandy to silty in texture with a acidic reaction and derived from Tertiary sedimentary rocks. *Eucalyptus hallii* is usually dominant or co-dominant in the canopy of the community in which it grows. The more frequent tree species recorded with this species are *Eucalyptus umbra*, *Corymbia intermedia*, *C. trachyphloia*, *Angophora leiocarpa*, *Melaleuca quinquenervia* and *Syncarpia glomulifera*.

3.13.6 Life history and ecology

Eucalyptus hallii is one of the few threatened Queensland species that has been studied in some detail. Erskine (1992) examined the life cycle and environment of this species and most of the information presented here comes from his report.

E. hallii is a medium size tree reaching 28 m high. The longevity of individual plants is unknown. However, it is suspected to be at least 100 years. The main method of reproduction is by sexually produced seeds. *E. hallii* appears to become reproductive when its girth exceeds 30 cm (Erskine 1992). Cultivated material of this species has been observed to flower within three years of germination. However, trees growing under natural field conditions have been observed for approximately 17 years and have never flowered.

Flowering has been reported in January and February by Brooker and Kleinig (1994) and from December to April (Erskine 1992). Plants have been recorded with buds throughout the year. The most common pollinators of Australian Myrtaceae are insects (Beardsell *et al.* 1993). Erskine (1992) reports anecdotal evidence that native bees may be effective in the pollination of *E. hallii*. Fruits have been recorded on the branches throughout the year. It is unknown how long the seed is retained in the woody fruits on the tree. Pryor and Johnson (1981) reported that many tropical eucalypt species shed their seeds and drop their fruit a few months after flowering, whereas southern species may retain their fruits for more than a year. The seed once released from the fruit falls to the ground. The seed has no adaptation for secondary dispersal by animals. Cremer (1977) observed that wind is probably the only important agent of seed dispersal in the eucalypts. The seeds readily germinate given reasonable moisture and temperature conditions. Erskine (1992) found high levels of vigour and viability of fresh seed. It is unlikely that a soil seed bank would develop for this species.

Fire is a major environmental factor in Australia, in particular in dry sclerophyll forest. Eucalypts are among the most resistant of trees to intense fire. *E. hallii* has the capacity to sprout from proventitious buds on the trunk, producing epicormic shoots. As with most eucalypt species *E. hallii* forms a lignotuber in the early stages of its life cycle. If for some reason the seedling which has developed from the tuber is destroyed growth is vigorously renewed by the development of new shoots from the lignotuber. The time required before the seedlings can tolerate fire is estimated to

be 1 or 2 years (Erskine 1992). Once the plant develops to a particularly girth it appears that the tuber is no longer detectable. It has been observed that mature plants which have been cut off above ground level can coppice from the stump.

3.13.7 Threats

There can be no doubt that habitat alienation (for agriculture and exotic pine plantations) in the species' narrow geographical range has led to a decline in populations in the past. A large proportion of the presently known populations is estimated to be on freehold land, State Forest lands of low commercial timber values and Vacant Crown Land. These areas are still under the potential threat of conversion to agricultural land for sugarcane, subdivision and clearing for semi rural blocks, forestry production or other uses that could be detrimental for the populations.

Erskine (1992) observed a correlation between the level and extent of soil waterlogging and the distribution of *E. hallii* within its restricted range. It could be speculated that the soil hydrology may be significant in the establishment and survival of the species in the region. Changes in soil hydrology through irrigation or the drainage of areas may affect the ability of this species to survive.

3.13.8 Management, research and conservation measures

Populations mapped by Erskine need to be vouchered and the landholders should be contacted and made aware of the significance of the species.

Only a small portion of known population is protected within land set aside for conservation purposes. The protection of the remaining natural vegetation in the state forest lands should be pursued through either declaration of a State Forest Scientific Area under the *Forestry Act 1959* or by converting the land to a conservation reserve.

There is little detailed information available on the role of fire in the ecology and biology of *E. hallii*. This needs to be understood if successful management techniques are to be developed for the conservation of the species in the wild. Research into the effect of fire on reproductive ecology and population dynamics is required.

It is speculated that levels and extent of waterlogging may be significant in the survival of the species. The relationship between soil hydrology and the local distribution of *E. hallii* should be established.

3.14 EUCALYPTUS TAURINA A.R. BEAN & BROOKER

3.14.1 Summary

E. taurina is restricted to south east Queensland where it occurs from Crows Nest south to near Haldon south east of Toowoomba. It has a distribution range of approximately 60 km and encompasses an area of occurrence of approximately 750 km². There is no quantitative data on population sizes. *E. taurina* is most commonly found in open eucalypt forest or woodland on gentle to steep slopes and ridge tops. The soils are generally well drained, shallow, sandy to sandy loam in texture. Current or perceived threats to the continued survival of *E. taurina* are timber harvesting, clearing of habitat and too frequent and intense fires.

3.14.2 Species description and identification

The genus *Eucalyptus* is placed in the family Myrtaceae and has approximately 700 species mostly which are endemic to Australia but several species extending to parts of Malesia and the Philippines (Chippendale 1988).

Eucalyptus taurina A.R. Bean & Brooker was formally described in 1994 from material collected near Helidon, approximately 80 km west of Brisbane (Bean & Brooker 1994). The botanical description of *Eucalyptus taurina* is as follows:

A tree to approximately 20 m high with rugged grey ironbark on the trunk and larger branches, branches less than 8 cm diameter, smooth. Juvenile leaves petiolate, lanceolate, 9-13.5 x 1.5-2.5 cm, strongly discolorous, not glossy, alternate. Adult leaves with petioles 14-18 mm long, lanceolate to narrowly lanceolate or slightly falcate, 9.5-15 x 1.5-2.5 cm, concolorous, dull, grey-green, alternate. Inflorescences axillary in upper leaf axils or apparently compound and terminal; umbellasters 7-flowered or less by abortion; peduncles angular, 4-7 mm long; pedicels absent or up to 2 mm long; buds fusiform when young, becoming elliptical at maturity, 7-8 x 3-3.5 mm. Fruits sessile or shortly pedicellate, 5-6.5 x 5-6 mm, obconical, disc obscure; valves 3-5, exserted (Bean & Brooker 1994). For a more detailed description refer to Bean & Brooker (1994). The species is illustrated in Brooker and Kleinig(1994) and Bean & Brooker (1994).

Eucalyptus taurina can be confused with *Eucalyptus crebra* which it superficially resembles. However it can be distinguished by its smooth outer branches, fusiform buds and the sessile or almost sessile fruits with exserted valves.

3.14.3 Current conservation status

Eucalyptus taurina is presently not listed on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* or the Commonwealth *Endangered Species Act 1992*. However its inclusion on the Queensland Schedule of threatened wildlife as 'Vulnerable' is pending. It is proposed to be added to the schedule because it has a restricted distribution and the majority of the known populations are not in any formal conservation reserve.

3.14.4 Distribution and abundance

E. taurina was not surveyed during the present study. Details from the 11 Queensland Herbarium specimens of *E. taurina* are listed in Appendix 1.13. Six CORVEG sites have also been recorded but are presently not vouchered. *E. taurina* has a distribution from near Crows Nest south to near Haldon south east of Toowoomba. The species is conserved in Crow's Nest Falls National Park, but the known population in the park is small (A.R Bean pers. comm.). Presently the main area for this species is just north of Helidon on freehold and State Forest land (SF 564 Fty 1444 and SF 616 Fty 1512). There is no quantitative data available on the number of individuals in the wild. *E. taurina* has a distributional range of approximately 60 km and encompasses an area of occurrence of approximately 750 km².

3.14.5 Habitat

Eucalyptus taurina is most commonly found in open eucalypt forest or woodland at altitudes of 300 to 450 m. It occurs in hilly terrain on gentle to steep slopes and on ridge tops. The soils are generally well drained, shallow, sandy to sandy loam in texture and derived from sandstone or

granitic rocks. The more frequent tree species recorded with this species are *Eucalyptus acmenoides*, *Corymbia citriodora* and *Angophora woodsiana*. Other associated trees and shrubs are *C. gummifera*, *C. trachyphloia*, *Eucalyptus baileyana* and *E. dura*.

3.14.6 Life history and ecology

Eucalyptus taurina is a tree reaching 22 m high. The longevity of individual plants is unknown. However, it is suspected to live for at least 100 years. The main method of reproduction is by sexually produced seeds.

Flowering has been observed in October. No pollinators have been reported for *E. taurina*. The most common pollinators of Australian Myrtaceae are insects (Beardsell *et al.* 1993). Fruits have been recorded in June and August. It is unknown how long the seed is retained in the woody fruits on the tree. Pryor and Johnson (1981) reported that many tropical eucalypt species shed their seeds and drop their fruit a few months after flowering, whereas southern species may retain their fruits for more than a year. The seed once released from the fruit falls to the ground. The seed has no adaptation for secondary dispersal by animals. Cremer (1977) observed that wind is probably the only important agent of seed in the eucalypts. The seeds readily germinate given moisture and reasonable temperature conditions.

Fire is a major environmental factor in Australia, in particular in dry sclerophyll forest. Eucalypts are among the most resistant of trees to intense fire. *E. taurina* has the capacity to sprout from proventitious buds on the trunk, producing epicormic shoots and very thick bark which acts as an efficient insulator. Also, as with most eucalypt species *E. taurina* forms a lignotuber in the early stages of its life cycle. If for some reason the seedling which has development from the tuber is destroyed, growth is vigorously renewed by the development of new shoots from the lignotuber.

3.14.7 Threats

Timber harvesting in the State Forest where this species occurs is considered to be a threat to *E. taurina*. The species produces a millable log and has been harvested in the past.

The clearing and harvesting of trees on private land are a threat in the Helidon area.

The occurrence of fire in the habitat of *E. taurina* should not be viewed as being incompatible with the long term survival of the species. However the lack of ecological information about this species' response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. If fires are too frequent and intense, the plants will have insufficient time to replace plants that are killed in the fires, and this will lead to population decline.

3.14.8 Management, research and conservation measures

Known populations should be examined to establish their size and extent and to identify threats to the populations. Further populations of this species should be searched for within its currently known range. A survey should be conducted to establish whether this species occurs in SF 665 Fty 947.

Research is required into the fire ecology, reproduction biology and the population dynamics of the species. The effect of grazing of domestic cattle on the population dynamics of *E. taurina* needs to be assessed if grazing on crown land is to be permitted out in areas where *E. taurina* grows.

Landholders should be contacted and made aware of the significance of the species on their land.

3.15 HALORAGIS EXALATA SUBSP. VELUTINA ORCHARD

3.15.1 Summary

Haloragis exalata subsp. *velutina* is restricted to north-eastern New South Wales and south-eastern Queensland where it occurs from Kempsey north to the Bunya Mountains. It has a distribution range of approximately 370 km. There is no quantitative data on population sizes at the sites in Queensland. One locality within the Brisbane city area is considered to be extinct. Potential threats are invasion of habitat by exotic weed species and an inappropriate fire regime.

3.15.2 Species description and identification

The genus *Haloragis* is placed in the family Haloragaceae. The genus is distributed from Australia to the south Pacific with approximately 28 species (Orchard 1990). In Australia it comprises approximately 23 species throughout the temperate and arid areas of the continent with a range of habits from ephemeral herbs to obligate aquatics (Orchard 1990).

Haloragis exalata subsp. *velutina* was formally described in 1975 based on material collected near Grafton in northern New South Wales (Orchard 1975). The botanical description of *Haloragis exalata* subsp. *velutina* is as follows:

Small erect shrub to 1.5 m tall. Stems 4-angled, finely and densely velvety with hairs less than 0.01 mm long. Leaves opposite, becoming alternate below inflorescence, sessile or shortly petiolate, narrowly lanceolate, minutely serrate with 30-40 teeth in distal part or entire, finely and densely velvety with hairs less than 0.01 mm long; lamina 55-60 mm long 6-8 mm wide; petiole 5-10 mm long. Inflorescence of 3-7 flowered dichasia; pedicels 0.7-1.5 mm long. Sepals ovate to deltoid, 0.6-0.8 mm long. Petals 2.4-3.3 mm long yellow-green to reddish. Fruit ovoid to obpyriform, 2-2.5 mm long, 4-ribbed, smooth or weakly rugose between ribs, finely and densely velvety with hairs less than 0.01 mm long (Orchard 1990). For a more detailed description refer to Orchard (1975 & 1990).

Haloragis exalata can be distinguished from other species of *Haloragis* by its opposite vegetative leaves at least on the lower stems which have a thin, entire narrowly lanceolate to oblong lamina, toothed inflorescence bracts, and 4-locular ovary and fruit. *Haloragis exalata* subsp. *velutina* differs from *Haloragis exalata* subsp. *exalata* by having a dense velvety indumentum and narrower petiolate leaves with a finely serrate or almost entire margin (Orchard 1990).

3.15.3 Current conservation status

Haloragis exalata subsp. *velutina* is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993) and is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.15.4 Distribution and abundance

H. exalata subsp. *velutina* is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from Kempsey north to the Bunya Mountains. It has a distribution range of approximately 370 km. *H. exalata* subsp. *velutina* was not surveyed during the present study.

Details from Queensland Herbarium specimens of *H. exalata* subsp. *velutina* are listed in Appendix 1.14. In Queensland five collections have been recorded. One early collection was made from a swamp in Hamilton, Brisbane. The habitat in the Hamilton area has been cleared and it is expected that this population has become extinct. Two other early records come from the Bunya Mountains, one clearly within Bunya Mountains National Park. Two recent collections have been made in SF 151 Fty 824 and SF 637 Fty 1613. There is no information available on population sizes at the sites.

3.15.5 Habitat

H. exalata subsp. *velutina* has been recorded growing in rainforest, on rainforest margins and from *Poa-Themeda* grassland adjacent to rainforest at altitudes above 500 m. It is also recorded from swampy terrain at elevations just above sea level.

3.15.6 Life history and ecology

There is little recorded information on the ecology and life history of the species. *Haloragis exalata* subsp. *velutina* is a slender open shrub that reproduces by sexually produced seeds. There is no indication that the species can reproduce vegetatively, however, some species of *Haloragis* are reported to be able to sucker (Elliott and Jones 1990).

Haloragis exalata subsp. *velutina* has been recorded flowering in February and April and with fruits in April. Pollinators are unknown but are suspected to be insects. The fruit is a indehiscent nut that falls from the plant when mature. There appear to be no adaptations for secondary dispersal by animals. The longevity and viability of the seed is unknown. Seed are reported to be slow to germinate, but some begin to germinate 15-20 days after sowing (Elliot and Jones 1990).

The response of the plant to fire and disturbance is not known. *Haloragis exalata* subsp. *velutina* above-ground biomass is probably killed by fire. It is not known whether this species is capable of regenerating from its rootstock. Elliot and Jones (1990) report that some *Haloragis* spp. readily colonize areas which have been disturbed.

3.15.7 Threats

With our limited knowledge of the species it is difficult to determine the stability of the populations and what possible threats there are to the long term existence of *H. exalata* subsp. *velutina* in the wild. The populations on rainforest margins may be susceptible to invasion by exotic weed species such as lantana (*Lantana camara*) into the habitat. The population recorded in the grassland community in the Bunya Mountains is also threatened by the invasion of exotic plant species. The introduced grasses kikuyu (*Pennisetum clandestinum*) and African lovegrass (*Eragrostis curvula*) are considered to have the potential to become major problems in maintaining the natural flora of the Bunya Mountain grasslands (Fensham and Fairfax 1996b). Kikuyu has already invaded two grassland patches displacing the native grasses and has been recorded in another two grassland patches (Fensham and Fairfax 1996b).

3.15.8 Management, research and conservation measures

Previously recorded sites should be examined to establish their size and extent of populations. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences.

It is important to understand how *H. exalata* subsp. *velutina* responds to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

Monitoring and control of the spread of the weeds should be undertaken. Fensham and Fairfax (1996a) recommended that kikuyu and African lovegrass be eradicated where possible from the grassland communities. Ongoing monitoring of the impact of weeds on the communities is required.

3.16 LASIOPETALUM SP. (PROSTON J.A. BAKER 17)

3.16.1 Summary

Lasiopetalum sp. (Proston J.A. Baker 17) is endemic to south east Queensland and is restricted to a very small area north of Proston where it is known from four sites. The total population is estimated to be 1180 plants in an area of approximately 50 hectares. The largest population occurs on freehold land while the other three stands occur on road verges. It occurs in eucalypt open forest on red loamy soils at altitudes of approximately 500 m. A current threat to the species is the loss of habitat to agricultural development.

3.16.2 Species description and identification

The genus *Lasiopetalum* is placed in the family Sterculiaceae. The genus is endemic to Australia where there are approximately 35 species distributed throughout the southern part of Australia with two species extending to south-east Queensland.

Lasiopetalum sp. (Proston J.A. Baker 17) has not been formally described but has been recognised as a distinct taxon since 1994. The botanical description *Lasiopetalum* sp. (Proston J.A. Baker 17) is as follows:

Erect shrub to 60 cm high; stems terete, densely stellate tomentose. Leaves with petioles 0.5-2 cm long; blades narrowly ovate to ovate, apex acute, base obtuse to subcordate, margin entire or almost so, 2.5-8 cm long, 0.8-3 cm wide, scattered stellate hairs above, densely stellate tomentose beneath. Inflorescences dense several-many-flowered leaf-opposed cymes, densely ferruginous tomentose; Calyx pinkish, 508 mm long, lobes narrowly ovate to ovate, stellate tomentose outside, glabrous except for margins inside, ovary densely pubescent. Fruits more or less ovoid, approximately 4 mm high, tipped by persistent style, loculicidally dehiscent (Stanley and Ross 1986)

Lasiopetalum sp. (Proston J.A. Baker 17) can be distinguished from the other species of *Lasiopetalum* in Queensland by the colour, shape and indumentum of its calyx. These differences are set out in Table 3.16.1.

TABLE 3.16.1. CHARACTERS DISTINGUISHING LASIOPETALUM SP. (PROSTON J.A. BAKER 17) AND LASIOPETALUM FERRUGINEUM

| Characters | <i>L. sp. (Proston J.A. Baker 17)</i> | <i>L. ferrugineum</i> |
|------------------|---|----------------------------------|
| calyx colour | pink | cream |
| calyx shape | narrowly ovate | ovate |
| calyx indumentum | stellate tomentose outside, glabrous except for margins on inside | stellate tomentose on both sides |

3.16.3 Current conservation status

Lasiopetalum sp. (Proston J.A. Baker 17) is presently not listed on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* or the Commonwealth *Endangered Species Act 1992*. However its inclusion on the Queensland Schedule of threatened wildlife as 'Endangered' is currently pending. It is proposed to be added to the schedule because it has a very restricted distribution and is not in any formal conservation reserve. It is threatened by habitat loss for agriculture.

3.16.4 Distribution and abundance

Details from Queensland Herbarium specimens of *Lasiopetalum* sp. (Proston J.A. Baker 17) are listed in Appendix 1.15. The species is restricted to a very small area north of Proston where it is known from four sites. There is no quantitative data available on population sizes. The following figures come from the Queensland Herbarium Rare and Threatened Database. The largest stand occurs on freehold land with an estimated population of approximately 1000 plants. The other three stands occur on road verges and are estimated to consist of 30, 50 and 100 plants. The four stands were probably remnants of a once continuous population that extended over an area approximately 4 km long but is now reduced to approximately 50 hectares of fragmented habitat.

3.16.5 Habitat

Lasiopetalum sp. (Proston J.A. Baker 17) has been recorded growing in eucalypt open forest on red loamy soils at altitudes of approximately 500 m. Associated species included *Eucalyptus fibrosa*, *E. melanoleuca*, *E. pothalassica*, *Corymbia intermedia*, *Melaleuca groveana*.

3.16.6 Life history and ecology

There have been no studies into the biology or autecology of *Lasiopetalum* sp. (Proston J.A. Baker 17). The majority of the following information is extrapolated from our understanding of other species of *Lasiopetalum*. A number of the more common species of *Lasiopetalum* have been propagated by cuttings and seed. It is reported that the seed does not require any pretreatment but may take 40-90 days to germinate (Elliot and Jones 1993).

Lasiopetalum sp. (Proston J.A. Baker 17) is a perennial shrub that reproduces by sexually produced seeds. There is no indication that the species can vegetatively reproduce. The longevity of the plants is unknown. *Lasiopetalum* sp. (Proston J.A. Baker 17) has been recorded flowering from September to November and fruiting has not been observed. However the fruit are suspected to mature soon after flowering. Pollinators are unknown but it is suspected to be insects.

The seed would be released soon after maturity. There is no information about possible dispersal mechanisms. The longevity and viability of the seed is unknown.

The response of *Lasiopetalum* sp. (Proston J.A. Baker 17) to fire is unknown and it is not known whether it has a lignotuber or similar root structures which would allow regeneration after fire.

3.16.7 Threats

Habitat loss due to clearing for agriculture in this species' narrow geographical range has undoubtedly led to a decline in populations in the past. Conversion of habitat to agricultural pursuits is still continuing to occur and poses a major threat to the long term survival of the species.

The lack of ecological information about this species' response to fire makes it impossible to assess how fire would impact on the long term survival of the species.

3.16.8 Management, research and conservation measures

One of the first steps towards the protection of this species in the wild should be to protect the known populations and their habitat. The majority of the populations are on freehold land. Liaison with land owners and local authorities are required to make them aware of the presence of the species and the importance of protecting the populations from further decline. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*. Local authorities should be made aware of the populations on the road verge.

Very little seems to be known about this species. Previously recorded sites should be examined to establish their size and extent. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences.

Investigation of the ecology of *Lasiopetalum* sp. (Proston J.A. Baker 17) is warranted, particularly by monitoring population numbers over several years and investigating the impacts of burning and other land-use practices.

3.17 LEUCOPOGON RECURVISEPALUS C.T. WHITE

3.17.1 Summary

L. recurvisepalus occurs from north of Grafton, New South Wales to near Beerwah on the Sunshine Coast, Queensland. In Queensland, the species is known only from three sites over a range of approximately 110 km, encompassing an area of occurrence of approximately 1800 km². Two of the three sites are within conservation reserves. It grows in hilly terrain on hillcrests or very gently to very steeply inclined hillslopes at elevations between 60 and 500 m above sea level and varying aspects. The soils are black light sandy clay loams to light clays on sandstones to brown to pale yellow clay loams and light clays developed from igneous rocks. The common feature of the sites is the pH of the surface soils ranging from 4.3 to 4.9. The vegetation community in which *L. recurvisepalus* is found varies in structure from low to tall closed heathland to mid-tall to tall woodland. Potential threats arise from inappropriate fire regimes and physical disturbance on freehold land.

3.17.2 Species description and identification

The genus *Leucopogon* is placed in the family Epacridaceae. *Leucopogon* occurs in Australia, Malesia, Indo-China, Pacific and New Zealand, but is predominantly an Australian genus with approximately 200 of the 230 species endemic to the continent (Powell 1992). Approximately 22 species occur in Queensland.

Leucopogon recurvisepalus was formally described in 1944 and based on material collected from the Plunkett area, approximately 40 km south of Brisbane (White 1944). A botanical description of *Leucopogon recurvisepalus* is as follows:

Erect to spreading shrub to 110 cm high with villous branchlets. Leaves linear-oblong to very narrowly triangular, 4.0-8.5 mm long, 1.0-2.0 mm wide, apex acuminate, base truncate, margins recurved, minutely toothed; lamina more or less discolourous, upper surface convex, scabrous, lower surface slightly ribbed to grooved, often shortly pubescent, petiole 0.3-0.4 mm long. Inflorescences

of 1 plus rudiment, 2 or 3 flowered dense axillary spikes; rhachis up to 1.5 mm long; bracteoles 1.2-1.5 mm long, broadly ovate. Flowers erect; sepals very narrowly ovate, apex attenuate, recurved abruptly 0.5-1.0 mm from tip, villous outside; corolla white, tube 2-2.5 mm long, lobes c. 2.5 mm long, densely bearded on lobes. Fruit ellipsoid, 2.8-3.2 mm long, ribbed, glabrous, brown (Powell 1992). (see **Plate 7**)

L. recurvisepalus is closely related to and resembles the species *L. ericoides* but can be distinguished by its recurved sepals. They also differ in habitat with *L. recurvisepalus* occurring on sandstone ridges and stony hills while *L. ericoides* occurs on coastal sandy flats and offshore islands.

3.17.3 Current conservation status

Leucopogon recurvisepalus is currently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “endangered wildlife”. The species has not been assigned a national conservation status by ANZECC (1993) or listed on Schedules of the Commonwealth *Endangered Species Protection Act 1992*.

3.17.4 Distribution and abundance

Details from Queensland Herbarium specimens of *L. recurvisepalus* are listed in Appendix 1.16. Altogether 9 specimens have been collected from three sites in south east Queensland. The original material was collected from the Plunkett area south west of Beenleigh from 1923 to 1930. In 1968 it was collected from Coochin Hills west of Beerwah and in 1995 from the D’Aguilar Range west of Mt Mee. *L. recurvisepalus* is also known to occur north of Grafton in northern New South Wales (Powell 1992).

The Queensland distribution of *L. recurvisepalus* has a range of approximately 110 km and encompasses an area of occurrence of approximately 1800 km². During the current study all three known sites were examined and it was observed that *L. recurvisepalus* was still present at all three. As far as can be ascertained, these three disjunct sites represent the natural distribution pattern in Queensland of this species and it is not related to habitat reduction or fragmentation from recent human activity. Appendix 2.4 gives a list of sites examined in the present survey, with locality and habitat data for those sites.

At the Plunkett locality *L. recurvisepalus* was found to be locally common at a number of sites throughout the Plunkett Conservation Park. The park has recently incorporated a part of TR 766 (Fty 1420) which contained the largest proportion of the population in the Plunkett area. Two sites within the Plunkett Conservation Park were examined in detail. *L. recurvisepalus* extends outside the park onto adjacent freehold land to the west and a powerline corridor to the south of the conservation park. Potential habitat on freehold to the east of the conservation park has recently been cleared. Land to the west of the conservation park is presently mostly under pine plantation except for a small proportion of hilly terrain adjacent to the park. This land is partly freehold and partly State Forest land. The area still retains its natural vegetation and *L. recurvisepalus* has been observed to be present.

At the Mt Coochin locality, the population was located on the slopes of the more easterly of the two peaks within the National Park. The Mt Mee locality is completely within the State Forest area (SF 893 Fty 1532). Three populations were located of which two were sampled. The populations in the Mt Mee locality are not in areas of high commercial timber values.

The populations at all sites except for site 1 at Mt Mee were estimated using 50 random 1 m² quadrats along a 100 m transect through the population. Table 3.17.1 presents the estimates of the area occupancy and abundance of *L. recurvisepalus* at each site examined. The total population of *L. recurvisepalus* was estimated with 95% confidence to be between 20000 and 1100000 individuals. Although the estimations are of limited value, it can be seen that *L. recurvisepalus* is presently very common where it occurs. Approximately half (42 %) of the estimated population is within conservation reserves with the remainder in a state forest area.

TABLE 3.17.1. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR *LEUCOPOGON RECURVISEPALUS* SITES IN QUEENSLAND SURVEYED IN 1997.

Where abundance was estimated by random transect sampling a mean value and lower and upper 95% confidence limits are given. Direct counts of plants have no estimate of error associated with them.

| Site | Date sampled | Population size | | | Area occupied (m ²) | Land tenure |
|-----------------|--------------|-----------------|---------------|-------------|---------------------------------|-------------|
| | | lower limit | mean estimate | upper limit | | |
| Plunkett site 1 | 1-Sep-97 | 18 670 | 79 606 | 140 542 | 31 200 | NP |
| Plunkett site 2 | 2-Sep-97 | 968 | 10 944 | 20 920 | 4 800 | NP |
| Mt Mee site 1 | 5-Sep-97 | — | 63 | — | 100 | SF |
| Mt Mee site 2 | 5-Sep-97 | 269 | 224 167 | 780 121 | 40 000 | SF |
| Mt Coochin | 3-Sep-97 | 147 | 73 500 | 155 990 | 25 000 | NP |
| Total | | 20 117 | 388 280 | 1 097 636 | 101 100 | |

It is difficult to obtain an understanding of the age structure of a population from a brief survey. However, measurements of plant heights to the nearest 1 cm were used as a guide to the age structure within the population. The heights were grouped into classes of 5 cm intervals. Plants that were flowering or had evidence of recent flowering were also noted. A summary of this data is presented in Figures 3.17.1 and 3.17.2. The heights range from 5 to 110 cm with the most common size class varying from site to site. There was a lack of smaller size classes in 2 of the 4 sites examined. The proportion of reproductive individuals varied between populations from 84-100%. Flowering had occurred over a wide range of size classes. The smallest size class with flowering individuals was 2.5-7.5 cm.

3.17.5 Habitat

In New South Wales *L. recurvisepalus* is reported to grow in dry sclerophyll forest and heath on sandy soils (Powell 1992).

The three Queensland sites observed vary substantially in physical characteristics from level or very gently inclined to very steeply inclined hillslopes at elevations between 60 and 500 m above sea level and varying aspects. The soil and the underlying geology varies from black light sandy clay loams to light clays on sandstones to brown to pale yellow clay loams and light clays developed from igneous rocks. The common feature of the sites is the pH of the surface soils ranging from 4.3 to 4.9.

The vegetation community in which *L. recurvisepalus* is found varies in structure and floristics from low to tall closed heathland (**Plate 8**) dominated by *Calytrix tetragona*, *Leptospermum microcarpum* and *Ptilothrix deusta* to mid-tall to tall woodland with mid-dense, low to tall shrub layer and mid-dense ground layers (**Plate 9**). The tree species present in the woodland communities include: Mt Mee sites 1 & 2, *Eucalyptus racemosa* and *Corymbia gummifera*; Mt Coochin, *C. trachyphloia*, *L. trinervium*, *E. curtisii* and *E. tindaliae*; Plunkett site 1, *E. planchoniana* and *Angophora woodsiana*.

All sites are relatively undisturbed and there is a noticeable absence of exotic weed species at all sites.

FIGURE 3.17.1: SIZE CLASS DISTRIBUTION OF *LEUCOPOGON RECURVISEPALUS* POPULATION AT PLUNKETT SITES 1 AND 2.

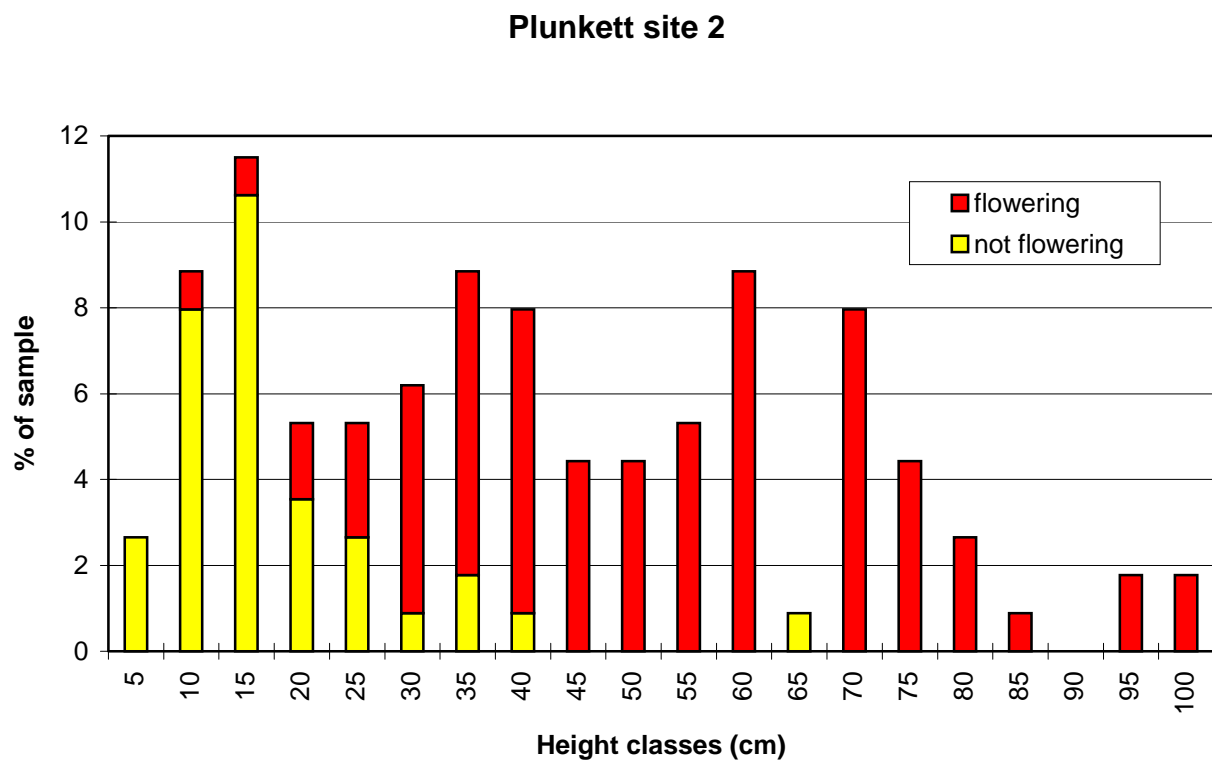
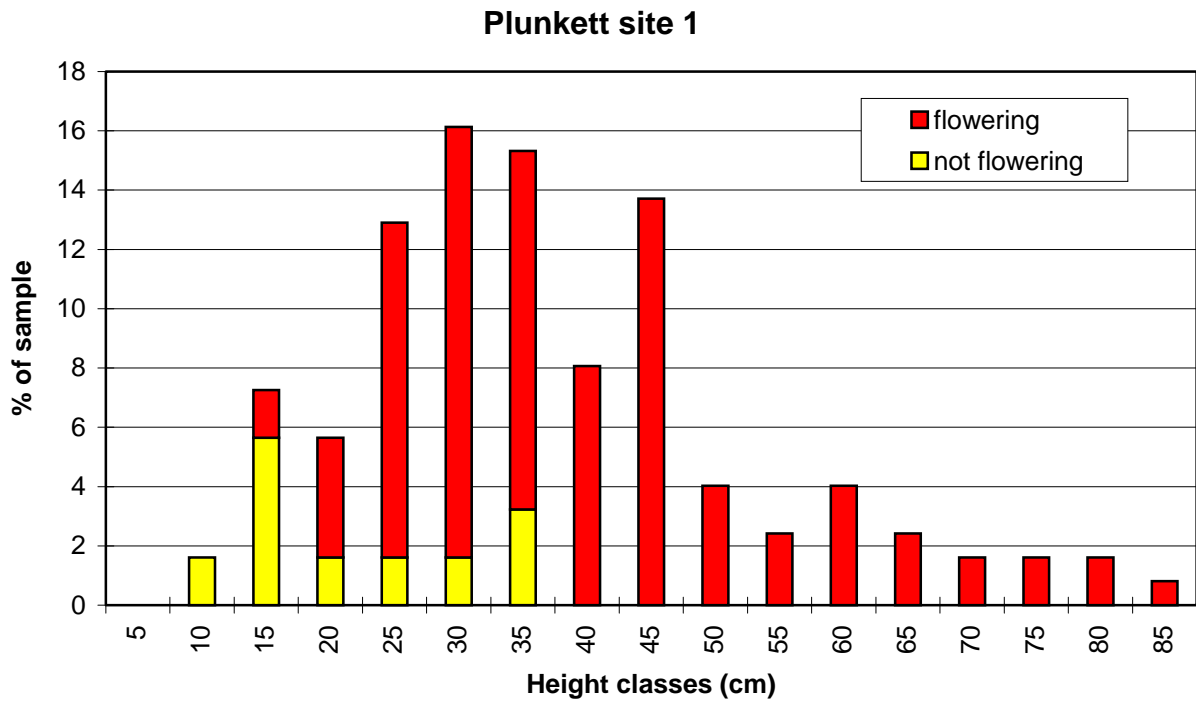
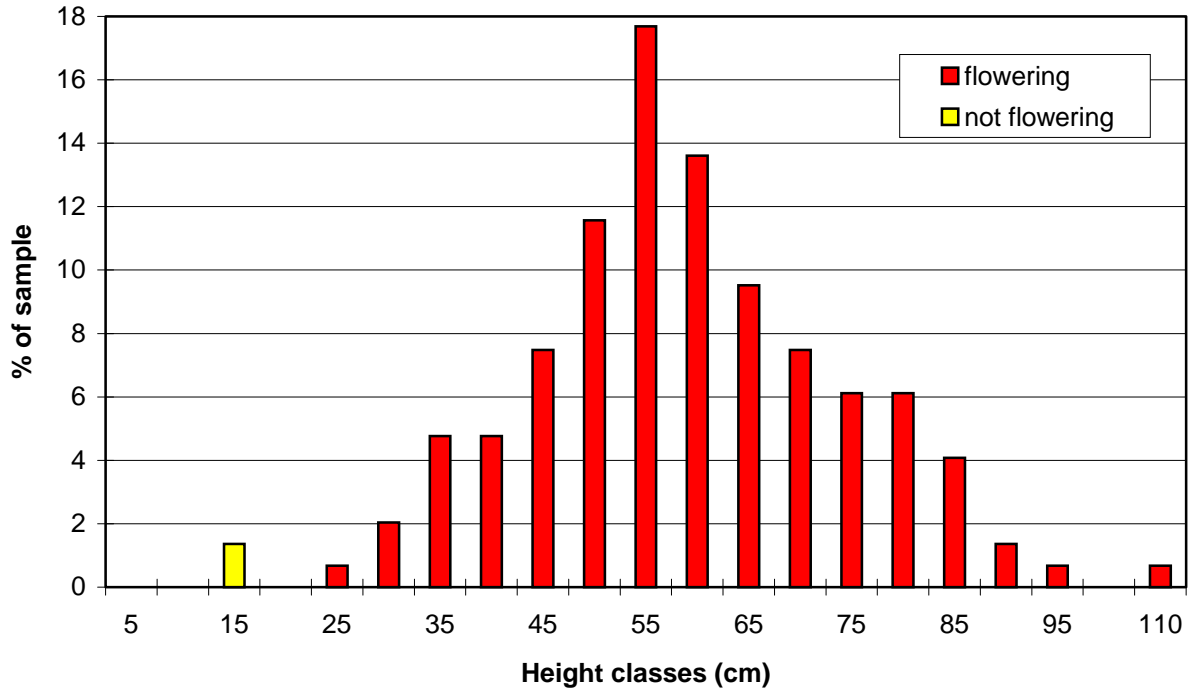
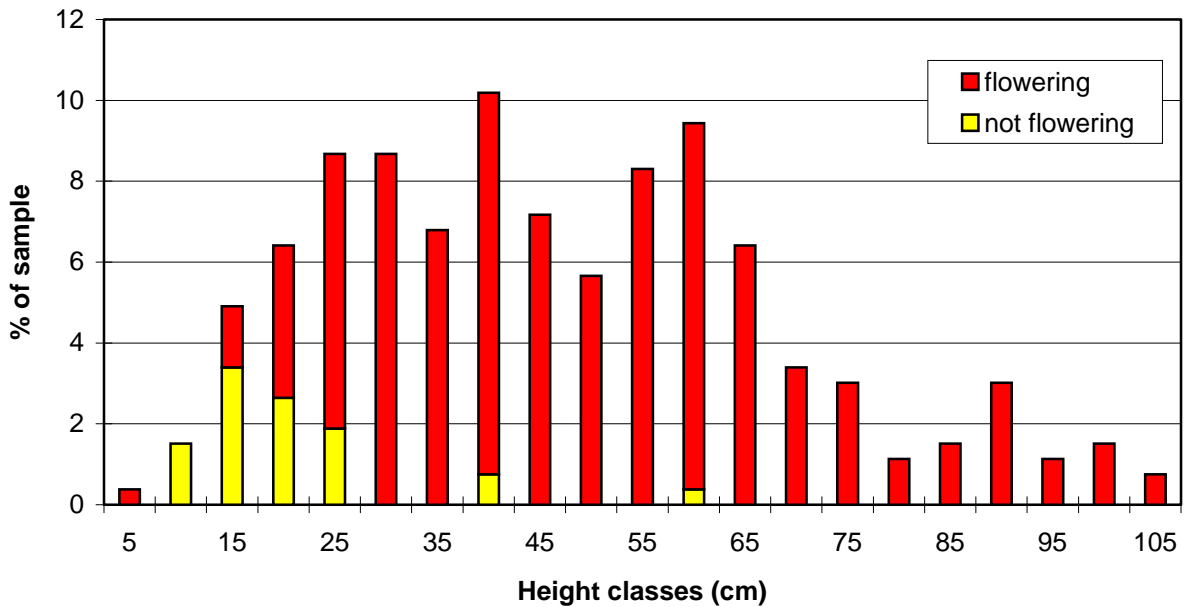


FIGURE 3.17.2: SIZE CLASS DISTRIBUTION OF *LEUCOPOGON RECURVISEPALUS* POPULATION AT MT COOCHIN AND MT MEE SITE 2.

Mt Coochin site



Mt Mee site 2



3.17.6 Life history and ecology

Leucopogon recurvisepalus is a perennial shrub up to 110 cm high. The longevity of individual plants is unknown. The main method of reproduction is by sexually produced seeds.

The bisexual flowers have been reported from June to July in New South Wales (Powell 1992). In Queensland flowering has been observed in January, March, April, June, August and September. It would appear that *L. recurvisepalus* may flower at most times of the year, but the principal flowering season is during August-September. The flowers are small and white. Although no pollinators have been reported or observed it is suspected to be insect pollinated. Each inflorescence has 1, 2 or 3 flowers each with the potential of producing seed. Although the ovary is 5-celled with 1 ovule per cell only single seeded fruit have been observed. The fruits form soon after flowering. The fruit fall from the plant soon after maturing. There does not appear to be any attractant to facilitate animal dispersal. Nothing is known about the germination and viability of seeds. It is believed that the seeds are in a dormant state and there would be an accumulation of seed in the soil.

The response of *L. recurvisepalus* to fire is unknown but it is believed that above-ground parts are fire-sensitive and are killed by fire. Whether the plants are capable of regenerating from rootstock is unknown. It appeared from field observation that the species is not capable of resprouting from the stem base and is dependent on seedling recruitment for its continued existence after fire.

3.17.7 Threats

There appears to be no immediate threats evident to those populations within the areas reserved for conservation or those populations on State Forest areas. The populations that occur on freehold land around Plunkett Conservation Park are threatened by land clearing.

A potential threat to *L. recurvisepalus* would be the application of an inappropriate fire regime to the populations. The lack of knowledge of the species' response to management tools such as fire may lead to the application of a fire regime that is detrimental to the long term survival of the species. The species' response to fire needs to be understood in the long term if successful management techniques are to be developed for the conservation of the species in the wild.

3.17.8 Management, Research and Conservation Measures

For the populations within the conservation reserves and state forest lands appropriate management practices need to be put into place to ensure the long-term survival of *L. recurvisepalus* in the wild. However, at present there is a lack of ecological information about *L. recurvisepalus* which makes it impossible to assess what would be appropriate for the management of the habitat for the long term benefit of the species. Research needs to be undertaken to understand the exact role of fire in the ecology of *L. recurvisepalus*.

For those populations that extend outside the conservation reserve at Plunkett, liaison with land owners and local authorities should be undertaken to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*.

When assessed against the IUCN (1994) criteria for threatened wildlife *L. recurvisepalus* falls into the category of Vulnerable, ie. is facing a high risk of extinction in the wild in the medium-term

future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5).

3.18 MACROZAMIA LOMANDROIDES D.L. JONES

3.18.1 Summary

The natural distribution of *M. lomandroides* is restricted to an area south of Bundaberg between Elliot and Isis Rivers. It covers a range of approximately 35 km and encompasses an area of occurrence of approximately 1000 km². It has been recorded from State Forest and National Parks areas. A total population of *M. lomandroides* was estimated to be between 28, 000 and 39, 000 individuals. The state forest sites are important to the conservation of the species because they represent a large proportion of the presently known populations. Current or perceived threats to the continued survival of *M. lomandroides* are considered to be loss of habitat, illegal removal of seeds, seedlings and mature plants from the wild and inappropriate fire regimes.

3.18.2 Species description and identification

The genus *Macrozamia* is placed in the family Zamiaceae. *Macrozamia* is an Australian endemic genus and consists of approximately 25 species (Jones 1993). It occurs in subtropical and temperate regions with the majority of species in south-eastern Queensland and eastern New South Wales.

Macrozamia lomandroides belongs to the section *Parazamia*. These are generally recognised by their subterranean trunk which have only a few leaves in the crown. The leaves are usually spirally twisted and the leaflets are all similar (ie. the lower leaflets are not reduced to spine-like structures). The leaflets lack mucilage canals.

Macrozamia lomandroides has a nonbranching subterranean stem up to 25 cm diameter with 2 to 6 leaves protruding aboveground forming a sparse, erect to spreading crown. The dull green, mature leaves are 0.3-0.8 m long and hairless except for the woolly base. Each leaf consists of 50-90 leaflets arranged spirally along a central stalk. The stalk is dull, pale green with pale green to cream marginal bands between the bases of the leaflets towards the top of the stalk. The dark green leaflets are thick, leathery, broadly linear to slightly obovate, up to 35 cm long by 9-14 mm wide, shallowly concave in cross-section and with 2-8 small teeth near the tip. The leaflet bases are pale green to cream and slightly thickened. The plants reproduce by cones which are somewhat pineapple-like in appearance. Male and female cones develop on separate plants. Male cones are cylindrical, 12-15 cm long and 4-5 cm diameter. Female cones are ovoid, 12-18 cm long and 7-9 cm in diameter. Seeds are ovoid to oblong, 2.2-2.6 cm long, 1.8-2.2 cm in diameter and orange to red when ripe. For a more detailed description and illustration of this species refer to Jones (1991) and Jones (1993). (see **Plate 10**).

M. lomandroides is related to *M. parcifolia* and *M. pauli-guilielmi* but can be distinguished from them by having generally broader leaflets which are stiff, leathery and held stiffly erect and by the many (usually 2 to 6) sharp teeth on the apex of the leaflets.

3.18.3 Current conservation status

Macrozamia lomandroides is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “Endangered”. The species has been assigned a national conservation status of E (endangered) by ANZECC (1993). It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*.

3.18.4 Distribution and abundance

Details from Queensland Herbarium specimens of *M. lomandroides* are listed in Appendix 1.17. Altogether 13 specimens of *M. lomandroides* have been collected from approximately 7 localities in an area south of Bundaberg between Elliot and Isis Rivers. One other unvouchered locality record has come from the CORVEG database.

The distribution of *M. lomandroides* has a range of approximately 35 km and encompasses an area of occurrence of approximately 1000 km². As far as can be ascertained, the range of this species is natural and is not related to recent human activity. *M. lomandroides* was noted at 21 sites during the current survey within the previously recorded range. Twelve are within State Forest lands, another eight within National Parks and one site is on vacant crown land. Fifteen of the sites were examined in some detail including 6 of the 8 previously known localities. Appendix 2.5 lists the sites examined in the present survey with habitat data recorded for those sites. Detailed locality information is not given. This information is available on request from the Queensland Herbarium. Table 3.18.1 gives estimates of the area of sites and abundance of *M. lomandroides* at each site examined in detail. One of the previous records had imprecise locality information and the other location was not searched for due to time constraints. Another 6 new sites were vouchered but not recorded in detail due to insufficient time available. Five of these sites were within National Parks and one within State Forest.

The total population of *M. lomandroides* was estimated to be between 28, 000 and 39, 000 individuals. Individual populations varied in size from 13 to at least 8300 individuals. Areas of occupancy varied from 1 m² to 2.3 hectares. Twenty of the twenty one sites recorded were in relatively undisturbed habitat, although firebreaks or forestry tracks may dissect most of the populations. At site 12 the population extended through an area of remnant native vegetation into the exotic pine plantation and out onto a 50 m fire break surrounding the plantation (**Plates 14 &15**).

Only a small proportion of the total population examined are within lands set aside for conservation of natural habitat. However, the 5 sites within the National Park lands that were not examined in detail contain a significant number of individuals. From the brief visit to these sites it is “guesstimated” that there are possibly another 10000-20000 individuals within land set aside for conservation than indicated by the data in Table 3.18.1. However, this information does not reduce the importance of those populations within the State Forest areas in terms of value for the conservation of this species.

All populations examined consisted of individuals that generally appear healthy. There was evidence of illegal removal of plants at two sites within the State Forest (sites 2 & 9) (**Plate 11**).

3.18.5 Habitat

The sites are on the gently undulating coastal plain on flats and very gently inclined hillslopes with variable aspects and at elevations between 10-50 m above sea level. The soils are well drained, dark greyish yellow, greyish yellow brown to dark reddish brown, clayey sands to sandy clay loams with a pH 4.8-5.6. The geology is mostly deeply weathered sedimentary rocks of quartzose to sublabilite sandstone, conglomerate, siltstone, mudstone and shale and with some Quaternary alluviums.

The vegetation community is a layered tall open forest (**Plate 13**). The common canopy species are *Corymbia trachyphloia*, *C. intermedia*, *Eucalyptus hallii* and *E. umbra*. Other tree species present included *E. racemosa*, *Angophora leiocarpa* and *Syncarpia glomulifera*. The most frequent mid stratum species included: *E. umbra*, *Xylomelum salicinum*, *Acacia leiocalyx*, *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar*, *Acacia aulacocarpa* and *A. flavescens*. Common shrub and ground cover species included: *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Hibbertia stricta*, *Acacia complanata*, *Entolasia stricta*, *Themeda triandra*, *Acacia leiocalyx*, *Daviesia filipes* and *Lepidosperma laterale*. Other shrub and ground cover species frequently observed were: *Acacia flavescens*, *Gompholobium pinnatum*, *Imperata cylindrica*, *Jacksonia scoparia*, *Persoonia virgata*, *Acacia aulacocarpa*, *Alloteropsis semialata*, *Dianella revoluta*, *Grevillea* sp., *Pimelea linifolia* and *Syncarpia glomulifera* subsp. *glomulifera*.

TABLE 3.18.1. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR MACROZAMIA LOMANDROIDES SITES.

Where abundance was estimated by random transect sampling a mean value and lower and upper 95% confidence limits are given. Populations obtained by direct counts or those visually estimated have no estimate of error associated with them

| Site | Date sampled | lower limit | Population mean | upper limit | Density (plants/m ²) | Area occupied (m ²) | Land tenure |
|--------------|--------------|-------------|-----------------|-------------|----------------------------------|---------------------------------|-------------|
| 1 | 31 Oct 97 | | 200-300 | | | 2 800 | VCL |
| 2 | 30 Oct 97 | | 54 | | 0.14 | 400 | SF |
| 3 | 30 Oct 97 | 626 | 690 | 754 | 0.46 | 1 500 | SF |
| 4 | 29 Oct 97 | 382 | 409 | 432 | 0.09 | 4 400 | SF |
| 5 | 29 Oct 97 | 5 466 | 6 804 | 8 142 | 0.49 | 14 000 | SF |
| 6 | 30 Oct 97 | 162 | 220 | 277 | 0.30 | 740 | SF |
| 7 | 29 Oct 97 | 5 784 | 6 640 | 7 496 | 0.33 | 20 000 | SF |
| 8 | 30 Oct 97 | 485 | 605 | 725 | 0.24 | 2 500 | SF |
| 9 | 30 Oct 97 | 8 305 | 8 775 | 9 245 | 0.39 | 22 500 | SF |
| 10 | 31 Oct 97 | 5 669 | 7 808 | 9 946 | 0.69 | 11 250 | SF |
| 11 | 31 Oct 97 | | 18 | | 18 | 1 | SF |
| 12 | 31 Oct 97 | 837 | 962 | 1 087 | 0.26 | 3 700 | SF |
| 13 | 21 Nov 97 | | 50 | | 0.06 | 800 | NP |
| 14 | 21 Nov 97 | | 13 | | 0.01 | 1 000 | NP |
| 15 | 21 Nov 97 | | 24 | | 0.02 | 1 000 | NP |
| Total | | 28 078 | 33 322 | 38 563 | | 86 591 | |

3.18.6 Life history and ecology

There have been no studies into the biology or autecology of *M. lomandroides*. The majority of the following information is extrapolated from our understanding of other cycads. However, it is also becoming increasingly clear that the reproductive processes and behaviour of different species within the same genus may differ considerably, so that information collected from one species cannot necessarily be extrapolated to another.

M. lomandroides is a dioecious, perennial plant that reproduces by sexually produced seeds. The longevity of the plants is unknown. Estimates of life span of other *Macrozamia* species range from 120 to 1500 years (Benson and McDougall 1993, Pate 1993). Coning has been recorded occurring in *M. lomandroides* from October to November (Jones 1993). From the present survey work undertaken in October and November 1997 the percentage of plants coning in the samples range from 2 to 25 % with a mean of 10 % over all samples (Table 3.18.2). 1.4 times more plants were observed with male cones than female cones. Similar levels of male-biased coning events and low levels of participation in given reproductive episodes have been reported in other species of *Macrozamia* (Ornduff 1993).

The level of reproduction varies greatly from year to year. The factors controlling the level of reproduction are unknown. There are reports suggesting a cyclical nature in the level of reproductive episodes (Jones 1993, Vorster 1995). It is suggested that variable rates of coning will also lead to variable rates of seedling recruitment. The level of survivorship from seed to adult is unknown. Survivorship of *M. riedlei* and *M. communis* has been reported by Connell and Ladd (1993). They observed that only 3-4 % of the seed produced survived to become adults with the greatest mortality occurring from seed germination to seedling stage.

TABLE 3.18.2. DEMOGRAPHIC AND CONING DATA FOR SELECTED SAMPLE SITES OF *MACROZAMIA LOMANDROIDES*.

| Site | Total adults | % adults | juveniles | % juveniles | No. of plants with male cones | No. of plants with female cones | % adults coning | Total plants |
|------|--------------|-------------|-------------|-------------|-------------------------------|---------------------------------|-----------------|--------------|
| 3 | 136 | 59.1 | 94 | 40.9 | 14 | 8 | 16.2 | 230 |
| 4.1 | 15 | 33.3 | 30 | 66.7 | 2 | 1 | 20.0 | 45 |
| 4.2 | 32 | 66.7 | 16 | 33.3 | 8 | 0 | 25.0 | 48 |
| 5.1 | 197 | 54.9 | 162 | 45.1 | 6 | 9 | 7.6 | 359 |
| 5.2 | 49 | 33.3 | 98 | 66.7 | 5 | 2 | 14.3 | 147 |
| 5.3 | 88 | 39.5 | 135 | 60.5 | 11 | 10 | 23.9 | 223 |
| 6 | 35 | 39.3 | 54 | 60.7 | 2 | 1 | 8.6 | 89 |
| 7 | 105 | 63.3 | 61 | 36.7 | 2 | 2 | 3.8 | 166 |
| 8 | 62 | 51.2 | 59 | 48.8 | 6 | 6 | 19.4 | 121 |
| 9.1 | 142 | 77.2 | 42 | 22.8 | 9 | 4 | 9.2 | 184 |
| 9.2 | 130 | 64.0 | 73 | 36.0 | 0 | 2 | 1.5 | 203 |
| 10 | 197 | 56.8 | 150 | 43.2 | 2 | 2 | 2.0 | 347 |
| 12 | 96 | 73.8 | 34 | 26.2 | 8 | 6 | 14.6 | 130 |
| 13 | 39 | 78.0 | 11 | 22.0 | 5 | 4 | 23.1 | 50 |
| | 1323 | 56.5 | 1019 | 43.5 | 80 | 57 | 10.4 | 2342 |

Traditionally cycads have been thought to be wind-pollinated (Chamberlain 1935), but evidence has been mounting that most cycad species are in fact pollinated by insects, specifically by beetles (Tang 1987, Norstog and Fawcett 1995). Forster *et al.* (1994) reported a number of Coleoptera, Hymenoptera and Thysanoptera in association with reproductive structures of *Macrozamia* species including *M. lomandroides*.

Seeds of *M. lomandroides* mature from March to April in the year following coning (Jones 1993). The seeds have a red to orange fleshy outer layer and fall from the cone at maturity. It has been reported that the fleshy outer layer attracts animals which feed on this fleshy tissue and secondarily disperse the seed. Possums, kangaroos, wallabies and rodents have been reported as dispersal agents of *Macrozamia* species (Jones 1993). However, from present field observations it would appear that most seeds are not dispersed far from the parent plant.

The seeds of most cycad species will not germinate immediately on maturity, for the embryo requires an after-ripening period (Jones 1993). *M. communis* and *M. riedlei* are reported to require 10-13 months before germination will occur (Ladd and Connell 1995). The seed of *M. lomandroides* requires approximately 6 to 12 months before it will germinate (Forster pers. comm.). The length of time that the seeds of *M. lomandroides* retain their viability is unknown. It is reported that under controlled storage conditions seeds of other *Macrozamia* species will retain their viability for many months (Jones 1993). Under field conditions it is suspected that seed would not stay viable for more than 6-12 months.

As germination occurs the micropylar end of the hard seed coat is ruptured by the emerging radicle, which turns down into the soil and grows rapidly. The greater part of the cotyledons remain inside the seed on the soil surface, absorbing all of the endosperm and transferring the food resources into the young root and developing underground stem of the seedling. Usually only one leaf appears initially at the soil surface some months after germination. The time from coning to the establishment of a juvenile with a single leaf is estimated to be 2 years. The length of time taken from seed germination to maturity is unknown. The time taken for cultivated cycads to reach maturity ranges from 2 to 30 years (Jones 1993).

From field observations it is suggested that seeds and the early stages of the seedling development are fire-sensitive. The time required before the seedling can tolerate fire is unknown. Mature plants are not greatly affected by fire. The destruction of the leaves above-ground occurs but the important growing tip is protected below ground level. There are some suggestions that some cycads may benefit from periodic exposure to fire (Zunckel 1995). It was observed during the present survey that in recently burnt areas *M. lomandroides* was quick to recover and was usually the first species in its habitat to produce new growth after fire (**Plate 12**).

General field observations during the present survey were that coning levels were comparable in burnt and unburnt areas. It is suggested that fire may promote coning and the production of seed but does not appear to be an essential requirement for coning to occur.

3.18.7 Threats

In the light of the field survey and from consultation with others, current or perceived threats to the continued survival of *M. lomandroides* are considered to be:

Loss of habitat: There can be no doubt that past habitat alienation, for agriculture and exotic pine plantations in the species' narrow geographical range has led to a decline in populations in the past. With a large proportion of the population occurring on State Forest lands of low commercial timber values and Vacant Crown Land there is still a potential threat of conversion of habitat to agricultural or forestry production or other uses that could be detrimental for the populations.

Illegal removal of seeds, seedlings and mature plants from the wild: There was clear evidence of continuing pressure on wild populations through the illegal removal of plants from the wild. Site 2 was one the largest known populations in the past of several hundred individuals (Forster pers. comm.). During the present survey only 54 plants were recorded at the site and there was evidence of recent extractions of plants from the site (**Plate 11**). The proximity of all populations to tracks and roads makes them potentially threatened by the illegal removal of plants.

Inappropriate fire regime: Mature *Macrozamia*s generally cope very well with fire and as pointed out earlier may benefit from periodic exposure to fire. However, fire can certainly effect the recruitment of new individuals because the seeds and young seedlings of *M. lomandroides* are fire-sensitive. Too frequent a fire regime would certainly lead to a gradual decline in the population as mature plants became senescent and there was a lack of recruitment of new plants. The consequences of repeated burning over a long time on the invertebrate pollinators are also unknown.

M. lomandroides grows at a number of sites with *Eucalyptus hallii*, another endangered species. Erskine (1992) observed a correlation between the level and extent of soil waterlogging and the distribution of *E. hallii* within its restricted range. It could be speculated that the soil hydrology

may also be significant in the distribution of *M. lomandroides* in the region. If so, changes in soil hydrology through irrigation or drainage of areas may effect the capability of this species to survive.

3.18.8 Management, Research and Conservation Measures

The protection of the remaining natural vegetation in the state forest lands should be pursued through either declaration of a State Forest Scientific Area under the *Forestry Act 1959* or by converting the land to a conservation reserve.

Eight populations were observed to be within conservation reserves. Three of the populations are small with less than 50 plants in each population. The remaining five populations were visually estimated to contain several thousand individuals in each population. These populations need to be assessed.

To reduce the illegal removal of plants and propagules of *M. lomandroides* from the wild, locality information of populations should not be supplied to persons who do not have appropriate permits from Department of Environment and Department of Primary Industries. Current legislation to prevent illegal collection of threatened species from the wild needs to be enforced.

During the present survey one stand of *M. lomandroides* was observed within an area planted with exotic pines. It is unlikely that these individuals of *M. lomandroides* will survive in the long term in these areas. Investigations should be undertaken into the possibility of salvaging these individuals.

There is little information available on the role of fire in the ecology and reproductive biology of *M. lomandroides*. This needs to be understood if successful management techniques are to be developed for the conservation of the species in the wild. Research into the effect of fire on coning and seedling survival is required. It is speculated that levels and extent of waterlogging may be significant in the survival of the species. The relationship between soil hydrology and the local distribution of *M. lomandroides* should be established.

Macrozamia lomandroides when assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Vulnerable, ie. is facing a high risk of extinction in the wild in the near future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²). The present status of Endangered for *M. lomandroides* should be reconsidered in the light of the present data available.

3.19 MACROZAMIA PARCIFOLIA P.I. FORST. & D.L. JONES

3.19.1 Summary

The distribution of *M. parcifolia* is restricted to an area in the Maryborough - Biggenden district. It covers a range of approximately 60 km and encompasses an area of occurrence of approximately 1500 km². It has been recorded from State Forest, National Park, freehold land and road verges. A total population of *M. parcifolia* was estimated to be between 16,500 and 18,000 individuals. The state forest sites are important to the conservation of the species because they represent the largest proportion of the presently known populations. Current or perceived threats to the continued survival of *M. parcifolia* are considered to be illegal removal of seeds, seedlings and mature plants from the wild, loss of habitat and inappropriate fire regimes.

3.19.2 Species description and identification

The genus *Macrozamia* is placed in the family Zamiaceae. *Macrozamia* is an Australian endemic genus and consists of approximately 25 species (Jones 1993). It occurs in subtropical and temperate regions with the majority of species in south-eastern Queensland and eastern New South Wales.

Macrozamia parcifolia belongs to the section *Parazamia*. These are generally recognised by their subterranean trunk which have only a few leaves in the crown. The leaves are usually spirally twisted and the leaflets are all similar (ie. the lower leaflets are not reduced to spine-like structures). The leaflets lack mucilage canals.

Macrozamia parcifolia has a nonbranching subterranean stem 10-20 cm diameter with 1 to 4 leaves protruding aboveground forming a sparse crown. Mature leaves are 65-95 cm long and hairless except for the woolly base. Each leaf consists of numerous leaflets arranged spirally along a central stalk. The stalk is dark green with greenish-white markings between the bases of the leaflets. The very narrow linear leaflets are 15-40 cm long by 1-3 mm wide, dark green above, bright green beneath and are strongly concave in cross-section. The leaflet bases are greenish-white and slightly thickened. The plants reproduce by cones which are somewhat pineapple-like in appearance. Male and female cones develop on separate plants. Male cones are cylindrical, 7-14 cm long and 2.5-4 cm diameter. Female cones are ovoid to ovoid-cylindrical, 8-14 cm long and 4-6 cm in diameter. Seeds are ovoid to oblong, 1.7-2.5 cm long, 1.5-2.0 cm in diameter and orange to red when ripe. For a more detailed description of this species refer to (Jones & Forster 1994) (see **Plate 16**).

M. parcifolia is related to *M. pauli-guilielmi* but can be distinguished from this species by having generally narrower, thinner-textured, darker green leaflets which are attached to the rachis at a steeper angle. In addition the leaves of *M. parcifolia* have an untidy and wispy appearance.

3.19.3 Current conservation status

Macrozamia parcifolia is presently listed under the name *Macrozamia* sp. (Biggenden P.I. Forster+ PIF12301B) on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*. The species has not been assigned a national conservation status by ANZECC (1993).

3.19.4 Distribution and abundance

Details from Queensland Herbarium specimens of *M. parcifolia* are listed in Appendix 1.18. A total of 14 specimens of *M. parcifolia* have been collected from approximately 7 localities in the Biggenden district.

The distribution of *M. parcifolia* has a range of approximately 60 km and encompasses an area of occurrence of approximately 1500 km². As far as can be ascertained, the range of this species is natural and is not related to recent human activity. *M. parcifolia* was observed at 23 sites during the current survey within the previously recorded range. Twenty were located within state forests, one within a conservation reserve, one on freehold land, and one on road reserve and freehold land. Another population has been reported on freehold land but was not examined during the current survey (C. Lancaster pers. comm.). Nineteen of the sites were examined in some detail including 4 of the 7 previously known localities. Appendix 2.6 lists the sites examined in the present survey with habitat data recorded for those sites. Detailed locality information is not given. This

information is available on request from the Queensland Herbarium. Table 3.19.1 gives estimates of the area and abundance of *M. parcifolia* at each site examined in detail. Three of the previously recorded localities were searched for unsuccessfully. Another four new sites were vouchered but not recorded in detail due to insufficient time available. All four sites are within state forests.

The total population of *M. parcifolia* was estimated to be between 16500 and 18000 individuals. Individual populations varied in size from 5 to at least 3600 individuals. Areas of occupancy varied from 0.4 to 8 hectares. Only a small proportion (4 %) of the total population examined is within lands set aside for conservation of natural habitat. The majority of the population (79 %) observed is within state forests. Twelve of the 20 sites recorded in state forest areas have had timber harvesting carried out in the surrounding compartment at least once since 1956.

All populations examined consisted of individuals that appear generally healthy.

3.19.5 Habitat

The sites are on undulating to steep low hills on hillcrests and very gently to moderately inclined hillslopes with variable aspect and at elevations between 100-220 m above sea level. The soils are generally well drained, brown, dull reddish brown to brownish black, loamy sand, sandy loam to light clay with pH 4.8-6.0 and occasionally stony. The geology is mostly the Brooweena formation with sedimentary rocks of quartzose to sublible sandstone, conglomerate, siltstone, mudstone and shale.

The vegetation community is a layered very tall to tall open forest. The common canopy species are *Eucalyptus acmenoides*, *Corymbia citriodora*, *Angophora leiocarpa*, *E. fibrosa*, *C. trachyphloia* and *E. crebra*. Other tree species occasionally present included

TABLE 3.19.1. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR MACROZAMIA PARCIFOLIA SITES.

Where abundance was estimated by transect sampling a mean value and lower and upper 95% confidence limits and are given. Populations obtained by direct counts or those visually estimated have no estimate of error associated with them. SF = state forest; RR = road reserve; F = freehold; NP = national park.

| Site | Date sampled | Population | | | Density | Land tenure | Area occupied (m ²) |
|------|--------------|-------------|-------|-------------|---------|-------------|---------------------------------|
| | | lower limit | mean | upper limit | | | |
| 1 | 30 Sep 97 | | 269 | | | SF | 45 000 |
| 2 | 28 Sep 97 | 298 | 310 | 322 | 0.03 | SF | 10 000 |
| 3 | 2 Oct 97 | 1 090 | 1 200 | 1 310 | 0.12 | SF | 10 000 |
| 4 | 2 Oct 97 | 2 919 | 3 075 | 3 231 | 0.10 | SF | 30 000 |
| 5 | 2 Oct 97 | | 5 | | | SF | 2 500 |
| 8 | 2 Oct 97 | 1 226 | 1 320 | 1414 | 0.13 | SF | 10 000 |
| 9 | 1 Oct 97 | | 65 | | | SF | 4 800 |
| 10 | 1 Oct 97 | | 9 | | | SF | 400 |
| 11 | 23 Oct 97 | 3 276 | 3 360 | 3 444 | 0.04 | SF | 80 000 |
| 12 | 28 Oct 97 | 3 675 | 3 760 | 3 845 | 0.09 | SF | 40 000 |
| 14 | 30 Sep 97 | | 43 | | | SF | 40 000 |
| 16 | 2 Oct 97 | | 42 | | | SF | 10 000 |
| 17 | 2 Oct 97 | | 194 | | | SF | 10 000 |
| 18 | 2 Oct 97 | | 9 | | | SF | 2 500 |
| 19 | 2 Oct 97 | | 29 | | | SF | 10 000 |
| 20 | 3 Oct 97 | | 25 | | | SF | 2 000 |
| 21 | 30 Sep 97 | | 22 | | | RR;F | 2 400 |
| 22 | 23 Oct 97 | 2 625 | 2 780 | 2 935 | 0.14 | F | 20 000 |

| | | | | | | | |
|----|-----------|--------|--------|--------|------|----|---------|
| 23 | 23 Oct 97 | 721 | 754 | 786 | 0.10 | NP | 7 850 |
| | | 16 542 | 17 280 | 17 999 | | | 337 450 |

Eucalyptus exserta, *E. major*, *Lophostemon confertus*, *Corymbia intermedia* and *E. longirostrata*. The most frequent mid stratum species included: *Lophostemon confertus*, *Acacia aulacocarpa* and *Eucalyptus* saplings. Common shrub and ground cover species included: *Acacia leiocalyx*, *Lophostemon confertus*, *Xanthorrhoea latifolia*, *Acacia aulacocarpa*, *Aristida* spp., *Jacksonia scoparia*, *Acrotriche aggregata*, *Lepidosperma laterale*, *Themeda triandra*, *Jacksonia scoparia*, *Cymbopogon refractus* and *Hardenbergia violacea*. Other shrub and ground cover species present included: *Chrysocephalum apiculatum*, *Acacia complanata*, *Cleistochloa subjuncea*, *Imperata cylindrica*, *Acacia leiocalyx*, *Entolasia stricta*, *Dianella revoluta*, *Lantana camara**, *Pultenaea spinosa*, *Acacia bancroftii*, *Acacia falcata*, *Acacia fimbriata*, *Acacia penninervis* subsp. *penninervis*, *Alphitonia excelsa*, *Persoonia sericea*, *Podolobium scandens*, *Sida subspicata*, *Eragrostis brownii*, *Macrozamia mountperriensis*, *Acacia conferta*, *Goodenia rotundifolia* and *Lomandra longifolia*.

3.19.6 Life history and ecology

There have been no studies into the biology or autecology of *M. parcifolia*. The majority of the following information is extrapolated from our understanding of other cycads. However, it is also becoming increasingly clear that the reproductive processes and behaviour of different species within the same genus may differ considerably, so that information collected from one species cannot necessarily be extrapolated to another.

M. parcifolia is a dioecious, perennial plant that reproduces by sexually produced seeds. The longevity of the plants is unknown. Estimates of life span of other *Macrozamia* species range from 120 to 1500 years (Benson and McDougall 1993, Pate 1993). Coning has been recorded occurring in *M. parcifolia* from October to January (Jones and Forster 1994). From the present survey work undertaken in October 1997 the percentage of plants coning in the samples range from 1 to 19 % with a mean of 3.9 % over all samples (Table 3.19.2). Twice as many plants were observed with male cones than female cones. Similar levels of male-biased coning events and low levels of participation in given reproductive episodes have been reported in other species of *Macrozamia* (Ornduff 1993).

The level of reproduction varies greatly from year to year. The factors controlling the level of reproduction are unknown. There are reports suggesting a cyclical nature in the level of reproductive episodes (Jones 1993, Vorster 1995). It is suggested that variable rates of coning will also lead to variable rates of seedling recruitment. The level of survivorship from seed to adult is unknown. Survivorship of *M. riedlei* and *M. communis* has been reported by Connell and Ladd (1993). They observed that only 3-4 % of the seed produced survived to become adults with the greatest mortality occurring from seed germination to seedling stage.

TABLE 3.19.2. DEMOGRAPHIC AND CONING DATA FOR SELECTED SAMPLE SITES OF *MACROZAMIA PARCIFOLIA*.

| Site | Total adults | % adults | juveniles | % juveniles | No. of plants with male cones | No. of plants with female cones | % adults coning | Total plants |
|------|--------------|----------|-----------|-------------|-------------------------------|---------------------------------|-----------------|--------------|
| 1 | 238 | 88.5 | 31 | 11.5 | 5 | 0 | 1.86 | 269 |
| 2 | 31 | 100.0 | 0 | 0.0 | 5 | 1 | 19.35 | 31 |
| 3 | 120 | 50.0 | 120 | 50.0 | 1 | 1 | 0.83 | 240 |
| 8 | 133 | 50.4 | 131 | 49.6 | 8 | 5 | 4.92 | 264 |

| | | | | | | | | |
|---------------|------------|-------------|------------|-------------|-----------|-----------|-------------|--------------|
| 12 | 82 | 87.2 | 12 | 12.8 | 1 | 0 | 1.06 | 94 |
| 22 | 349 | 83.5 | 69 | 16.5 | 14 | 10 | 5.74 | 418 |
| Totals | 953 | 72.4 | 363 | 27.6 | 34 | 17 | 3.88 | 1 316 |

Traditionally cycads have been thought to be wind-pollinated (Chamberlain 1935), but evidence has been mounting that most cycad species are in fact pollinated by insects, specifically by beetles (Tang 1987, Norstog and Fawcett 1995). Forster *et al.* (1994) reported a number of Coleoptera, Hymenoptera and Thysanoptera in association with reproductive structures of *Macrozamia* species.

Seeds of *M. parcifolia* mature from February to April (Jones and Forster 1994). The seeds have a red to orange fleshy outer layer and fall from the cone at maturity. It has been reported that the fleshy outer layer attracts animals which feed on this fleshy tissue and secondarily disperse the seed. Possums, kangaroos, wallabies and rodents have been reported as dispersal agents for *Macrozamia* species (Jones 1993). However, from present field observations it would appear that most seeds are not dispersed far from the parent plant.

The seeds of most cycad species will not germinate immediately on maturity, for the embryo requires an after-ripening period (Jones 1993). *M. communis* and *M. riedlei* are reported to require 10-13 months before germination will occur (Ladd and Connell 1995). The seed of *M. parcifolia* requires approximately 6-12 months before it will germinate (Forster pers. comm.). The length of time that the seeds of *M. parcifolia* retain their viability is unknown. It is reported that under controlled storage conditions seeds of other *Macrozamia* species will retain their viability for many months (Jones 1993). Under field conditions it is suspected that seed would not stay viable for more than 6-12 months.

As germination occurs the micropylar end of the hard seed coat is ruptured by the emerging radicle, which turns down into the soil and grows rapidly. The greater part of the cotyledons remain inside the seed on the soil surface, absorbing all of the endosperm and transferring the food resources into the young root and developing underground stem of the seedling. Usually only one leaf appears initially at the soil surface some months after germination. The time from coning to the establishment of a juvenile with a single leaf is estimated to be 2 years. The length of time taken from seed germination to maturity is unknown. The time taken for cultivated cycads to reach maturity ranges from 2 to 30 years (Jones 1993).

From field observations it is suggested that seeds and the early stages of the seedling development are fire-sensitive. The time required before the seedling can tolerate fire is unknown. Mature plants are not greatly affected by fire. The destruction of the leaves above-ground occurs but the important growing tip is protected below ground level. There are some suggestions that some cycads may benefit from periodic exposure to fire (Zunckel 1995). It was observed during the present survey that in recently burnt areas recently burnt *M. parcifolia* was quick to recover and was usually the first species in the habitat to produce new growth after fire. It would appear that if the growing apex is not killed by fire or destroyed by physical disturbance then *M. parcifolia* can regenerate (**Plate 18 & 19**).

3.19.7 Threats

There is no quantitative data to indicate that populations of *M. parcifolia* are presently declining. However, in the light of the field survey and from consultation with others, current or perceived threats to the continued survival of *M. parcifolia* are considered to be:

Loss of habitat: There can be no doubt that past habitat alienation, for agriculture and road development in the species' narrow geographical range has led to a decline in populations in the past. For those populations on freehold land and road reserves the loss of habitat is a continuing issue.

Leaves and fruits of cycads are poisonous to domestic stock if ingested. Most graziers in the past have taken measures to eradicate cycads from areas where domestic stock graze. Those populations surviving in areas grazed by stock are still threatened by such land management practices.

Illegal removal of seeds, seedlings and mature plants from the wild: Cycads world-wide have become extremely desirable plants to collect. The proximity of known populations to tracks and roads makes them potentially threatened by illegal removal if the locations of the populations are generally known.

Inappropriate fire regime: Mature *Macrozamia*s generally cope very well with fire and as pointed out earlier may benefit from periodic exposure to fire. However, fire can certainly affect the recruitment of new individuals because the seeds and young seedlings of *M. parcifolia* are fire-sensitive. Too frequent a fire regime would certainly lead to a gradual decline in the population as mature plants became senescent and there was a lack of recruitment of new plants. The impact of present Department of Primary Industries, Forestry fire management on the ability of *M. parcifolia* to maintain a sustainable population level is unknown. The consequences of repeated burning over a long time on the invertebrate pollinators are also not known.

3.19.8 Management, Research and Conservation Measures

The majority of the presently known population is within State Forest lands which make this area important in the conservation of the species. Appropriate management guidelines should be prepared in relation to areas within State Forest. Individual mature plants can survive habitat disturbance caused by timber harvesting, however the long term impact of timber harvesting in the habitat on this species is unknown. Research is required into the effects of current management of the habitat. Fire is an important management tool in forested areas. There is little information available on the role of fire in the ecology and reproductive biology of *M. parcifolia*. This needs to be understood if successful management techniques are to be developed for conservation of the species in the wild. Research into the effect of fire on coning and seedling survival is required.

To reduce the illegal removal of plants and propagules of *M. parcifolia* from the wild, locality information of populations should not be supplied to persons who do not have appropriate permits from Department of Environment and Department of Primary Industries. Current legislation to prevent illegal collection of threatened species from the wild needs to be enforced.

M. parcifolia when assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of vulnerable, ie. is facing a high risk of extinction in the wild in the medium-term future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²). The present status of Vulnerable for *M. parcifolia* is considered appropriate.

3.20 MACROZAMIA PAULI-GUILIELMI W. HILL & F. MUELL.

3.20.1 Summary

The distribution of *M. pauli-guilielmi* is restricted to an area between Bundaberg and Kin Kin. It covers a range of approximately 130 km and encompasses an area of occurrence of approximately 2400 km². It has been recorded from State Forest, National Park and freehold land. A total population of *M. pauli-guilielmi* was estimated to be between 10,000 and 14,000 individuals. The state forest sites are important to the conservation of the species because they represent a large proportion of the presently known populations. Current or perceived threats to the continued survival of *M. pauli-guilielmi* are considered to be loss of habitat, illegal removal of seeds, seedlings and mature plants from the wild and inappropriate fire regimes.

3.20.2 Species description and identification

The genus *Macrozamia* is placed in the family Zamiaceae. *Macrozamia* is an Australian endemic genus and consists of approximately 25 species (Jones 1993). It occurs in subtropical and temperate regions with the majority of species in south-eastern Queensland and eastern New South Wales.

Macrozamia pauli-guilielmi belongs to the section *Parazamia*. These are generally recognised by their subterranean trunk which have only a few leaves in the crown. The leaves are usually spirally twisted and the leaflets are all similar (ie. the lower leaflets are not reduced to spine-like structures). The leaflets lack mucilage canals.

Macrozamia pauli-guilielmi has a nonbranching subterranean stem up to 20 cm diameter with 1 to 7 leaves protruding aboveground forming a sparse crown. Mature leaves are 0.5-1.2 m long and hairless except for the woolly base. Each leaf consists of 140-200 leaflets conspicuously arranged spirally along a central stalk. The leaflets are narrowly linear, measure 15-35 cm long by 2-4 mm wide, and are a dark, dull green above, yellowish underneath and shallowly concave in cross-section. The ends of the leaflets are spreading to weeping, the leaflet bases are white and conspicuously thickened. The plants reproduce by cones which are somewhat pineapple-like in appearance. Male and female cones develop on separate plants. Male cones are cylindrical, 10-20 cm long and 4-6 cm diameter. Female cones are ovoid to barrel-shaped, 8-15 cm long and 6-8 cm in diameter. Seeds are ovoid to oblong, 2-2.5 cm long, 1.5-2.0 cm in diameter and orange to red when ripe. For a more detailed description and illustration of this species refer to Jones (1993).

M. pauli-guilielmi is related to *M. parcifolia* and *M. lomandroides*. *M. pauli-guilielmi* can be distinguished from *M. parcifolia* by having generally broader, thicker-textured, leaflets, which are attached to the rachis at a broader angle. *M. pauli-guilielmi* can be distinguished from *M. lomandroides* by having generally narrower, thinner textured leaflets which are generally weakly ascending to erect and which lack sharp teeth on the apex.

3.20.3 Current conservation status

Macrozamia pauli-guilielmi is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “endangered”. It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*. The species has not been assigned a national conservation status by ANZECC (1993).

3.20.4 Distribution and abundance

Details from Queensland Herbarium specimens of *M. pauli-guilielmi* are listed in Appendix 1.19. Altogether 27 herbarium specimens of *M. pauli-guilielmi* have been collected from approximately 14 localities in coastal areas from Bundaberg and Kin Kin. Eight of the records have insufficient information to relocate the collection sites. Another seven unvouchered localities have been noted on CORVEG data.

M. pauli-guilielmi was observed at 19 sites during the current survey within the previously recorded range. Six of the sites observed had not been previously recorded. Seventeen of the sites were examined in some detail. Appendix 2.7 lists the sites examined in the present survey with habitat data recorded for those sites. Detailed locality information is not given. This information is available on request from the Queensland Herbarium. Table 3.20.1 gives estimates of the area of occupancy and abundance of *M. pauli-guilielmi* at each site.

The distribution of *M. pauli-guilielmi* has a range of approximately 130 km and encompasses an area of occurrence of approximately 2400 km². As far as can be ascertained, the range of this species is natural and is not related to recent human activity. The total population of *M. pauli-guilielmi* was estimated to be between 10,000 and 14,000 individuals. Individual populations varied in size from 2 to at least 4300 individuals. Areas of occupancy varied from 0.01 to 8 hectares. Twenty of the twenty one sites recorded were in relatively undisturbed habitat.

Only a small proportion of the total population examined is within areas set aside for conservation of natural habitat. However, there are another 4 previously recorded sites that are within areas gazetted for conservation purposes. Currently there are no population details for these sites. Three sites occur in State Forest Scientific Areas. These were the largest populations examined during the current survey, consisting of 65 % of the total number of individuals observed. A number of small populations of *M. pauli-guilielmi* were observed within areas planted with exotic pines. The *M. pauli-guilielmi* individuals were mature and appeared to be remnants from the original vegetation prior to the pine plantation being planted (**Plate 20 & 23**). Other populations of *M. pauli-guilielmi* have recently been observed on freehold land in the vicinity of Tinana Creek (J. Brushe, pers. comm.).

All populations examined consisted of individuals that appear generally healthy.

3.20.5 Habitat

The sites are on gently undulating plains to low hills on hillcrests, very gently to moderately inclined hillslopes and levees with variable aspect and at elevations between 10-100 m above sea level. The soils are generally well drained, greyish yellow to very dark reddish brown, or brownish black, sands, loamy sands, sandy loam to light clay with pH 4.9-5.9 and occasionally stony. The geology is mostly sedimentary rocks from Duckinwilla Group, Kin Kin Beds, Burrum Coal Measures and Myrtle Creek Sandstones, and Quaternary alluviums.

The vegetation community is a layered very tall to tall open forest (**Plate 22**). The common canopy species are *Corymbia intermedia*, *Eucalyptus racemosa*, *C. citriodora*, *Angophora leiocarpa* and *E. acmenoides*. Other tree species occasionally present included: *C. trachyphloia*, *E. crebra*, *E. major*, *E. fibrosa*, *E. umbra*, *E. microcorys*, *E. pilularis*, *E. siderophloia*, *E. tindaliae* and *Lophostemon confertus*. The most frequent mid stratum species included: *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar*, *Alphitonia excelsa* and *Acacia aulacocarpa*. Common shrub and

ground cover species included: *Themeda triandra*, *Acacia aulacocarpa*, *Entolasia stricta*, *Imperata cylindrica*, *Aristida* spp., *Acacia leiocalyx*, *Jacksonia scoparia*, *Lepidosperma laterale*, *Xanthorrhoea johnsonii* and *Xanthorrhoea latifolia*. Other shrub and ground cover species present included: *Acrotriche aggregata*, *Banksia oblongifolia*, *Cymbopogon refractus*, *Desmodium rhytidophyllum*, *Hakea plurinervia*, *Alphitonia excelsa*, *Cleistochloa subjuncea*, *Daviesia umbellulata*, *Geitonoplesium cymosum*, *Leptospermum trinervium*, *Lomatia silaifolia*, *Monotoca scoparia*, *Persoonia virgata*, *Daviesia ulicifolia*, *Gompholobium pinnatum* and *Lomandra multiflora*.

TABLE 3.20.1. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR MACROZAMIA PAULI-GUILIELMI SITES.

Where abundance was estimated by transect sampling a mean value and lower and upper 95% confidence limits and are given. Populations obtained by direct counts or those visually estimated have no estimate of error associated with them. SA, SF = scientific area in state forest; SF = state forest; NP = national park; VCL = vacant crown land.

| Site | Date surveyed | Population | | | Density | Land tenure | Area occupied (m ²) |
|------|---------------|-------------|--------|-------------|---------|-------------|---------------------------------|
| | | lower limit | mean | upper limit | | | |
| 1 | 3 Oct 97 | | 105 | | | SF | 30 000 |
| 2 | 3 Oct 97 | | 2 | | | SF | 314 |
| 3 | 9 Oct 97 | | 23 | | | SF | 314 |
| 4 | 9 Oct 97 | | 106 | | | NP | 5 000 |
| 5 | 20 Oct 97 | | 2 | | | SF | 100 |
| 6 | 27 Oct 97 | 4 321 | 5 120 | 5 919 | 0.06 | SA, SF | 80 000 |
| 7 | 22 Oct 97 | | 158 | | | SF | 25 000 |
| 8 | 22 Oct 97 | | 214 | | | SF | 2 500 |
| 9 | 22 Oct 97 | | 10 | | | SF | 10 000 |
| 10 | 22 Oct 97 | 3 220 | 3 600 | 3 980 | 0.04 | SF | 100 000 |
| 11 | 22 Oct 97 | 909 | 1 224 | 1 539 | 0.05 | SA, SF | 24 000 |
| 12 | 24 Oct 97 | 1 832 | 1 950 | 2 068 | 0.13 | SA, SF | 15 000 |
| 13 | 24 Oct 97 | | 42 | | | SF | 750 |
| 14 | 3 Oct 97 | | 126 | | | SF | 20 000 |
| 15 | 3 Oct 97 | | 20 | | | SF | 15 000 |
| 16 | 21 Oct 97 | | 15 | | | SF | 78 |
| 17 | 31 Oct 97 | | 105 | | | VCL | 1 023 |
| | | 10 282 | 12 822 | 13 506 | | | 329 079 |

3.20.6 Life history and ecology

There have been no studies into the biology or autecology of *M. pauli-guiliei*. The majority of the following information is extrapolated from our understanding of other cycads. However, it is also becoming increasingly clear that the reproductive processes and behaviour of different species within the same genus may differ considerably, so that information collected from one species cannot necessarily be extrapolated to another.

M. pauli-guiliei can be easily propagated from seed and by slices from the trunk (Jones 1993). It is a dioecious, perennial plant that reproduces by sexually produced seeds. The longevity of the plants is unknown. Estimates of life span of other *Macrozamia* species range from 120 to 1500 years (Benson and McDougall 1993, Pate 1993). The coning period has not been recorded for *M. pauli-guiliei*. However, it would be expected to produce cones in late spring to early summer.

The level of reproduction in cycads varies greatly from year to year. The factors controlling the level of reproduction are unknown. There are reports suggesting a cyclical nature in the level of

reproductive episodes (Vorster 1995). Coning has been reported for *M. pauli-guilielmi* to be extremely irregular and seems to take place about every four to six years. It is suggested that variable rates of coning will also lead to variable rates of seedling recruitment. The level of survivorship from seed to adult is unknown. Survivorship of *M. riedlei* and *M. communis* has been reported by Connell and Ladd (1993). They observed that only 3-4 % of the seed produced survived to become adults with the greatest mortality occurring from seed germination to seedling stage.

Traditionally cycads have been thought to be wind-pollinated (Chamberlain 1935), but evidence has been mounting that most cycad species are in fact pollinated by insects, specifically by beetles (Tang 1987, Norstog and Fawcett 1995). Forster *et al.* (1994) reported a number of Coleoptera, Hymenoptera and Thysanoptera in association with reproductive structures of *Macrozamia* species including *M. pauli-guilielmi*.

It is unknown when the seeds of *M. pauli-guilielmi* mature. However, based on other closely related species (*M. lomandroides* and *M. parcifolia*) it would be expected to be 3-6 months after coning. The seeds have a red to orange fleshy outer layer and fall from the cone at maturity. It has been reported that the fleshy outer layer attracts animals which feed on this fleshy tissue and secondarily disperse the seed. Possums, kangaroos, wallabies and rodents have been reported as dispersal agents for *Macrozamia* species (Jones 1993). However, from present field observations it would appear that most seeds are not dispersed far from the parent plant.

The seeds of most cycad species will not germinate immediately on maturity, for the embryo requires an after-ripening period (Jones 1993). *M. communis* and *M. riedlei* are reported to require 10-13 months before germination will occur (Ladd and Connell 1995). The seed of *M. pauli-guilielmi* requires approximately 6-12 months before it will germinate (Forster pers. comm.). The length of time that the seeds of *M. pauli-guilielmi* retain their viability is unknown. It is reported that under controlled storage conditions seeds of other *Macrozamia* species will retain their viability for many months (Jones 1993). Under field conditions it is suspected that seed would not stay viable for more than 6-12 months.

As germination occurs the micropylar end of the hard seed coat is ruptured by the emerging radicle, which turns down into the soil and grows rapidly. The greater part of the cotyledons remain inside the seed on the soil surface, absorbing all of the endosperm and transferring the food resources into the young root and developing underground stem of the seedling. Usually only one leaf appears initially at the soil surface some months after germination. The time from coning to the establishment of a juvenile with a single leaf is estimated to be 2 years. The length of time taken from seed germination to maturity is unknown. The time taken for cultivated cycads to reach maturity ranges from 2 to 30 years (Jones 1993).

From field observations it is suggested that seeds and the early stages of the seedling development are fire-sensitive (**Plate 21**). The time required before the seedling can tolerate fire is unknown. Mature plants are not greatly affected by fire. The destruction of the leaves above-ground occurs but the important growing tip is protected below ground level. There are some suggestions that some cycads may benefit from periodic exposure to fire (Zunckel 1995).

3.20.7 Threats

In the light of the field survey and from consultation with others, current or perceived threats to the continued survival of *M. pauli-guilielmi* are considered to be:

Loss of habitat: In the past large tracts of the habitat of *M. pauli-guilielmi* have been cleared for pine plantations and agriculture and to a lesser extent residential development. For those populations on freehold land and road reserves, the loss of habitat is a continuing issue.

Leaves and fruits of cycads are poisonous to domestic stock if ingested. Most graziers in the past have taken measures to eradicate cycads from areas where domestic stock graze. Those populations surviving in areas grazed by stock are still threatened by such land management.

Illegal removal of seeds, seedlings and mature plants from the wild: Cycads world-wide have become extremely desirable plants to collect. The proximity of known populations to tracks and roads makes them potentially threatened by illegal removal if the locations of the populations are generally known.

Inappropriate fire regime: Mature *Macrozamia*s generally cope very well with fire and as pointed out earlier may benefit from periodic exposure to fire. However, fire can certainly affect the recruitment of new individuals because the seeds and young seedlings of *M. pauli-guilielmi* are fire-sensitive. Too frequent a fire regime would certainly lead to a gradual decline in the population as mature plants became senescent and there was a lack of recruitment of new plants. The impact of present Department of Primary Industries, Forestry fire management on the ability of *M. pauli-guilielmi* to maintain a sustainable population level is unknown. The consequences of repeated burning over a long time on the invertebrate pollinators are also not known.

3.20.8 Management, Research and Conservation Measures

In the long term the populations within areas currently planted with exotic pines are unlikely to survive. Prior to replanting of the next crop of pine the ground is ripped and then mounded. It is suspected that a large proportion of the plants would not survive this site preparation. Investigations should be undertaken into the possibility of salvaging these individuals.

There is little information available on the role of fire in the ecology and reproductive biology of *M. pauli-guilielmi*. This needs to be understood if successful management techniques are to be developed for conservation of the species in the wild. Research into the effect of fire on coning and seedling survival is required.

The protection of the remaining populations of *M. pauli-guilielmi* in natural vegetation in the state forest lands that are not presently within State Forest Scientific Areas should be pursued.

To reduce the illegal removal of plants and propagules of *M. pauli-guilielmi* from the wild, locality information of populations should not be supplied to persons who do not have appropriate permits from Department of Environment and Department of Primary Industries. Current legislation to prevent illegal collection of threatened species from the wild needs to be enforced.

Macrozamia pauli-guilielmi when assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Vulnerable, ie. is facing a high risk of extinction in the wild in the near future, as defined by criteria D.2. Its population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²). The present status of Endangered for *M. pauli-guilielmi* should be reconsidered in the light of the present data available.

3.21 MARSDENIA CORONATA BENTH.

3.21.1 Summary

Marsdenia coronata is restricted to south east Queensland where it has a scattered distribution from the Gunalda Range north of Gympie south to the Great Dividing Range near Killarney. It is recorded from three National Parks and from seven State Forest areas. There is no quantitative data on populations. However, it has been reported as being rare or occasional at collection sites. The distribution of *Marsdenia coronata* has a range of approximately 250 km and encompasses an area of occurrence of approximately 8800 km². Current or perceived threats to the continued survival of *M. coronata* are considered to be loss of habitat to urban development and mining.

3.21.2 Species description and identification

The genus *Marsdenia* is placed in the family Asclepiadaceae. The genus contains 250 species in Africa, Asia, Malesia, Central and South America, Melanesia and Australia (Forster 1996). In Australia there are approximately 33 species of which 28 are endemic and mostly found throughout the tropical and eastern Australia. They are commonly known as 'milk vines' because of the milky latex which oozes from the plant when damaged (Elliot & Jones 1993). The botanical description of *Marsdenia coronata* is as follows:

Herbaceous slender wiry vine with white latex. Roots comprising a string of interconnected water-storage tubers. Stems cylindrical, up to 1.5 mm diameter, with 2 vertically spiralling bands of sparse to dense trichomes. Leaves petiolate; lamina linear-lanceolate, up to 5.5 cm long and 1 cm wide, discoloured, glabrous or with scattered trichomes below, venation obscure; apex acute; base rounded or cuneate; petioles up to 7 mm long; colleters 3 to 4 at lamina base. Inflorescence umbelliform. Flowers 4-5 mm long, 3-4 mm diameter. Corolla shallowly campanulate, yellow to yellow-green; tube 2.6-3 mm long, 3-3.2 mm diam.; lobes triangular, 1.6-2 mm long, 1.5-2 mm wide, internally glabrous. Corolline corona absent. Staminal corona of 5 auriculate, peltate lobes shorter than staminal column, entire; lobes 0.8-1 mm long. Anther appendages ovate to triangular. Style-head conical-globose. Fruit fusiform-ovoid, approximately 10 cm long, 15-16 mm diameter (Forster 1995, Forster 1996). For a more detailed description and illustration refer to Forster (1995 & 1996).

Marsdenia coronata is closely related to *M. brevis* but differs from this species in its flower morphology and in having less discoloured leaves. The distinguishing features are set out in Table 3.21.1. Without flowering material it can be difficult to distinguish these two species.

TABLE 3.21.1. CHARACTERS DISTINGUISHING *MARSDENIA CORONATA* AND *MARSDENIA BREVIS*

| Characters | <i>M. coronata</i> | <i>M. brevis</i> |
|-----------------------------------|-----------------------|----------------------|
| corolla shape | flattened-campanulate | urceolate |
| pouching at base of corolla lobes | present | absent |
| length of coronal lobes | 0.8-1 mm | 0.4-0.7 |
| apex of coronal lobes | not notched | notched |
| Leaves | discoloured | strongly discoloured |

3.21.3 Current conservation status

Marsdenia coronata is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of E (endangered) by ANZECC (1993). It is recently been removed from the Schedule 1 of the Commonwealth *Endangered Species Protection Act 1992*.

3.21.4 Distribution and abundance

Marsdenia coronata was not surveyed during the present study. Details from Queensland Herbarium specimens of *M. coronata* are listed in Appendix 1.20. The species is known from thirty-four collections. *M. coronata* has a scattered distribution from the Gunalda Range north of Gympie to the Great Dividing Range near Killarney. Thirteen of the collections have been collected either on private land or road sides and most of these are within the vicinity of Ipswich. It is recorded from three National Parks (Main Range, Moogerah Peaks and Mount Coolum National Parks) and from seven State Forest areas (SF 215 Fty 821, SF 256 Fty 1190, SF 589 Fty 1657, SF 639 Fty 902, SF 792 Fty 1681, SF 944 Fty 1040 and SF 1239 Fty 1255). There is no quantitative data available on population sizes. However, it has been reported as being rare or occasional at collection sites. The distribution of *Marsdenia coronata* has a range of approximately 250 km and encompasses an area of occurrence of approximately 8800 km².

3.21.5 Habitat

Marsdenia coronata is most commonly found in open eucalypt forest and woodland communities on hillslopes and ridge tops at altitudes of 40 to 780 m. The soils are generally well drained, shallow, vary in texture from sandy, gravelly sand, loam to clay loam and are derived from sandstone or acid volcanic rocks. It has also been found on rocky outcrops along clifflines. The more frequent tree species recorded with this species are *Eucalyptus fibrosa*, *E. carnea*, *Corymbia citriodora*, *C. henryi*, *E. acmenoides* and *E. propinqua*.

3.21.6 Life history and ecology

There have been no studies into the biology or autecology of *Marsdenia coronata*. The majority of the following information is extrapolated from our understanding of other species of *Marsdenia*.

M. coronata is a perennial vine that reproduces by sexually produced seeds. There is no indication that the species can vegetatively reproduce. The longevity of the plants is unknown. Roots of this species are fleshy tuberous water storage organs in the form of a string of interconnected tubers to which the plant may die back in times of drought or fire (Forster 1995). *M. coronata* has been recorded flowering in January, February, April to June and October to December and fruiting in September. The species appears to be capable of flowering throughout the year but the main period of flowering is from October to February. Pollinators are suspected to be insects. Small beetles and small flies have been observed transferring pollinaria in other species of *Marsdenia* in Australia (Forster 1995).

Fruits mature within 2 to 3 months after flowering and split to release many seeds. The light-weight seeds with tufts of silky hairs are adapted for dispersal by air currents. The longevity and viability of the seed are unknown. Elliot and Jones (1993) report that *Marsdenia* seeds have a limited period of viability. This suggests that the species would not support a long-term seed bank in the soil.

The response of *M. coronata* to fire is unknown but the above-ground biomass is probably killed by fire. It is capable of regenerating from its tuberous rootstock.

3.21.7 Threats

The lack of information about present populations levels of *M. coronata* and precise habitat requirements make it difficult to assess threats to this species.

Large tracts of habitat have been cleared for urban development and mining in the Ipswich area. Clearing for urban development is continuing to occur and threatens a number of populations in the Ipswich area.

3.21.8 Management, research and conservation measures

Field investigations are required to determine what populations remain and what would be the appropriate course of action for conserving the species.

For the populations within conservation reserves and state forest lands appropriate management practices need to be put into place to ensure the long-term survival of *M. coronata* in the wild. However, at present there is a lack of ecological information about *M. coronata* which makes it impossible to assess what would be appropriate for the management of the habitat for the long term benefit of the species. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

For those populations that occur on freehold land and road verges, liaison with land owners and local authorities should be undertaken to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*.

3.22 *MEDICOSMA ELLIPTICA* T.G. HARTLEY

3.22.1 Summary

Medicosma elliptica has a very restricted distribution in the Dawes and Many Peaks Ranges approximately 25 km south-south-west of Miriam Vale (SF 391 Fty 1007 Granite Creek State Forest). The species has a total geographic range of approximately 20 km with an area of occupancy of less than 50 hectares. The total population has been estimated to be 100-250 individuals. It grows in mountainous terrain on relatively rocky, moderately to very steeply inclined hillslopes with varying aspects and at elevations between 200-580 m above sea level. The soils are well drained, shallow to deep, grey brown to reddish brown loams. The vegetation community is a complex notophyll vine forest. *M. elliptica* grows in the mid stratum of this community type. Current or perceived threats to the continued survival of *M. elliptica* in the wild are the encroachment of fire into its habitat and the spread of the weed *Lantana camara* (lantana).

3.22.2 Species description and identification

The genus *Medicosma* is placed in the family Rutaceae. *Medicosma* presently contains 22 species and occurs in Australia, New Guinea and New Caledonia. Six of the species are endemic to eastern Australia.

Medicosma elliptica T.G. Hartley was formally described in 1985 from material collected from the upper reaches of Granite Creek, approximately 90 km north west of Bundaberg (Hartley 1985). The botanical description of *Medicosma elliptica* is as follows:

Shrub or small tree to 7 m high. Branchlets glabrous; terminal buds corky. Leaves (sub)opposite, 5-13.5 cm long; petiole glabrous or nearly so, flat adaxially, neither swollen apically nor articulated with the blade, 4-10 mm long, 1-1.5 mm wide at the middle; blade subcoriaceous, glabrous, conspicuously oil-dotted, elliptic or elliptic-obovate (or obovate), 4.5-12.5 cm long, 1.8-6 cm wide, about 2-3 times as long as wide, the base acute to attenuate, the main veins 11-13 on each side of the midrib, diverging at an angle of 50-60°, the apex (acute or) obtuse to rounded, usually retuse. Inflorescences axillary, one- or few-flowered, subsessile or with herbaceous axis to 2 mm long; pedicel(s) obsolete to 1 mm long. Flowers bisexual, 5.5-6 mm long, tetragonously ovoid in bud; sepals densely appressed-pubescent, imbricate for about 1/2 their length, broadly ovate or suborbicular, about 2 mm long; petals white, densely pubescent abaxially, narrowly elliptic, 4.5-5.5 mm long. Follicles glabrous or nearly so, approximately 7-10 mm long, wrinkled when dry, dehiscing along the adaxial, apical edges and partially down the abaxial side, mostly with solitary seed. Seeds subovoid, 5-6 mm long, with suborbicular, subfleshy piece of tissue attached near hilum. (Hartley 1985). For a more detailed description and illustration refer to Hartley (1985).

Medicosma elliptica is related to *M. obovata* and *M. sessiliflora*. It can be distinguished from *M. obovata* by its leaf shape and from *M. sessiliflora* by the angle of divergence of the lateral veins of its leaves. The three species are also geographically separated. Details of these differences are present in Table 3.22.1.

TABLE 3.22.1. CHARACTERS DISTINGUISHING *MEDICOSMA ELLIPTICA*, *MEDICOSMA OBOVATA* AND *MEDICOSMA SESSILIFLORA*.

| Characters | <i>M. elliptica</i> | <i>M. obovata</i> | <i>M. sessiliflora</i> |
|---|---|--|--|
| petiole | neither swollen apically nor articulated with the blade | often slightly swollen apically and sometimes obscurely articulated with the blade | swollen apically and often articulated with the blade |
| leaf shape | elliptic or elliptic-obovate, rarely obovate, 2-3 times as long as wide | obovate rarely elliptic, 1.5-2 times as long as wide | elliptic or elliptic-oblong to oblanceolate, 2-4 times as long as wide |
| leaf base | acute to attenuate | obtuse to attenuate | cuneate to rounded |
| No. of lateral veins on each side of midrib | 11-13 | 8-10 | (9)12-16 |
| angle of lateral veins | 50-60° | 50-60° | 70-80° |

3.22.3 Current conservation status

Medicosma elliptica is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V

(vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.22.4 Distribution and abundance

Details from Queensland Herbarium specimens of *Medicosma elliptica* are listed in Appendix 1.21. A total of 13 specimens of *M. elliptica* have been collected from an area within SF 391 (Fty 1007) (Granite Creek State Forest) approximately 25 km south-south-west of Miriam Vale. The species has a total geographic range of approximately 20 km with an area of occupancy of less than 50 hectares (W.J.F. McDonald pers. comm.). The total population has been estimated to be 100-250 individuals (W.J.F. McDonald pers. comm.).

3.22.5 Habitat

The sites are situated in mountainous terrain on relatively rocky, moderately to very steeply inclined hillslopes with varying aspects and at elevations between 200-580 m above sea level. The soils are well drained, shallow to deep, grey brown to reddish brown loams. The geology is predominantly basalt/ultrabasic rock. The area is mapped as Muncon Volcanics, a Triassic formation made up of intermediate and basic lavas (andesite and basalt), tuff, agglomerate, siltstone and lithic sandstone.

The vegetation community is a complex notophyll vine forest with *Araucaria cunninghamii*, *Ficus macrophylla* and *Lophostemon confertus* emergents. Common canopy species included: *Argyrodendron trifoliolatum*, *Ficus platypoda*, *Planchonella queenslandica*, *Beilschmiedia obtusifolia*, *Cinnamomum oliveri*, *Premna lignum-vitae*, *Olea paniculata*, *Brachychiton discolor*, *Mischarytera lautereriana* and *Syzygium australe*. Other low trees, shrubs, epiphytes and vines included: *Wilkiea macrophylla*, *Randia chartacea*, *Cleistanthus cunninghamii*, *Austromyrtus bidwillii*, *Bosistoa pentacocca*, *Actephila lindleyi*, *Phyllanthus brassii*, *Melodinus australis*, *Elaeagnus latifolia*, *Ripogonum album*, *Melodorum leichhardtii*, *Clematis glycinoides*, *Platynerium bifurcatum*, *Dendrobium speciosum* and *Davallia pyxidata*. The area has been modified by previous human disturbance, during the logging of *Araucaria cunninghamii* (hoop pine). The disturbance associated with harvesting of hoop pine from the complex notophyll vine forest has assisted in the establishment of lantana (*Lantana camara*) throughout the community.

M. elliptica grows in the mid stratum of this community type.

3.22.6 Life history and ecology

Very little is known about this species. The cultivation of other species of *Medicosma* has been by seed or cuttings. The seed is best sown fresh, although germination is generally erratic due to the presence of inhibitors (Elliot & Jones 1993). Cuttings of hardened new growth may be successful but often slow to strike. (Elliot & Jones 1993).

M. elliptica is a small tree with an unknown life span. The main method of reproduction is by sexually produced seeds. Very little is known about the floral ecology of *M. elliptica*. Herbarium records and field observations indicate that *M. elliptica* flowers from December to May. Fruits have been observed in December and June. The breeding system of *M. elliptica* is unknown.

The seed is not retained on the plant for a long time but is forcibly ejected from the fruit when mature. The dispersal distance achieved by this mechanism is unknown but would be expected to be only a relatively short distance. It is suggested that the subfleshy appendage attached to the seed may further aid in the dispersal of seed by the attraction of ants to collect the seed (Hartley 1985). Ant-dispersal is known to occur in other genera with similar seed characteristics in the family Rutaceae (Berg 1975).

It is suspected that all stages of the life cycle *M. elliptica* are susceptible to fire. It is not known whether *M. elliptica* is capable of suckering or resprouting from the base of the tree trunk.

3.22.7 Threats

In the past the area has been logged for *Araucaria cunninghamii* (hoop pine) and a portion of the habitat has been cleared for the establishment of hoop pine plantations. The present policy of the Department of Primary Industries, Forestry is not to harvest timber from rainforest communities.

The main potential threats to the continued existence of *M. elliptica* in the wild include the encroachment of fire into its habitat and the spread of the weed *Lantana camara* (lantana).

3.22.8 Management research and conservation measures

The principal habitat management issue for this species is the eradication of weeds, particularly lantana (*L. camara*) from the habitat. Control of such large infestations of a weed species can only be successfully and economically achieved by biological agents. Research into the biological control of *L. camara* is currently being undertaken by staff of the Department of Natural Resources.

A total fire exclusion policy should be practised. Liaison is required with Department of Primary Industries, Forestry and rural landholders adjoining the State Forest to alert the local community to the issue of fire management within the area.

A more accurate survey of the species' distribution in the State Forest is required. There is no doubt that further surveys of appropriate habitats are required to substantiate whether there are additional populations in the vicinity.

There is little information available on the autecology and reproductive biology of *Medicosma elliptica*. Studies into regeneration techniques, the species' response to disturbance and habitat requirements are needed.

The whole of the vine forest habitat should be considered for protection. The declaration of a State Forest Scientific Area under the *Forestry Act 1959* should be considered.

3.23 NOTELAEA LLOYDII GUYMER

3.23.1 Summary

Notelaea lloydii is endemic to south east Queensland where it occurs from Mt Brisbane, near Somerset Dam to just south of Beaudesert. The distribution of *N. lloydii* has a range of approximately 120 km and encompasses an area of occurrence approximately 3700 km². It is recorded from one National Park (Moogerah Peaks) and from two State Forest areas (SF 494 Fty 1309 and SF 637 Fty 1613). There is no quantitative data on population size. It is most commonly found in open eucalypt forest near the margins of vine thickets, vine forests and softwood scrubs on gentle to steep dry slopes, rarely on rocky outcrops. The soils are generally well drained, shallow, stony to very rocky in texture and derived from sandstone or acid volcanic rocks. Current or perceived threats to the continued survival of *N. lloydii* in the wild are the loss of habitat through urban development, inappropriate fire regimes and invasion of the exotic species *Lantana camara* (lantana).

3.23.2 Species description and identification

The genus *Notelaea* is placed in the Olive family (Oleaceae). *Notelaea* is endemic to Australia where there are approximately 9 species distributed throughout eastern Australia.

Notelaea lloydii Guyer was formally described in 1987 from material collected by Mr L. Bird from Mt Crosby, a western suburb of Brisbane. The botanical description of *Notelaea lloydii* is as follows:

Shrub to 4 m high with many stems arising from the base. The stems are covered with a smooth, pale grey bark. The hairless, discolorous, leathery leaves are linear or slightly falcate, 7-14 cm long, 2-5.5 mm wide, and arranged in opposite pairs along the branchlets. The main leaf veins are clearly visible and slightly raised on the upper leaf surface. Flowers are pale yellow or cream, up to 2 mm in diameter and grow on slender stalks 3-5 mm long. Up to 20 flowers may be grouped together on a stem that grows from the joint of a leaf with a branchlet. The fruits are spherical to ovoid, 6-8 mm long, 5-8 mm in diameter, and consist of a hard woody nut with a thin, dark blue skin. For a more detailed description of this species refer to (Guymer 1987). Illustrations of this species are published in Williams (1987) and Guymer (1987).

N. lloydii may be confused with the closely related *N. microcarpa* but can be distinguished by its leaf shape and habit (W. Harris pers. comm.). The differences are set out in Table 3.23.1.

TABLE 3.23.1. CHARACTERS DISTINGUISHING *NOTELAEA LLOYDII* AND *NOTELAEA MICROCARPA*

| Characters | <i>N. lloydii</i> | <i>N. microcarpa</i> |
|-----------------|---------------------------|-----------------------------|
| leaf shape | linear | linear-lanceolate |
| leaf width (mm) | 2-5.5 | 7-23 |
| habit | multistemmed shrub to 4 m | large shrub to tree to 15 m |

3.23.3 Current conservation status

Notelaea lloydii is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.23.4 Distribution and abundance

Notelaea lloydii was not surveyed during the present study. Details from Queensland Herbarium specimens of *N. lloydii* are listed in Appendix 1.22. The species is known from thirty five collections. *Notelaea lloydii* has a distribution from Mt Brisbane, near Somerset Dam to just south of Beaudesert. Twenty three of the collections have been made either on private land or road sides within the western suburbs of Brisbane and Ipswich. It is recorded from one National Park (Moogerah Peaks) and from two State Forest areas (SF 494 Fty 1309 and SF 637 Fty 1613). There is no quantitative data available on population sizes, however, it has been reported as being rare or only a few plants seen at collection sites. The distribution of *Notelaea lloydii* has a range of approximately 120 km and encompasses an area of occurrence of approximately 3700 km².

3.23.5 Habitat

Notelaea lloydii is most commonly found in open eucalypt forest near the margins of vine thickets, vine forests and softwood scrubs at altitudes of 80 to 480 m. It occurs in undulating to hilly terrain on gentle to steep dry slopes, rarely on rocky outcrops. The soils are generally well drained, shallow, stony to very rocky in texture and derived from sandstone or acid volcanic rocks. The more frequent tree species recorded with this species are *Eucalyptus crebra*, *Corymbia citriodora*, *E. acmenoides* and *Acacia concurrens*. Other associated trees and shrubs are *Brachychiton populneus*, *Alphitonia excelsa*, *Acacia aulacocarpa*, *A. falcata* and *Diospyros geminata*.

3.23.6 Life history and ecology

There have been no studies into the biology or autecology of *N. lloydii*. *N. lloydii* is a perennial shrub that reproduces by sexually produced seeds. There is no indication that the species can vegetatively reproduce. The longevity of the plants is unknown. The species has an underground lignotuber to which the plant may die back in times of drought or fire (W. Harris pers. comm.). *N. lloydii* has been recorded flowering from June to August and fruiting from October to December. Insects are suspected to be possible pollinators.

The fruits of *N. lloydii* are 5-8 mm in diameter with a single seed enclosed in a hard woody nut with a thin dark blue skin. There is no mechanical mechanism for dispersal and no dispersal agents have been recorded. It is suggested that dispersal may be effected by animals, such as birds. The longevity and viability of the seed is unknown. However, the best level of germination is achieved from fresh seed which germinates rapidly without any pretreatment (K. Hall pers. comm.). This suggests that the species would not support a long term seed bank in the soil.

The above-ground structures of *N. lloydii* are killed by fire. However, regeneration can occur from the lignotuber. It is suspected that seeds and the early stages of the seedling development are fire-sensitive. The time required before the seedling can tolerate fire is unknown. It has been estimated that a period of at least 5 years between fires would be required to allow seed to germinate and reach a stage tolerant of fire (W. Harris pers. comm.).

3.23.7 Threats

There can be no doubt that habitat loss due to clearing, for urban and mining in this species geographical range has led to a decline in populations in the past. The conversion of habitat to urban developments is still continuing to occur and poses a major threat to the long term survival of the species in some areas.

Mature *N. lloydii* plants generally cope with fire. However, fire can certainly affect the recruitment of new individuals because the seeds and young seedlings of *N. lloydii* appear to be fire-sensitive. Too frequent a fire regime would certainly lead to a gradual decline in the population as mature plants became senescent and there was a lack of recruitment of new plants.

The populations on vine forest margins may be susceptible to the invasion of exotic weed species such as lantana (*Lantana camara*) into the habitat. It is suspected that lantana could modify the habitat by decreasing light intensities and increasing fire intensities to the extent that *N. lloydii* could not survive.

3.23.8 Management, research and conservation measures

Field investigations are required to determine what populations remain and what would be the appropriate course of action for conserving the species. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences of the species.

There is little information available on the role of fire in the ecology and reproductive biology of *N. lloydii*. This needs to be understood if successful management techniques are to be developed for conservation of the species in the wild. Research into the effect of fire on mature plants and seedlings is required.

Monitoring and control of the spread of weeds in the vicinity of populations should be undertaken.

For those populations that occur on freehold land and road verges, liaison with land owners and local authorities should be undertaken to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*.

3.24 OLDENLANDIA SP. (WIETALABA N. GIBSON 1344)

3.24.1 Summary

Oldenlandia sp. (Wietalaba N. Gibson 1344) is known only from SF 583, 45 km S of Gladstone. The total population is estimated to be between 50 000 and 100 000 plants over an area of occupancy of approximately 10 hectares. It grows in a simple microphyll/notophyll vineforest on hillcrests and moderately to very steeply inclined hillslopes with a southerly to easterly aspect and between 200-420 m above sea level. The soils are well drained, dark reddish brown loams with an acidic reaction. The species is currently not represented within any form of secure conservation reserve anywhere in the state. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) is considered at risk due to continued threats associated with land management in relation to fire and the encroachment of lantana into its habitat.

3.24.2 Species description and identification

The genus *Oldenlandia* is placed in the family Rubiaceae. *Oldenlandia* with approximately 100 species is widespread throughout the tropical and warm subtropical regions of the world, with its largest diversity in Africa. In Australia it comprises approximately 20 species which are distributed throughout northern Australia.

Oldenlandia sp. (Wietalaba N. Gibson 1344) has not been formally described but has been recognised as a distinct taxon since 1996. The botanical description of *Oldenlandia* sp. (Wietalaba N. Gibson 1344) is as follows:

Woody herbaceous perennial, densely intricately branched, to 1 m high, with thin, greyish, papery bark on mature stems; branchlets divaricate at approximately 80 degrees, quadrangular when young becoming rounded with age, hispidulous; axillary branchlets short, persistent after senescence giving the plant a spinose appearance. Leaves opposite, appearing fasciculate on older branches due to the short axillary branchlets, subsessile; lamina narrowly oblong to oblong-elliptic, 3-7 mm long, 1-2 mm wide, discolourous, glabrous or with minute scabrous hairs above, glabrous or sparsely hispidulous below, attenuate at base, obtuse, subacute or sometimes mucronulate at apex, midrib prominent below, margins recurved when dry. Stipule-sheath approximately 1 mm long, hispidulous, produced into triangular lobe; margin fimbriate. Flowers solitary in penultimate leaf axils appearing terminal by the abortion or reduction of terminal shoot; pedicels slender, 1-3 mm long, glabrous or hispidulous. Hypanthium subglobose, approximately 1 mm diameter, glabrous or sparsely hispidulous; calyx lobes broadly triangular, 0.6-1.0 mm long, obtuse to subacute at apex, joined at the base into free tube approximately 1 mm long, entire on margin. Corolla cream with lilac tinge and faint lilac blotches in throat, glabrous, infundibular, glabrous; tube 4-5 mm long; lobes reflexed, triangular, 4-5 mm long. Stamens exserted; filaments 0.5-1.0 mm long; anthers linear-oblong, c. 2 mm long. Ovules approximately 25-35 per locule. Style exserted, 6-7 mm long; stigma bifid; lobes linear, approximately 2 mm long, reflexed. Capsule subglobose, approximately 2 mm diameter, glabrous or nearly so, not markedly furrowed along dissepiment; calyx lobes spreading; beak approximately 1 mm long, rounded, not protruding above calyx lobes. Seeds

numerous, depressed obconic or irregularly polygonal, approximately 0.5 mm long; testa light brown, reticulate-areolate. (see **Plate 24**)

Oldenlandia sp. (Wietalaba N. Gibson 1344) is closely related to *O. polyclada* from north Queensland but differs in its branching, leaf size, pedicel length, calyx lobe length and flower arrangement. The differences are set out in Table 3.24.1.

TABLE 3.24.1. CHARACTERS DISTINGUISHING *OLDENLANDIA* SP. (WIETALABA N. GIBSON 1344) AND *OLDENLANDIA POLYCLADA*

| Characters | <i>O. sp. (Wietalaba N. Gibson 1344)</i> | <i>O. polyclada</i> |
|-------------------------|--|------------------------------------|
| branching pattern | divaricate, c. 80 ° | not divaricate, c. 45° |
| leaf size (mm) | 3-7 x 1-2 | 7-40 x 2-6 |
| pedicel length (mm) | 1-3 | 3-6 |
| calyx lobe (length)(mm) | 0.1-1 | 2-8 |
| flower arrangement | always being solitary in leaf axils | solitary or 2-8 flowered fascicles |

3.24.3 Current conservation status

Oldenlandia sp. (Wietalaba N. Gibson 1344) is presently not listed on the schedule of the Queensland *Nature Conservation Act 1992*. It is not currently assigned a national conservation status or listed on the Commonwealth *Endangered Species Protection Act 1992*. However, its inclusion on the Queensland Schedule of threatened wildlife as ‘Endangered’ is currently pending. It is proposed for addition to the schedule because it has a restricted distribution and is not protected in any formal conservation reserve. Potential threats are believed to be fire and weed competition.

3.24.4 Distribution and abundance

Details from Queensland Herbarium specimens of *Oldenlandia* sp. (Wietalaba N. Gibson 1344) are listed in Appendix 1.23. All five specimens come from a single locality in SF 583 (Fty 1595), approximately 45 km south of Gladstone. The area is presently managed by Department of Primary Industries, Forestry.

Previous estimates of population size were of a few hundred individuals and concluded that below average rainfall in the early 1990’s had killed the majority of the population. The present survey examined the southern and northern slopes adjoining the previously known site. Detailed information of 2 sites examined are presented in Appendix 2.8. No other likely habitats were examined during this present study. Another vineforest along Koolkooroom Creek approximately 20 km south of the present site has been briefly examined but *Oldenlandia* sp. (Wietalaba N. Gibson 1344) was not observed to be present (P.I. Forster pers. comm.).

Owing to the steepness of the habitat and the density of the vegetation it was not possible to estimate the population by a systematic sampling technique within the time available. However, *Oldenlandia* sp. (Wietalaba N. Gibson 1344) was observed to be very common in a number of sites within the vineforest. It was observed that the species was the dominant shrub in three of the four sites examined. A total area of occupancy is estimated to be approximately 10 hectares with a total population guesstimated to be 50 000 to 100 000 individuals.

In the past, harvesting of hoop pine has occurred in the vineforest, which opened up a number of snig tracks along the ridge lines. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) was observed within its habitat to grow along these tracks with lantana (*Lantana camara*).

3.24.5 Habitat

The site is situated in mountainous terrain on moderately to very steeply inclined hillslopes mostly with a southerly to easterly aspect and at elevations between 200-400 m above sea level. The soils are well drained, dark reddish brown loams with a pH 6.6-6.8. The geology is mapped as Muncon Volcanics: intermediate and basic lava, tuff agglomerate, siltstone, lithic arenite, conglomerate, mudstone.

The vegetation in this community is somewhat intermediate between a simple microphyll/notophyll vine forest with *Araucaria* emergents and semi-evergreen microphyll vine thicket. The common canopy species are *Backhousia kingii*, *Choricarpia subargentea*, *Barklya syringifolia* and *Archidendropsis thozetiana*. Other common floristic elements observed around the *Oldenlandia* sites included *Lantana camara**, *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Canthium odoratum*, *Capparis arborea*, *Carissa ovata*, *Diospyros geminata*, *Geitonoplesium cymosum*, *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Smilax australis*, *Spartothamnella juncea* and *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360).

Although the vineforest community is seen as a uniform community type there is a mosaic of differing habitat and floristic associations within the area. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) was observed to occur mostly in areas that were drier, more exposed and with a more open canopy structure. These sites generally have shallow rocky soils and are on the upper slopes or on the ridge lines. It is suggested *Oldenlandia* sp. (Wietalaba N. Gibson 1344) may prefer a ecotonal habitat. (Plate 25)

3.24.6 Life history and ecology

There have been no studies made of the biology or autecology of *Oldenlandia* sp. (Wietalaba N. Gibson 1344) and because of its recent discovery there has been very little field observation and anecdotal evidence of its life history. The majority of the following information is extrapolated from our understanding of the closely related *Oldenlandia polyclada*.

Oldenlandia sp. (Wietalaba N. Gibson 1344) is a herbaceous perennial up to 100 cm high. The longevity of individuals is unknown. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) and *O. polyclada* are the only perennial species of *Oldenlandia* in Australia. *O. polyclada* has been grown in cultivation for approximately 10 years. It has been observed to die back to the root stock during drought conditions and resprout from the base once conditions improve. *O. polyclada* has also been observed to sucker from roots that have been exposed on the surface of the soil.

Oldenlandia sp. (Wietalaba N. Gibson 1344) has been recorded flowering in May and November and fruiting in April, November and December. All species of *Oldenlandia* are suspected of being insect pollinated (Robbrecht 1988). Observations of cultivated *O. polyclada* suggest it may be self-incompatible. The fruit matures within one or two months of pollination of the flower. The fruits dehisce tardily at maturity releasing numerous small seeds. The levels of seed viability are unknown. The longevity of the seed in the soil is unknown.

The species' response to fire is not known. The occurrence of *Oldenlandia* sp. (Wietalaba N. Gibson 1344) along old snig tracks with lantana suggests that this species may tolerate a degree of disturbance within its habitat.

3.24.7 Threats and current conservation measures

The major threat to the remaining populations of *Oldenlandia* sp. (Wietalaba N. Gibson 1344) is the modification of its habitat by the combination of fire and weed invasion.

Large tracts of the vine forest to the north and northwest of the known sites of this species have been previously destroyed by fires with the resultant dominance of the slopes with *Lantana camara*. *Lantana camara* is the most significant environmental weed at the site where *Oldenlandia* sp. (Wietalaba N. Gibson 1344) occurs. Past timber harvesting opened up tracks along the ridges which have become overgrown with lantana. Lantana in the understorey at high density provides high fuel loads which will support fires moving into the vine forest. There are also reports indicating that lantana can have an allelopathic effect on a range of plant lifeforms (Achhireddy and Singh 1984).

3.24.8 Management and Research Actions

The principal habitat management issue for this species is the eradication of weeds, particularly lantana (*L. camara*) from the habitat. Lantana is present throughout the sites where *Oldenlandia* sp. (Wietalaba N. Gibson 1344) occurs. Control of such large infestations of a weed species can only be successfully and economically achieved by biological agent. Research into the biological control of *L. camara* is currently being undertaken by staff of the Department of Natural Resources.

A total fire exclusion policy should be practised. Liaison is needed with Department of Primary Industries, Forestry and rural landholders adjoining the State Forest to alert the local community to the issue of fire management within the area.

Further surveys of appropriate habitats are required to substantiate whether there are any more populations in existence. The habitat is difficult to traverse because of the steepness of the slopes and density of the vegetation. So far only a small portion of the habitat has been examined and further searching of the immediate locality is likely to add to the known population size of this species. Apart from other nearby vine forest sites other possible habitats worthy of investigation include the western slopes of Kroombit Tops and the vineforest communities in the Kalpower area.

There is little information available on the autecology and reproductive biology of *Oldenlandia* sp. (Wietalaba N. Gibson 1344). Studies into the species' response to disturbance and its habitat requirements are needed.

The whole of the vine forest should be considered for protection. The declaration of a State Forest Scientific Area under the *Forestry Act 1959* should be considered.

The present information indicates that *Oldenlandia* sp. (Wietalaba N. Gibson 1344) is geographically very restricted, occurs in a specific habitat and that it has a large population size. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Critical endangered, ie. is facing a high risk of extinction in the wild in the immediate-term future, as defined by criteria B.1 & 2e. Extent of occurrence estimated to be less than 100 km², area of occupancy estimated to be less than 10 km², known to exist at only a single location, and continuing decline projected in quality of habitat. *Oldenlandia* sp. (Wietalaba N. Gibson 1344) has been proposed for inclusion on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* as Endangered. This status is considered to be appropriate based on present knowledge.

3.25 PARSONSIA KROOMBITENSIS J.B. WILLIAMS

3.25.1 Summary

Parsonsia kroombitensis is endemic to south east Queensland where it is recorded from the Calliope and Boyne Ranges, approximately 80 km south west of Gladstone and from the Cania Gorge National Park near Monto. The distribution of *P. kroombitensis* has a range of approximately 70 km and encompasses an area of approximately 1300 km². There is no quantitative data on populations. It grows on escarpments at the edges of deep valleys, among outcrops, in low shrubby woodland or open shrubland communities at altitudes from 120 to 860 m. A perceived threat to the continued survival of *Parsonsia kroombitensis* in the wild is an inappropriate fire regime.

3.25.2 Species description and identification

The genus *Parsonsia* is placed in the family Apocynaceae. *Parsonsia* has approximately 130 species distributed from south east Asia to Australia, New Zealand and parts of the south-western Pacific (Williams 1996). In Australia, 35 species are distributed across northern and eastern parts of the continent.

Parsonsia kroombitensis was formally described in 1996 from material collected at Kroombit Tops, approximately 59 km south west of Gladstone. The botanical description of *Parsonsia kroombitensis* is as follows:

Climber to 2 m high, often in clumps pendent from rock crevices; stems minutely puberulous; latex clear. Leaves glabrous or lower surface minutely puberulous, dark purple or purplish brown when dried; petiole 3-7 mm long; lamina lanceolate, linear-lanceolate or deltoid, 2-6 cm long, 0.6-1.9 cm wide, rounded, truncate, cordate or cuneate at base, recurved marginally, acuminate, apiculate. Inflorescence of axillary, occasionally terminal, open cymes with 2-9 flowers; pedicels 2-15 mm long. Corolla orange-yellow, red in throat and at base of lobes, white on margins of lobes; tube cylindrical, 4.5 mm long, conspicuously bearded at throat with glistening hairs; lobes spreading, recurved near apex, narrowly obovate with a thickened median strip, 4-5 mm long, 2.8 mm wide, glabrous. Capsules very narrowly ovoid, 4-10 cm long, 0.7-1 cm diameter, glabrous or puberulous (Williams 1996).

Parsonsia kroombitensis is distinguished by all parts becoming dark purple or purplish brown when dry; small to very small, lanceolate or deltoid, acuminate leaves, with rounded-truncate, cordate or cuneate base, with main veins impressed above and a little raised below; broad, recurved corolla lobes that are orange with a white margin and red base; a beard of glistening hairs at the corolla throat; and the red, 2/3-exserted anther cone and the straight filaments (Williams 1996).

3.25.3 Current conservation status

Parsonsia kroombitensis is presently not listed on the schedule of the Queensland *Nature Conservation Act 1992*. It is not currently assigned a national conservation status or listed on the Commonwealth *Endangered Species Protection Act 1992*. However, its inclusion on the Queensland Schedule of threatened wildlife as 'Vulnerable' is currently pending. It is to be added to the schedule because it has a restricted distribution and is not in any formal conservation reserve. A too frequent fire regime is considered a potential threat to the long-term survival of the species.

3.25.4 Distribution and abundance

Details from Queensland Herbarium specimens of *Parsonsia kroombitensis* are listed in Appendix 1.24. The species is known from four collections from state forest lands in the Calliope and Boyne Ranges, approximately 80 km south west of Gladstone. It also occurs in the Cania Gorge National Park (J. Brushe pers. comm.). There is no quantitative data available on populations. Anecdotal evidence suggests that it is not common at the sites where it has been observed (J. Brushe pers. comm.). The distribution of *P. kroombitensis* has a range of approximately 70 km and encompasses an area of approximately 1300 km².

3.25.5 Habitat

P. kroombitensis grows on escarpments at the edges of deep valleys, among outcrops of acid volcanic rock, in low shrubby woodland of *Eucalyptus acmenoides* and *Corymbia trachyphloia* on metamorphosed sandstone, in open woodlands of *E. eugenioides*, *E. montivaga* and *E. longirostrata* in brown gravelly loam on mudstone and in open shrubland and among lithophytic vegetation at altitudes from 120 to 860 m.

3.25.6 Life history and ecology

There have been no studies into the biology or autecology of *P. kroombitensis*. A number of the more common species of *Parsonsia* have been propagated by cuttings and seed (Wrigley & Fagg 1996).

P. kroombitensis is a perennial climber that reproduces by sexually produced seeds. There is no indication that the species can reproduce vegetatively. The longevity of the plants is unknown. *P. kroombitensis* has been recorded flowering in February and March and fruiting in July and September.

Seeds of *P. kroombitensis* mature the same year of flowering. The seeds are adapted for dispersal by air currents, being relatively light in weight with a plume of long hairs. The longevity and viability of the seed is unknown.

P. kroombitensis' response to fire is unknown. The above-ground biomass is probably killed by fire. It does not appear to have a lignotuber or have the capability of resprouting from the stem base. The continued existence of this species after fire would rely on successful seedling recruitment.

3.25.7 Threats

With our limited knowledge of the species it is difficult to determine the stability of the populations and what possible threats there are to the long term existence of *Parsonsia kroombitensis* in the wild.

Fires are either unplanned (wildfires from lightning strikes) or planned (hazard reduction burns). The lack of ecological information about this species' response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. The species is suspected of being fire-sensitive and incapable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from seed (obligate seeder). If fires were at a frequency that did not allow the production of adequate seed for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites. However, the habitat in which the species has been observed provides some degree of protection from frequent burning in that the rocky outcrops may buffer plants from fires.

3.25.8 Management, research and conservation measures

Previously recorded sites should be examined to establish the size and extent of the populations. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences.

Very little is known about this species. Investigations into the ecology of *P. kroombitensis* are warranted, particularly the species' response to fire and habitat disturbance.

3.26 PARSONSIA LARCOMENSIS J.B. WILLIAMS

3.26.1 Summary

Parsonsia larcomensis is endemic to central and south east Queensland where it is recorded from three mountain peaks, Mt Wheeler (near Rockhampton), Mt Larcom (near Gladstone) and Mt Perry (near Bundaberg) and one riverine habitat near Byfield. The distribution of *P. larcomensis* has a range of approximately 280 km. It is recorded from TR 157 Fty 1077 (Mt Perry) and is not recorded in any conservation reserve. There is no quantitative data on populations. It grows mostly on shallow loamy soils on cliff lines and exposed outcrops of trachyte rocks at or near mountain summits. A perceived threat to the continued survival of *Parsonsia kroombitensis* in the wild is an inappropriate fire regime.

3.26.2 Species description and identification

The genus *Parsonsia* is placed in the family Apocynaceae. *Parsonsia* has approximately 130 species distributed from south east Asia to Australia, New Zealand and parts of the south-western Pacific (Williams 1996). In Australia, 35 species are distributed across northern and eastern parts of the continent.

Parsonsia larcomensis was formally described in 1996 from material collected from Mt Larcom, approximately 20 km west north west of Gladstone. The botanical description of *Parsonsia larcomensis* is as follows:

Prostrate, creeping, more or less glabrous semi-woody plants to 5 m long, attached to rocks or soil by adventitious roots; latex clear. Leaves coriaceous, glabrous; petiole 3-7 mm long; lamina ovate to broadly elliptic, 1.1-4.5 cm long, 1-2.2 cm wide, rounded or cordate at base, shortly acuminate or acute, apiculate, green above, glaucous below. Inflorescence of axillary and terminal panicles, with 5-12 flowers, pedicels 3-5 mm long. Calyx lobes narrow, 4.5-5 mm long, Corolla whitish, with 5 red spots in throat; tube narrowly funnel-shaped, 7.5-8 mm long, glabrous or puberulous internally but not bearded; lobes spreading to recurved, lanceolate or narrowly deltoid, 2-3 mm long, acute, puberulous externally glabrous internally. Capsules slender, terete-fusiform, 7-11 cm long, 0.5-1.1 cm diameter, brown, puberulous (Williams 1996).

Parsonsia larcomensis resembles *P. straminea* but can be distinguished by its smaller capsules and a number of floral features. The differences are presented in Table 3.26.1.

TABLE 3.26.1. CHARACTERS DISTINGUISHING *PARSONSIA LARCOMENSIS* AND *PARSONSIA STRAMINEA*

| Characters | <i>P. larcomensis</i> | <i>P. straminea</i> |
|------------------------------------|--|--------------------------|
| corolla lobes (length)(mm) | 2-3 | 4-5 |
| corolla tube (length)(mm) | 7.5-8 | c. 3 |
| corolla colour | whitish but with 5 red spots in the throat | cream, yellowish or pink |
| staminal filament (length)(mm) | 6-7 | 10-20 |
| nectary scales(degree of adnation) | fused to form ring | free |
| capsules (length)(cm) | 7-11 | 10-20 |

3.26.3 Current conservation status

Parsonsia larcomensis is presently not listed on the schedule of the Queensland *Nature Conservation 1992*. It is listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*. Its inclusion on the Queensland Schedule of threatened wildlife as 'Vulnerable' is currently pending. It is to be added to the schedule because it has a restricted distribution and is not in any formal conservation reserve. Potential threats are believed to be fire and weed competition.

3.26.4 Distribution and abundance

Details from Queensland Herbarium specimens of *Parsonsia larcomensis* are listed in Appendix 1.25. The species is known from seven collections from four localities, Upper Stoney, approximately 15 km west of Byfield, Mt Wheeler, approximately 20 north east of Rockhampton, Mt Larcom approximately 20 north west of Gladstone and Mt Perry approximately 80 km west south west of Bundaberg. The Mt Perry site is within TR 157 (Fty 1077). The Upper Stoney site is within the Shoalwater Bay Military Training Area. The other two localities are on freehold land. The species is not recorded in any conservation reserve. There is no quantitative data available on population sizes. However, it has been reported as being rare or common at collection sites. The distribution of *P. larcomensis* has a range of approximately 280 km. Three of the four localities are outside the South East Queensland Biogeographical Region.

3.26.5 Habitat

P. larcomensis grows on shallow loamy soils on cliff lines and exposed outcrops of trachyte rocks at or near the summit of mountains. It is also recorded in a gully at base of rock face in *Eucalyptus fibrosa* woodland on serpentinite rocks.

3.26.6 Life history and ecology

There have been no studies into the biology or autecology of *P. larcomensis*. A number of the more common species of *Parsonsia* have been propagated by cuttings and seed (Wrigley & Fagg 1996).

P. larcomensis is a perennial climber that reproduces by sexually produced seeds. There is no indication that the species can reproduce vegetatively. The longevity of the plants is unknown. *P. larcomensis* has been recorded flowering in January, February, May and August and fruiting in July and September.

Fruits of *P. larcomensis* mature approximately 2 months after flowering. The mature pod splits to release the seed. The seeds are adapted for dispersal by air currents. The longevity and viability of the seed is unknown.

P. larcomensis' response to fire is unknown. The above-ground biomass is probably killed by fire. It does not appear to have a lignotuber or have the capability of resprouting from the stem base. The continued existence of this species after fire would rely on successful seedling recruitment.

3.26.7 Threats

With our limited knowledge of the species it is difficult to determine the stability of the populations and what possible threats there are to the long term existence of *Parsonsia larcomensis* in the wild.

Fires are either unplanned (wildfires from lightning strikes) or planned (hazard reduction burns). The lack of ecological information about this species response to fire makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term benefit of the species. The species is suspected to be fire-sensitive and incapable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from seed (obligate seeder). If fires were at a frequency that did not allow the production of adequate seed for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites. However, the habitat in which the species has been observed provides some degree of protection from frequent burning in that the rocky outcrops may buffer plants from fires.

3.26.8 Management, research and conservation measures

Previously recorded sites should be examined to establish the population sizes and extent. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences.

Very little is known about this species. Investigations into the ecology of *P. larcomensis* are warranted, particularly the species' response to fire and habitat disturbance.

For those populations that occur on freehold land, liaison with land owners should be undertaken to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*.

3.27 PASPALIDIUM GRANDISPICULATUM B.K. SIMON

3.27.1 Summary

P. grandispiculatum occurs from north of Grafton, New South Wales to near Helidon, Queensland. In Queensland, the species is known only from three sites over a range of approximately 100 km and encompasses an area of occurrence of approximately 1600 km². None of the sites are within a conservation reserve. There is no quantitative information about population size. It has been recorded growing in tall open forest on brown loam soils along a gently sloping gully at an altitude of 220 m. A potential threat to the survival of the species in one of the Queensland locations is physical disturbance from quarry operations.

3.27.2 Species description and identification

The genus *Paspalidium* is placed in the grass family (Poaceae). *Paspalidium* is widespread throughout the tropical regions of the world with approximately 40 species (Jacobs and Wall 1993b). In Australia it comprises approximately 22 species of which 12 occur in south east Queensland (Stanley and Ross 1989).

Paspalidium grandispiculatum B.K. Simon was formally described in 1982 from material collected 14 km north of Helidon (Simon 1982). The botanical description of *Paspalidium grandispiculatum* is as follows:

Perennial grass up to 150 cm tall with robust woody underground rhizomes. Culms woody smooth, glaucous to pruinose, branched at some nodes throughout the culm length. The leaf-sheaths are

glabrous and smooth. The leaf-blades are linear, up to 10 cm long by 0.4 cm wide and scaberulous on nerves particularly on the underside. At the junction of the leaf-sheath and leaf-blade there is a fringe of whitish hairs. Spikelets are 3.5-4.5 mm long and have 2 flowers. Each spikelet is accompanied by a bristle arising from the stalk beneath the spikelet. The bristles are 3-8 mm long. The spikelets are irregularly gathered at the end of the stems. For a more detailed description and illustration refer to Simon (1982).

P. grandispiculatum is distinguished from all other Australian species of *Paspalidium* by its large spikelets and characteristic woody culms arising from robust woody rhizomes (Simon 1982).

3.27.3 Current conservation status

P. grandispiculatum is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.27.4 Distribution and abundance

P. grandispiculatum was not surveyed during the present study. Details from Queensland Herbarium specimens of *P. grandispiculatum* are listed in Appendix 1.26. Five specimens of *P. grandispiculatum* have been collected in Queensland. Four of the specimens come from a single locality along the Helidon-Ravensbourne Road, while the other record is from the Beaudesert district. There is no information available on population size at either of the localities. *P. grandispiculatum* has been recorded recently in Doubleduke State Forest, north east of Grafton, New South Wales. It is apparently a dominant species in the understorey of the open forest where it occurs (A. Benwell pers. comm.). One other locality has been recorded in the CORVEG database from Queensland. This is 5 km north north west of Helidon on private land. At the time (February 1997) the area was being used for the extraction of gravel by the Gatton Shire Council (P. Grimshaw pers. comm.). *P. grandispiculatum* was a common understorey species at the site (P. Grimshaw pers. comm.). None of the sites is in an area set aside for conservation of habitat. In Queensland the distribution of *P. grandispiculatum* has a range of approximately 100 km and encompasses an area of occurrence of approximately 1600 km².

3.27.5 Habitat

Very little habitat information is available. At the original collection site *P. grandispiculatum* was recorded growing in an open eucalypt forest with *Acacia complanata* in the shrub layer. The only other information available comes from the CORVEG database. The species was growing in a tall open forest on sandstone in brown loam along a gently sloping gully at an altitude of 220 m. The common canopy species are *Corymbia trachyphloia*, *Eucalyptus acmenoides* and *E. taurina*. The common understorey species were *Leptospermum trinervium*, *Acacia complanata*, *A. julifera*, *Bursaria spinosa*, *Paspalidium grandispiculatum*, *Entolasia stricta*, *Themeda triandra*, *Lepidosperma laterale*, *Daviesia villifera*, *Leucopogon biflorus* and *Notelaea linearis*.

3.27.6 Life history and ecology

There have been no studies into the biology or autecology of *P. grandispiculatum*. *P. grandispiculatum* is a perennial grass with a stout rhizome. The main methods of reproduction are by sexually produced seeds and vegetatively by the division of the rhizome. It has been recorded

flowering from January to May. There is no information available about the viability or longevity of the seed.

The species' response to grazing or habitat disturbance is unknown. The above-ground parts of *P. grandispiculatum* are killed by fire but the species is capable of regenerating from the rhizome.

3.27.7 Threats

The lack of information about the present population levels and precise habitat requirements of *P. grandispiculatum* make it difficult to assess threats to this species.

The extraction of gravel from near the site on private land may be a major threat to the population.

3.27.8 Management, research and conservation measures

This species requires detailed surveys to assess previously recorded localities and to collect information on habitat requirements. Additional surveys are also required to establish if any further populations of this species occur in the region. These surveys would need to be carried out during the flowering period from January to May.

For those populations that occur on freehold land, liaison should be undertaken with land owners and the Gatton Shire Council to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*.

3.28 PLECTRANTHUS NITIDUS P.I. FORST.

3.28.1 Summary

Plectranthus nitidus is restricted to south-eastern Queensland and north-eastern New South Wales, from the Nightcap Range north to the McPherson Range. There are two records in Queensland with one site possibly conserved in Springbrook National Park near the Mudgeeraba - Springbrook road. The other record is from the Land Warfare Centre near Canungra. There is no information on population sizes at these sites. Potential threats to the survival of the species at the Springbrook location include roadside clearing, invasion of habitat by weeds and fire.

3.28.2 Species description and identification

The genus *Plectranthus* is placed in the mint family (Lamiaceae). *Plectranthus* is widespread throughout the tropical regions of Africa to Asia and Australia with approximately 200 species (Mabberley 1997). In Australia it comprises approximately 40 species of herbs and herbaceous shrubs.

Plectranthus nitidus was formally described in 1992 from cultivated material collected from the upper reaches of Terania Creek in the Nightcap Range, New South Wales, approximately 30 km north of Lismore (Forster 1992). The botanical description of *Plectranthus nitidus* is as follows:

Herb to 40 cm high, foliage scentless. Stems or lateral branches erect to straggling, the lower parts fleshy and up to 8 mm thick; upper parts with scattered, antrorse, 2-4-celled non-glandular trichomes up to 0.1 mm long, lacking glandular trichomes and sessile glands. Leaves discolorous; petiole 11-30 mm long; lamina lanceolate-ovate, 25-55 mm long, 15-30 mm wide, fleshy, serrate with 6-8 teeth on each margin; upper surface green, glabrous, veins impressed; lower surface purple, veins raised, with scattered, antrorse, 2-4-celled non-glandular hairs to 0.1 mm long, lacking glandular trichomes, with very scattered 8-celled sessile glands. Flowers in compact cymose clusters, arranged into terminal racemes 20-40 cm long. Clusters 6-10 flowered; pedicels 4.0-6.3 mm long. Calyx 2.5-2.7 mm long. Corolla 8-9 mm long, lilac-white; tube 3.8-4.4 mm long, abruptly curved at an angle of 25-30° 1.5-1.7 mm from base, glabrous; upper lobes subcircular, 2.2-2.5 mm long, 2.0-2.2 mm wide; lateral lobes oblong, 1.5-1.8 mm long, 0.8-1.0 mm wide; lower lobe oblong, 3.5-3.9 mm long, 2.3-3.1 mm wide. Fruiting calyx 3.6-3.8 mm long; upper lobe ovate, 1.8-2.8 mm long, 1.3-2.6 mm wide; lateral lobes lanceolate-falcate, 1.5-2.2 mm long, 0.7-0.9 mm wide; lower lobes lanceolate-falcate, 2.2-3.1 mm long, 0.6-0.8 mm wide. Seeds hemi-spherical, shiny black, 0.9-1 mm long, 0.5-0.8 mm wide, 0.3-0.4 mm thick (Forster 1992). For a more detailed description and illustrations, refer to Forster (1992).

Plectranthus nitidus is related to *P. apreptus* from north Queensland but differs from this species in its stems, leaves and racemes lacking glandular hairs and nearly always lacking sessile glands; the axis bracts lanceolate-triangular and 3.6-3.8 mm long; and the corolla tube bent at 25-30°, 1.5-1.7 mm from the base. It is distinguishable from other species of *Plectranthus* in south east Queensland by its stems, branches, floral axes and the lower surface of the leaves having antrorse, non-glandular hairs.

3.28.3 Current conservation status

Plectranthus nitidus is presently listed on the schedule of the Queensland *Nature Conservation* 1992 as “endangered wildlife”. It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act* 1992. The species has not been assigned a national conservation status by ANZECC (1993).

3.28.4 Distribution and abundance

P. nitidus is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from the Nightcap Range north to the McPherson Range. It has a distribution range of approximately 60 km. *P. nitidus* was not surveyed during the present study. Details from Queensland Herbarium specimens of *P. nitidus* are listed in Appendix 1.27. There is a single record in Queensland from near the Mudgeeraba - Springbrook road. This site appears to be within Springbrook National Park but this needs to be confirmed. Recently, a second record for Queensland has been found at the Land Warfare Centre near Canungra. There is no information available on population sizes of this species in Queensland.

3.28.5 Habitat

P. nitidus has been reported growing on damp rocks on cliff faces and rocky outcrops in subtropical rainforest or bordering subtropical rainforest. Recorded at 180 m above sea level.

3.28.6 Life history and ecology

There have been no studies into the biology or autecology of *Plectranthus nitidus*. *P. nitidus* is a herb with an unknown life span. It is easily propagated by cuttings. The main method of reproduction is by sexually produced seeds. *P. nitidus* as with most other *Plectranthus* spp. produces roots from branch nodes where the branches come in contact with the soil surface. It is

believed that the plants are fire-sensitive (P. Forster pers. comm.). The continued existence of this species after fire would rely on successful seedling recruitment.

P. nitidus has been recorded flowering in February. The pollinators of *P. nitidus* are unknown. Pollinators reported for the family Lamiaceae include bees, birds, flies, wasps, butterflies and hawkmoths (Huck 1992). The most common pollinators for *Plectranthus* are bees and flies (Huck 1992). Fruits develop and mature soon after flowering. The fruit comprise 4 (1-seeded) nutlets which fall from the fruit after maturity. There is no information about seed viability and germination.

3.28.7 Threats

The site along the Mudgeeraba - Springbrook road may be subject to roadside clearing as part of road maintenance.

Another potential threat to the species is habitat invasion by exotic species, particularly lantana (*Lantana camara*), mist flower (*Ageratina riparia*) and Crofton weed (*Ageratina adenophora*).

The species is suspected to be fire-sensitive and incapable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from seed (obligate seeder). If fires were at a frequency that did not allow the production of adequate seed for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites. However, the habitat in which the species has been observed provides some degree of protection from frequent burning in that the rocky outcrops may buffer plants from fires.

3.28.8 Management, research and conservation measures

Very little is known about this species. Previously recorded sites should be examined to establish the population sizes and extent. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences. Observations should be made on potential threatening processes. The spread of weeds, the impact of fire and the condition of habitat on the rock faces should be monitored.

Relevant management bodies should be made aware of population localities.

3.29 PLECTRANTHUS OMISSUS P.I. FORST.

3.29.1 Summary

Plectranthus omissus is endemic to south-eastern Queensland where it is recorded from the Kilkivan and Gympie districts. The distribution of *P. omissus* has a range of approximately 70 km and encompasses an area of occurrence of approximately 700 km². It is recorded from 3 sites all within State Forests lands. The population at Timber Reserve (TR) 26 was estimated to comprise 30-40 plants. There is no information available on population sizes at the other sites. The species is not within any areas set aside for conservation purposes. The species is threatened by weed infestation by lantana (*Lantana camara*) and blue billygoat weed (*Ageratum houstonianum*).

3.29.2 Species description and identification

The genus *Plectranthus* is placed in the mint family (Lamiaceae). *Plectranthus* is widespread throughout the tropical regions of Africa to Asia and Australia with approximately 200 species (Mabberley 1997). In Australia it comprises approximately 40 species of herbs and herbaceous shrubs.

Plectranthus omissus was formally described in 1992 from material collected in TR 26, approximately 8 km north of Kilkivan (Forster 1992). The botanical description of *Plectranthus omissus* is as follows:

Subshrub to 100 cm high, foliage slightly aromatic. Stems or lateral branches erect to straggling, the lower parts woody and up to 10 mm thick; upper parts with sparse to dense, retrorse, 6-8-celled non-glandular silver trichomes up to 0.6 mm long but commonly much shorter, lacking glandular trichomes, with sparse sessile 4-celled glands. Leaves concolorous; petiole 25-36 mm long; lamina broadly ovate, 20-80 mm long, 30-60 mm wide, somewhat fleshy, serrate with 17-19 teeth on each margin; both surfaces with dense, retrorse, 6-8-celled non-glandular hairs silver hairs, lacking glandular hairs, with sparse to dense sessile 4-celled glands. Flowers in compact cymose clusters, arranged into terminal racemes 15-35 cm long. Clusters 14-16-flowered; pedicels 3-3.5 mm long. Calyx 2.6-2.8 mm long. Corolla 8.5-8.8 mm long, lilac; tube 4.8-5.0 mm long, abruptly curved at an angle of c. 110-130° c 1.4 mm from base, with scattered, divaricate, 4-6-celled non-glandular trichomes to 0.4 mm long, lacking glandular trichomes, with scattered sessile 4-celled glands; upper lobes subcircular, 2.4-2.5 mm long, 2.4-2.5 mm wide; lateral lobes ovate, 1.0-1.2 mm long, c. 0.8 mm wide; lower lobe, oblong, 4.4-4.5 mm long, 3.0-3.2 mm wide. Fruiting calyx 4.0-4.8 mm long; upper lobe lanceolate-triangular, 1.7-1.8 mm long, 1.2-1.4 mm wide; lateral lobes lanceolate-falcate, 1.3-1.5 mm long, c. 1.2 mm wide; lower lobes lanceolate-falcate, 2.4-2.5 mm long, 0.5-0.6 mm wide. Seeds hemi-spherical, 0.7-0.8 mm long, c. 0.7 mm wide, 0.4 mm thick (Forster 1992). For a more detailed description and illustration refer to Forster (1992).

Plectranthus omissus is superficially similar to *P. argentatus* and *P. torrenticola* but differs from them by a number of characters that are set out in Table 3.29.1.

3.29.3 Current conservation status

Plectranthus omissus is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “endangered wildlife”. It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*. The species has not been assigned a national conservation status by ANZECC (1993).

TABLE 3.29.1. CHARACTERS DISTINGUISHING PLECTRANTHUS OMISSUS, PLECTRANTHUS ARGENTATUS AND PLECTRANTHUS TORRENTICOLA

| Character | <i>P. omissus</i> | <i>P. torrenticola</i> | <i>P. argentatus</i> |
|---|-------------------|------------------------|----------------------|
| 4-celled sessile glands | present | absent | present |
| flower number/cluster | 14-16 | 10-12 | 6-10 |
| corolla tube angle (°) | 110-130 | 30 | 0-10 |
| trichomes on corolla tube | present | absent | absent |
| corolla upper lobe size (length x width mm) | 2.4-2.5 x 2.4-2.5 | 1.7-2.1 x 1.9-2.2 | 1.4-1.5 x 1.5-1.7 |
| corolla lower lobe size (length x width mm) | 4.4-4.5 x 3-3.2 | 4.6-5.6 x 2.7-4.5 | 4-4.2 x 4-4.2 |

3.29.4 Distribution and abundance

Plectranthus omissus was not surveyed during the present study. Details from Queensland Herbarium specimens of *P. omissus* are listed in Appendix 1.28. *P. omissus* is restricted to the Kilkivan and Gympie districts in south-eastern Queensland. There are two locality records on the database with another record currently being processed. All sites are within state forest lands (beauty spot 11, TR 26 Fty 250; SF 393 Fty 1146; SF 67 Fty 1173). The population at TR 26 was estimated to comprise 30-40 plants (Forster 1992). There is no information available on population sizes at the other sites. The distribution of *P. omissus* has a range of approximately 70 km and encompasses an area of occurrence of approximately 700 km².

3.29.5 Habitat

P. omissus has been recorded on steep rocky outcrops approximately 300-400 m above sea level on the margin of vine forest or sclerophyll forests.

3.29.6 Life history and ecology

There have been no studies into the biology or autecology of *Plectranthus omissus*. *P. omissus* is a herbaceous shrub with an unknown life span. It is easily propagated by cuttings. The main method of reproduction is by sexually produced seeds. *P. omissus* as with most other *Plectranthus* produces roots from branch nodes where the branches come in contact with the soil surface. It is believed that the plants are fire-sensitive (P. Forster pers. comm.).

P. nitidus has been recorded flowering in February and March. The pollinators of *P. omissus* are unknown. Pollinators reported for the family Lamiaceae include bees, birds, flies, wasps, butterflies and hawkmoths (Huck 1992). The most common pollinators for *Plectranthus* are bees and flies (Huck 1992). Fruits develop and mature soon after flowering. The fruit comprise 4 (1-seeded) nutlets which fall from the fruit after maturity. There is no information available on seed viability and germination of this species.

3.29.7 Threats

The area around the population in TR 26 is infested with lantana (*Lantana camara*) and blue billygoat weed (*Ageratum houstonianum*). These exotic species are considered to be a potential threat to the long term survival of the species.

The species is suspected to be fire-sensitive and incapable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from seed (obligate seeder). If fires were at a frequency that did not allow the production of adequate seed for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites. However, the habitat in which the species has been observed provides some degree of protection from frequent burning in that the rocky outcrops may buffer plants from fires.

3.29.8 Management, research and conservation measures

Very little is known about this species. Previously recorded sites should be examined to establish the population sizes and extent. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences. Observations should be made on potential threatening processes. The spread of weeds, the impact of fire and the condition of habitat on rock faces should be monitored. Monitoring and control of the spread of weeds on the rock face at TR 26 should be undertaken.

3.30 PLECTRANTHUS TORRENTICOLA P.I. FORST.

3.30.1 Summary

Plectranthus torrenticola is restricted to south east Queensland where it occurs from Kenilworth to Bli Bli. The distribution of *P. torrenticola* has a range of approximately 35 km and encompasses an area of occurrence of approximately 500 km². It is recorded from SF 1239 (Fty 1255), SF 918 (Fty 678) and from Kondallila National Park. There is no quantitative data on population sizes. A current threat to the Kondallila National Park population is considered to be habitat disturbance from pedestrian traffic.

3.30.2 Species description and identification

The genus *Plectranthus* is placed in the mint family (Lamiaceae). *Plectranthus* is widespread throughout the tropical regions of Africa to Asia and Australia with approximately 200 species (Mabberley 1997). In Australia it comprises approximately 40 species of herbs and herbaceous shrubs.

Plectranthus torrenticola was formally described in 1992 from material collected in State Forests, approximately 15 km north west of Nambour (Forster 1992). The botanical description of *Plectranthus torrenticola* is as follows:

Subshrub to 30 cm high, foliage slightly aromatic. Stems or lateral branches erect to straggling, the lower parts woody and up to 5 mm thick; upper parts with dense, retrorse, 5-8-celled non-glandular silver trichomes to 0.4 mm long, lacking glandular trichomes and sessile glands. Leaves discolorous; petiole 8-18 mm long; lamina narrow ovate, 20-60 mm long, 20-50 mm wide, fleshy, serrate with 10-16 teeth on each margin; both surfaces with sparse to dense, retrorse, 4-8-celled glandular and non-glandular hairs silver hairs, lacking sessile glands. Flowers in compact cymose clusters, arranged into terminal racemes 20-30 cm long. Clusters 10-12-flowered; pedicels 3-5 mm long. Calyx 1.8-2.1 mm long. Corolla 9.8-12.2 mm long, light -purple; tube 5.3-6.0 mm long, abruptly curved at an angle of c. 30° 2.1-2.2 mm from base, glabrous; upper lobes subcircular, 1.7-2.1 mm long, 1.9-2.2 mm wide; lateral lobes broadly-ovate, 0.9-1.1 mm long, 0.9-1.0 mm wide; lower lobe, oblong, 4.6-5.6 mm long, 2.7-4.5 mm wide. Fruiting calyx 5.4-6.0 mm long; lobes longer than or equal to tube. Seeds semi-spherical, c. 0.8 mm long, 0.8 mm wide, 0.5 mm thick, brown (Forster 1992). For a more detailed description and illustration refer to Forster (1992).

Plectranthus torrenticola is superficially similar to *P. argentatus* and *P. omissus* but differs from them by a number of characters that are set out in Table 3.30.1.

TABLE 3.30.1. CHARACTERS DISTINGUISHING PLECTRANTHUS TORRENTICOLA, PLECTRANTHUS ARGENTATUS AND PLECTRANTHUS OMISSUS

| Character | <i>P. torrenticola</i> | <i>P. argentatus</i> | <i>P. omissus</i> |
|---|------------------------|----------------------|-------------------|
| 4-celled sessile glands | absent | present | present |
| flower number/cluster | 10-12 | 6-10 | 14-16 |
| corolla tube angle (°) | 30 | 0-10 | 110-130 |
| trichomes on corolla tube | absent | absent | present |
| corolla upper lobe size (length x width mm) | 1.7-2.1 x 1.9-2.2 | 1.4-1.5 x 1.5-1.7 | 2.4-2.5 x 2.4-2.5 |
| corolla lower lobe size (length x width mm) | 4.6-5.6 x 2.7-4.5 | 4-4.2 x 4-4.2 | 4.4-4.5 x 3-3.2 |

3.30.3 Current conservation status

Plectranthus torrenticola is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “endangered wildlife”. It is also listed on Schedule 1 Part 1 (endangered) of the Commonwealth *Endangered Species Protection Act 1992*. The species has not been assigned a national conservation status by ANZECC (1993).

3.30.4 Distribution and abundance

P. torrenticola was not surveyed during the present study. Details from Queensland Herbarium specimens of *P. torrenticola* are listed in Appendix 1.29. *Plectranthus torrenticola* is restricted to south east Queensland where it occurs between Kenilworth and Bli Bli. A total of eight collections have been made. There are currently four known sites, including two within State Forest (SF 918 Fty 678, SF 1239 Fty 1255) and one in Kondallila Falls National Park. Another site is Dunethin Rock near Bli Bli. There is no quantitative information available on population sizes. The information on one specimen (AQ 565525) indicates that *P. torrenticola* was a frequent species on the rock outcrops in the vicinity of the collection site in SF 1239. The distribution of *P. torrenticola* has a range of approximately 35 km and encompasses an area of occurrence of approximately 500 km².

3.30.5 Habitat

P. torrenticola has been recorded growing on rocky outcrops on hillslopes or along edges of creeks in open eucalypt forest and on the margin of rainforest at altitudes of 250 to 450 m. The soils are shallow. In adjoining dry sclerophyll forest communities the common dominant trees are *Eucalyptus pilularis*, *E. grandis*, *E. propinqua* and *Lophostemon confertus*.

3.30.6 Life history and ecology

There have been no studies into the biology or autecology of *Plectranthus torrenticola*. *P. torrenticola* is a herbaceous shrub with an unknown life span. It is not known to be cultivated. The main method of reproduction is by sexually produced seeds. *P. torrenticola* as with most other *Plectranthus* produces roots from branch nodes where the branches come in contact with the soil surface. It is believed that the plants are fire-sensitive (P. Forster pers. comm.).

P. torrenticola has been recorded flowering between February and April. The pollinators of *P. torrenticola* are unknown. Pollinators reported for the family Lamiaceae include bees, birds, flies, wasps, butterflies and hawkmoths (Huck 1992). The most common pollinators for *Plectranthus* are bees and flies (Huck 1992). Fruits develop and mature soon after flowering. The fruit comprises 4 (1-seeded) nutlets which fall from the fruit after maturity. There is no available information on seed viability and germination of this species.

3.30.7 Threats

The lack of information about present population levels of *P. torrenticola* and precise habitat requirements makes it difficult to assess threats to this species. *P. torrenticola* is reported to be threatened by disturbance caused by visitation at Kondallila Falls National Park (Forster 1992).

3.30.8 Management, research and conservation measures

Very little is known about this species. Previously recorded sites should be examined to establish population sizes and extent. Areas of likely habitat in the vicinity of known populations should be searched for further occurrences. Observations should be made on potential threatening processes.

Locations of recorded populations should be brought to the attention of reserve managers. Attempts should be made to minimise the impact of pedestrian traffic on the population at Kondallila Falls National Park.

3.31 *PROSTANTHERA* SP. (MT TINBEERWAH P.R.SHARPE 4781)

3.31.1 Summary

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) is known from four sites near Tewantin in south east Queensland. It has a distribution range of approximately 5 km with a area of occurrence of approximately 7 km². Two of the populations are on freehold land, and two on state forest land. The total area of occupancy is approximately 2 hectares. The largest known population is on freehold land. *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) occurs in shrubland on rocky hillslopes and in tall open forest on gently inclined slopes or flat terrain on the coastal plain. Potential threats to the survival of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) arise from inappropriate fire regime, weed invasion of the habitat and the lack of secure tenure.

3.31.2 Species description and identification

The genus *Prostanthera* is placed in the mint family (Lamiaceae). *Prostanthera* is endemic to Australia where there are approximately 100 species distributed throughout all states.

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) has not been formally described under the conventions in the International Code of Botanical Nomenclature. The botanical description of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is as follows:

Low, straggling or compact shrub to 1 m high, strongly aromatic; branches glabrous except for a band of hairs between lateral ridges; hairs short, curled and antrorse. Leaves with lamina obovate to more or less spathulate, 5-9 mm long, 4-8 mm wide; apex rounded; base long-attenuate; margins entire; upper surface mid green, lower surface, moderately covered with more or less sessile glands; petiole 1-2 mm long. Flowers axillary, part-inflorescence 1-flowered; bracteoles not persistent, size not known. Calyx 4-4.5 mm long; tube 2-2.5 mm long; upper lobe c. 2 mm long, slightly enlarged in fruit. Corolla 6-7 mm long, bluish. Anthers with appendage 0.5-0.7 mm long. Fruit comprising of 4 rugose mericarps, approximately 1.5 mm long (see **Plate 26**).

The species belongs in the section *Prostanthera*. This section of the genus is distinguished in having calyx lobes of unequal length; corollas mauve to blue-purple or white; corolla tube short, broad apically; lower corolla lobe longer and more spreading than the erect upper lobes; fruits enclosed by inward folded lower calyx lobe; and the upper calyx lobe usually recurved.

The affinities of this species are presently uncertain. Examination of Queensland Herbarium material shows that this species closely resembles a recently described species, *Prostanthera*

palustris B.J. Conn, from the Bundjalung N.P. near Evans Head in northern New South Wales. The description of *P. palustris* clearly indicates that it has non-aromatic leaves and that this is one of the distinguishing features of this species (Conn 1997). *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) appears to differ only from *P. palustris* in having strongly aromatic leaves. *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) and *P. palustris* appear to be the same species but this will need to be confirmed. *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is easily distinguished from other *Prostanthera* species in south east Queensland by its obovate to more or less spatulate leaves.

3.31.3 Current conservation status

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as “vulnerable wildlife”. It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*. ANZECC (1993) referred to this species under the name *Prostanthera* sp. Mt Tinbeerwah (C. Sandercoe C1286) when assigning it a national conservation status of V (vulnerable).

3.31.4 Distribution and abundance

A compilation of Queensland Herbarium records of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is presented in Appendix 1.30. This species was only known from three specimens collected in the proximity of Mt Tinbeerwah, approximately 10 km west of Noosa. Another population was reported to occur on the rocky outcrop on Mt Tinbeerwah but had never been vouchered (Mr G. Thomas pers. comm.). Two of the four known sites are on freehold land and two are on State Forest land. Only three of the four sites have been located by the present survey work. Information on habitat and locality data for the site not visited during the present survey has been supplied from field notes of the original collector (C. Sandercoe pers. comm.).

Detailed information of these populations are presented in Appendix 2.9. A summary of population information is presented in Table 3.31.1. The distribution of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) has a range of approximately 5 km and encompasses an area of occurrence of approximately 7 km². The total population is estimated to be less than 2000 individuals.

Lot 183: This occurrence was originally thought to be within Tewantin State Forest. The stand is on the waning lower slope of Mt Tinbeerwah, below the southern cliff face. The population of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) was only estimated visually because the ground layer was very dense and the plants of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) were interwoven in the vegetation. It was apparent in the field that an accurate count could be achieved only by tracing all stems back to their sources. Apart from being very time-consuming, it would have caused the destruction of the plants and the surrounding vegetation.

Illoura Place: This occurrence is situated near the western boundary of the freehold block. A large portion of the block has been cleared in the past but has been allowed to regenerate naturally. Where *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) occurs, it appears that the land has only been partially cleared. The freehold property to the west has been heavily grazed.

Mt Tinbeerwah: This occurrence is within Tewantin State Forest (SF 959 Fty 1295). The population is accessible from the walkway from the carpark to the summit of the mountain. The stand of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) extends over an area of approximately 200 m by 50 m. At this site *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) grows in the shallow pockets of soil that are scattered over the rock face. There are no commercial timber values

in the vicinity of the population. The area is presently managed jointly by Department of Natural Resources and the Department of Primary Industries, Forestry.

TABLE 3.31.1. ESTIMATED ABUNDANCE, AREA OF OCCUPANCY AND LAND TENURE FOR *PROSTANTHERA* SP. (MT TINBEERWAH P.R.SHARPE 4781) SITES IN QUEENSLAND SURVEYED IN 1997.

| Site | Date sampled | Population size | Area occupied (m ²) | Land tenure |
|--------------------------------|--------------|-------------------------|---------------------------------|-------------|
| Mt Tinbeerwah (Tewantin SF) | 7 Oct 1997 | 52 mature 8 juvenile | 10000 | SF |
| Lot 1/RP205063 (Illoura Place) | 27 Oct 1997 | 21 mature | 30 | Freehold |
| Lot 183/MCH947 | 27 Oct 1997 | 500-1000 mature | 10000 | Freehold |
| Tewantin SF (Sandercoe C1286) | 4 Dec 1997 | unknown | unknown | SF |
| Total | | 500-1000 | +20030 | |

3.31.5 Habitat

The habitat data for the four sites are set out in Appendix 2.9.

Lot 183: The site is situated on the lower southern slope of Mt Tinbeerwah. The soil is a black clay loam with a surface pH 4.2. The geology is mapped as Myrtle Creek Sandstone. The vegetation structure is a layered very tall open forest. The common overstorey trees are *Syncarpia glomulifera* subsp. *glomulifera*, *Corymbia intermedia* and *Eucalyptus pilularis*. Common mid-stratum species are *Allocasuarina littoralis*, *Synoum glandulosum* and *Leptospermum polygalifolium*. The ground layer is dense. The common species included *Schoenus melanostachys*, *Gahnia clarkei*, *Dianella longifolia*, *Smilax australis*, *Prostanthera* sp. (Tinbeerwah P.R.Sharpe 4781) and *Lomandra hystrix*.

Mt Tinbeerwah (**Plate 28**): The site occurs on the steep rocky platform. The soils are shallow reddish black loam with a high organic content and pH 4.2. The geology is mapped as Tertiary, trachyte, comendite, trachyrhyolite, mangerite, syenite. The vegetation structure is an open shrubland. Common species included *Leptospermum microcarpum*, *Acacia hubbardiana*, *Allocasuarina littoralis*, *Commersonia* sp. (Mt Tinbeerwah G.P.Guymer 1786), *Goodenia rotundifolia*, *Lepidosperma laterale*, *Aristida benthamii* var. *benthamii*, *Dianella caerulea* var. *vannata*, *Digitaria parviflora*, *Eriostemon difformis* subsp. *smithianus*. A number of exotic weed species were observed around the lookout on the summit and on the disturbed soil at the edge of the walkway from the carpark. These included: *Bidens pilosa*, *Brachiaria decumbens*, *Conyza sumatrensis*, *Eragrostis mexicana* subsp. *mexicana*, *Ipomoea batatas*, *Lantana camara*, *Melinis minutiflora* and *Melinis repens*.

Illoura Place (**Plate 29**): The site is situated on the gently undulating coastal plain. The soil is a dark reddish brown loam with a surface pH 4.5. The geology is mapped as Quaternary alluvium. The vegetation at the site has been partially cleared. The vegetation structure is a tall open forest. The common overstorey trees are *Syncarpia glomulifera* subsp. *glomulifera*, *Corymbia intermedia* and *Eucalyptus umbra*. The understorey is mid-dense with the common species including *Acacia aulacocarpa*, *Alphitonia excelsa*, *Elaeocarpus obovatus*, *Petalostigma triloculare*, *Melaleuca nodosa*, *Dianella caerulea* var. *vannata*, *Entolasia stricta*, *Hibbertia aspera*, *Pultenaea myrtooides*, *Pultenaea retusa*, *Zieria minutiflora*, *Melaleuca quinquenervia* and *Lomandra longifolia*.

Tewantin SF (Sandercoe 1286): The site is situated on a flat sandy area near a drainage line in the eastern end of the State Forest near Harry Spring Environmental Park. The vegetation structure is a tall open forest. The common overstorey trees are *Eucalyptus resinifera*, *Syncarpia glomulifera* and *Corymbia intermedia*.

3.31.6 Life history and ecology

There have been no studies into the biology or autecology of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781). *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is not known to be in cultivation but a number of *Prostanthera* species have been cultivated as common garden plants for many years (Wrigley and Fagg 1996). *Prostanthera* species are readily propagated from cuttings.

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) is a herbaceous shrub with an unknown life span. The main method of reproduction is by sexually produced seeds. However, *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) has been observed to produce roots from branch nodes where the branches come in contact with the soil surface (**Plate 27**) Observations of the population on Mt Tinbeerwah indicate that the plants are fire-sensitive. The species does not appear to have a lignotuber or similar root structures so regeneration after fire relies on the successful germination of seed. However, *Prostanthera palustris* (*Prostanthera* sp. 7) in New South Wales was observed to apparently resprout from basal stem buds, after a high-intensity fire (Quinn *et al.* 1995).

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) has been recorded flowering in January, April and November. The most common pollinators of section *Prostanthera* have been reported to be bees (Conn 1984). Fruits develop and mature soon after flowering. The fruit comprises 4 (1-seeded) nutlets which fall from the fruit after maturity. There is no information about seed viability and germination.

3.31.7 Threats

In the light of the available information, current or potential threats to the continued survival of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) in the wild are an inappropriate fire regime, weed invasion of the habitat and the lack of secure tenure for the largest known populations.

Two of the four known sites are on freehold land where changes of land management may lead to the destruction of the populations. The lack of secure land tenure for these two sites is a direct threat to the long term viability of the species at those sites and possibly to the long term viability of the species as a whole in south east Queensland.

The Mt Tinbeerwah population is on the rock outcrop north of the walkway from the carpark to the summit. Presently the population is free of exotic weed species. However there are several exotic species on the shallow soils along the edge of the walkway and around the lookout at the summit. There is a potential for these exotic plant species to encroach on the habitat of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781). The impact that such a weed species invasion would have on *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is uncertain. However, it can be assumed that weeds would change the vegetation structure and lead to increased competition for available habitat resources. Therefore a potential threat to *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is the invasion of weed species into the habitat.

Anecdotal evidence suggest that plants of *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) are fire-sensitive and are not capable of regenerating from underground organs. The continued existence of the species in the wild after a fire would require the regeneration of the species from

seed (obligate seeder). If fires were at a frequency that did not allow the replenishment of adequate seed in the seedbank for future recruitment events then the population would decline and the species would be eliminated from the area. This is a potential threat at all sites. However, the habitat at Mt Tinbeerwah may provide some degree of protection from frequent burning in that the rocky outcrops and pavements buffer plants from fires.

3.31.8 Management, Research and Conservation Measures

One of the first steps towards the protection of this species in the wild should be to protect the existing populations and their habitat. The majority of the population is on two lots of freehold land. Liaison with land owners and local authorities are required to make them aware of the presence of the species and the importance of protecting the populations. Discussions should be undertaken with the land holders in regard to protecting the areas with Conservation Agreements under the Queensland *Nature Conservation Act 1992*. The acquisition of the areas appears unwarranted because of their small size and lack of other biodiversity benefits.

Targeting the lack of autecological data is another priority that should be undertaken for *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781). Research should focus on providing quantitative data on fire ecology, reproduction biology and population dynamics of the species. Such information is crucial for rational management decisions to be made in the future.

The spread of weeds and the condition of habitat on the rock face at Mt Tinbeerwah should be monitored.

Further surveys should be undertaken with the State Forest areas, especially to relocate the State Forest site that was not located in the current survey.

Prostanthera sp. (Mt Tinbeerwah P.R.Sharpe 4781) assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Endangered, ie. is facing a high risk of extinction in the wild in the near future, as defined by criteria B.1, 2.b&e. Extent of occurrence estimated to be less than 5000 km² or area of occupancy estimated to be less than 500 km², and estimates indicating: known to exist at no more than five locations; and continuing decline inferred in area of occupancy and number of mature individuals. On this assessment the present status of Vulnerable for *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) is considered inappropriate and should be updated to Endangered.

3.32 RHODAMNIA SP. (CALLIOPE N. GIBSON 1335)

3.32.1 Summary

Rhodamnia sp. (Calliope N. Gibson 1335) is known only from SF 583, 45 km S of Gladstone. A total of 19 plants are known in the wild spread over approximately 60 hectares. It grows in a simple microphyll/notophyll vineforest on hillcrests and moderately to very steeply inclined hillslopes with a southerly to easterly aspect and between 200 to 420 m above sea level. The soils are well drained, dark reddish brown loams with an acidic reaction. The species is currently not represented within a secure conservation reserve anywhere in the state. *Rhodamnia* sp. (Calliope N. Gibson 1335) is considered at risk due to its low known population size and exposure to continued threats associated with fire and the encroachment of lantana into its habitat.

3.32.2 Species description and identification

The genus *Rhodamnia* is placed in the family Myrtaceae. *Rhodamnia* occurs from southern China, Burma to Australia and New Caledonia with approximately 28 species (Scott 1979, Mabberley 1997). The genus is represented in Australia by 13 species which are distributed along the east coast.

Rhodamnia sp. (Calliope N. Gibson 1335) has not been formally described but has been recognised as a distinct taxon since 1995. The botanical description of *Rhodamnia* sp. (Calliope N. Gibson 1335) is as follows:

Erect tree to 8 m high; bark light grey to grey, scaly and shallowly furrowed. Young branches rounded, not winged, glabrous or sparsely sericeous but soon becoming glabrous. Leaves mostly concentrated near branch tips, decussate, opposite, strongly discolorous; petioles 2-4 mm long, channelled on upper surface; lamina narrowly elliptic or rarely obovate, sometimes slightly falcate, 20-70(-85) mm long, (3-)5-12(-15) mm side, cuneate at base, obtuse or broadly acute at apex; margin flat; upper surface sparsely sericeous becoming glabrous with age; lower surface very densely shortly tomentose; intramarginal veins prominent on both surfaces. Flowers in clusters of 2-7 on short axillary shoots; peduncle 1.5 mm long; bracteoles 2, ovate, c. 0.5 mm long, tip not exceeding base of sepal lobes. Hypanthium obconic, sparsely short sericeous. Sepals 4, persistent, fused at base, broadly rounded, 0.3-0.5 mm long, sparsely short sericeous. Petals 4, yellowish-white, widely ovate, c. 2.5 mm long, c. 3 mm wide, glabrous but slightly ciliate on margins. Stamens numerous, multiseriate, excluded; filaments 2-3 mm long; staminal disk glabrous. Style c. 5 mm long, glabrous. Fruit a soft berry, subglobose, 3-4 mm long, 4-5 mm diameter, glabrous or nearly so, yellowish red, 2-4-seeded (Snow and Guymmer in press, J. Brushe pers. comm.) (see **Plates 30, 31, & 32**).

Rhodamnia sp. (Calliope N. Gibson 1335) can be distinguished from other *Rhodamnia* species in south east Queensland by having 2-7 flowers in short-shooted axillary fascicles, narrowly elliptic leaves and primary lateral veins mostly less than 2 mm from the leaf margin.

3.32.3 Current conservation status

Rhodamnia sp. (Calliope N. Gibson 1335) is presently not listed on the schedule of the Queensland *Nature Conservation Act 1992*. It is not currently assigned a national conservation status or listed on the Commonwealth *Endangered Species Protection Act 1992*. However its inclusion on the Queensland Schedule of threatened wildlife as 'Endangered' is currently pending. It is to be added to the schedule because it has a very restricted distribution, is not in any formal conservation reserve and is threatened by weed invasion and fires encroaching into its habitat.

3.32.4 Distribution and abundance

A compilation of Queensland Herbarium records of *Rhodamnia* sp. (Calliope N. Gibson 1335) is presented in Appendix 1.31. All six specimens come from a single locality (and possibly from a single individual) in SF 583 (Fty 1595), approximately 45 km south of Gladstone. An area of approximately 1 hectare had been previously searched within the vicinity of the known individual revealing a total of 3 individuals (one mature and 2 juveniles) within this area. The present study examined the southern and northern slopes below the known locality. No other likely habitats were examined during this present study. Another vineforest along Koolkooroom Creek approximately 20 km south of the present site has been briefly examined but *Rhodamnia* sp. (Calliope N. Gibson 1335) was not observed to be present (P.I. Forster pers. comm.).

The total population of *Rhodamnia* sp. (Calliope N. Gibson 1335) was found to be 19 individuals. Another 16 individuals of *Rhodamnia* sp. (Calliope N. Gibson 1335) were recorded at 5 sites on 2 ridges within the state forest. Information on these populations is presented in Appendix 2.10. The distribution of *Rhodamnia* sp. (Calliope N. Gibson 1335) has a range of approximately 1 km and encompasses an area of occurrence of approximately 60 hectares. All sites are south of the original site. The largest stand consisted of 7 plants. Other stands consisted of 4, 3 and 2 solitary individuals. A total area of occupancy is estimated to be 3500 m².

The individuals of *Rhodamnia* sp. (Calliope N. Gibson 1335) observed were all mature plants 2-8 m high and generally healthy except for one individual at site 3. The latter plant consisted of a single young shoot arising from the base of a tree trunk that appeared to have recently died. No seedlings of *Rhodamnia* sp. (Calliope N. Gibson 1335) were observed.

3.32.5 Habitat

The sites are situated in mountainous terrain on hillcrests and moderate to very steeply inclined hillslopes mostly with a southerly to easterly aspect and at elevations between 200 and 420 m above sea level. The soils are well drained, dark reddish brown loams with a pH 6.2-6.8. The geology is mapped as Muncon Volcanics: intermediate and basic lava, tuff agglomerate, siltstone, lithic arenite, conglomerate, mudstone.

The vegetation in this community is somewhat intermediate between a simple microphyll/notophyll vine forest with *Araucaria* emergents and semi-evergreen microphyll vine thicket (**Plate 34**). The common canopy species are *Backhousia kingii*, *Choricarpia subargentea*, *Barklya syringifolia* and *Archidendropsis thozetiana*. Other common floristic elements observed around the *Rhodamnia* sites included *Diospyros geminata*, *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360), *Notelaea microcarpa*, *Carissa ovata*, *Lantana camara**, *Ancistrachne uncinulata*, *Phyllanthus pusillifolius*, *Croton acronychioides* and *Melodorum leichhardtii*.

3.32.6 Life history and ecology

There have been no studies made of the biology or autecology of *Rhodamnia* sp. (Calliope N. Gibson 1335) and because of its recent discovery there has been very little field observation and anecdotal evidence of its life history. Beardsell *et al.* (1993) have reviewed the reproductive biology of the Australian Myrtaceae while Lughadha & Proença (1996) have surveyed the reproductive biology of the Myrtoideae (Myrtaceae). There is no information presented in these reviews about the genus *Rhodamnia*.

A number of *Rhodamnia* species have been cultivated in Australia by the use of cuttings and seeds (Wrigley & Fagg 1996). *Rhodamnia* sp. (Calliope N. Gibson 1335) forms a tree up to 8 m high with a trunk up to 12 cm diameter and when mature is part of the upper stratum of the closed forest community. The longevity of individuals is unknown. It appears capable of resprouting from the base when the above-ground portion of an individual is killed (**Plate 33**). Most individuals observed were single trunked, except for two which were multistemmed from the ground level and appear to have developed from a resprouting event in the past.

Rhodamnia sp. (Calliope N. Gibson 1335) has been observed with immature fruits in December and mature fruits late January. Most mature plants observed in November were in the early stages of flowering with primordial flower buds present. Only one was in full flower. This individual appeared to be nearing its peak flowering and had numerous flowers clustered along the stems just

below the end of the branchlets. There was a faint perfume emanating from the flowers and nectar was observed to be present. The *Rhodamnia* has unspecialised flowers that may attract a wide range of pollinators. The most common pollinators of Australian Myrtaceae are insects (Beardsell *et al.* 1993) and this is the most likely group to be the pollen vector for *Rhodamnia* sp. (Calliope N.Gibson 1335). An introduced honey bee (*Apis mellifera*) was observed visiting the flowers of *Rhodamnia* sp. (Calliope N.Gibson 1335) during fieldwork in November.

Rhodamnia sp. (Calliope N.Gibson 1335) has been observed in fruit in late January (J. Brushe pers. comm.). The fruits of *Rhodamnia* sp. (Calliope N.Gibson 1335) are 3-4 mm in diameter and 1 to 4 seeded. The seed is surrounded by a soft, fleshy tissue with a yellowish red skin on the outside suggesting dispersal may be effected by animals. Of possible animal dispersal agents, birds and bats are the most likely. Other *Rhodamnia* species in south east Queensland which have similar fruits have been observed to be ingested by birds (Church 1997). In Australian rainforests, the most important bird species for seed dispersal are probably pigeons (Adam 1992). Another possible dispersal mechanism is downslope movement of fruit by gravity.

In their review of the reproductive biology of Australian Myrtaceae, Beardsell *et al.* (1993) concluded that self-incompatibility was common in the family and appeared to be the main method of enhancing outcrossing. However, Lughadha & Proença (1996) commented that there are as many reports of self-compatibility in the Myrtoideae as those of self-incompatibility. If *Rhodamnia* sp. (Calliope N.Gibson 1335) is self compatible the loss of genetic variation through self-crossing may be a major threat to the long term viability of the species with its small population of scattered individuals.

Field observations suggest that there is presently a lack of recruitment of *Rhodamnia* sp. (Calliope N.Gibson 1335) at the site.

The very restricted distribution *Rhodamnia* sp. (Calliope N.Gibson 1335) may indicate that it is rather selective in its environmental requirements.

It is suspected that all stages of the life cycle of *Rhodamnia* sp. (Calliope N.Gibson 1335) are fire-sensitive.

3.32.7 Threats

There are two major threats to the remaining population of *Rhodamnia* sp. (Calliope N.Gibson 1335), fire and weed invasion of the habitat.

Large tracts of the vine forest to the north and northwest of the known plants have been previously destroyed by fires. This area is now densely covered with lantana (*Lantana camara*) (**Plate 35**). Two of the known plants of *Rhodamnia* sp. (Calliope N.Gibson 1335) are within 50 m of this area. Lantana is the most significant environmental weed at the site. Past timber harvesting opened up tracks along the ridges which have become overgrown with lantana. Lantana in the understorey at high density provides fuel loads which will support fires moving into the vine forest. There are also reports indicating that lantana can have an allelopathic effect on a range of plant lifeforms (Achhireddy and Singh 1984).

A continuing low population size may also be a potential threat to the species in the long term. A restricted gene pool and inbreeding could lead to loss of genetic variation which would threaten the long term viability of the population.

3.32.8 Management, Research and Conservation Measures

The continued decline of the species can only be averted by removing threats to the populations. A strategy needs to be drawn up to address the following issues.

The principal habitat management issue for this species is the protection of its vineforest habitat from fires. A total fire exclusion policy should be practised. Liaison is needed with Department of Primary Industries, Forestry and rural landholders adjoining the State Forest to alert the local community to the issue of fire management within the area.

The eradication of weeds, particularly lantana (*L. camara*) from the habitat. Lantana is present throughout the vineforest. Control of such large infestations of a weed species can only be successfully and economically achieved by biological agents. Research into the biological control of *L. camara* is currently being undertaken by staff of the Department of Natural Resources.

Further surveys of habitat are required to substantiate whether there are any more populations in existence. The habitat is difficult to traverse because of the steepness of the slopes and density of the vegetation. So far only a small portion of the potential habitat has been examined and further searching of the immediate locality is likely to add to the known population size of this species. Apart from other nearby vine forest sites, other possible habitats worthy of investigation include the western slopes of Kroombit Tops and the vineforest communities in the Kalpower area (W.J.F. McDonald pers. comm.).

There is little information available on the ecology and reproductive biology of *Rhodamnia* sp. (Calliope N.Gibson 1335). Studies into the factors affecting recruitment and establishment of individuals is required. Loss of genetic variation is potentially a major threat to the long term viability of small populations of rare plant species. Investigations should be initiated into the level and structure of genetic variation, and the breeding system of *Rhodamnia* sp. (Calliope N.Gibson 1335). These investigations should focus on determining strategies for conserving the genetic resources of this species.

The whole of the vine forest should be considered for protection. The declaration of a State Forest Scientific Area under the *Forestry Act 1959* should be considered.

The present information indicates that *Rhodamnia* sp. (Calliope N.Gibson 1335) has a very small population which is geographically restricted, with an area of occurrence of approximately 60 hectares and an area of occupancy estimated to be 3500 m². The species is not conserved in any secure reserve. *Rhodamnia* sp. (Calliope N.Gibson 1335) assessed against the IUCN (1994) criteria for threatened wildlife falls into the category of Critical endangered, ie. is facing a high risk of extinction in the wild in the immediate future, as defined by criteria B.1, C.2 and D. B.1. Extent of occurrence estimated to be less than 100 km² or area of occupancy estimated to be less than 10 km², and known to exist at only a single location. C.2. Population estimated to number less than 250 mature individuals and a continuing decline inferred in numbers of mature individuals and population structure in the form of all individuals in a single subpopulation. D Population estimated to number less than 50 mature individuals. *Rhodamnia* sp. (Calliope N.Gibson 1335) has been proposed for inclusion on the schedule of threatened wildlife of the Queensland *Nature Conservation Act 1992* as Endangered. This status is considered to be appropriate.

3.33 SOPHORA FRASERI BENTH.

3.33.1 Summary

Sophora fraseri is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from the Casino area north to near Miriam Vale. Most collections are from the Conondale, D'Aguilar and Taylor Ranges, and the Great Dividing Range south of Toowoomba in south east Queensland. There is no information available on population sizes at these sites. It grows mostly in hilly terrain at altitudes from 60 to 660 m on shallow soils along rainforest margins in eucalypt forests or in large canopy gaps in closed forest communities. Current or perceived threats to the continued survival of *S. fraseri* are considered to be inappropriate fire regimes and increased competition from exotic weeds.

3.33.2 Species description and identification

The genus *Sophora* is placed in the pea family (Fabaceae). *Sophora* is widespread throughout the tropical and temperate regions of the world with approximately 50 species (Mabberley 1997). *Sophora fraseri* is one of two species of *Sophora* recorded in Australia.

Sophora fraseri Benth. was formally described in 1864 from material collected from south east Queensland and northern New South Wales (Bentham 1864). The botanical description of *Sophora fraseri* is as follows:

Sparsely branched shrub, 1-2 m high, softly pubescent. Leaves pinnate, with a terminal leaflet; petiole 10-20 mm long; rhachis 50-150 mm long; stipels absent; leaflets 17-39, oblong to ovate, 5-25 mm long, 3-10 mm wide, apex obtuse or retuse, margins entire, pubescent; petiolules 1-2 mm long. Flowers in terminal racemes 5-13 cm long; pedicels 5-10 mm long. Calyx 4-6 mm long. Corolla 9-15 mm long, pale yellow. Pod moniliform, indehiscent, 3-10 cm long, up to 8 mm diameter, sparsely hairy, irregularly constricted between seeds; seeds 2-7, approximately 6 mm long. For other descriptions of this species refer to Thompson (1961), Stanley and Ross (1983), Hacker (1990) and Harden (1991).

Sophora fraseri is a fairly distinctive species with its pinnate leaves with numerous leaflets, yellow flowers, plump seeds and pods which are very constricted between the seeds, giving the appearance of a string of beads.

3.33.3 Current conservation status

Sophora fraseri is presently listed on the schedule of the Queensland *Nature Conservation Act 1992* as "vulnerable wildlife". The species has been assigned a national conservation status of V (vulnerable) by ANZECC (1993). It is also listed on Schedule 1 Part 2 (vulnerable) of the Commonwealth *Endangered Species Protection Act 1992*.

3.33.4 Distribution and abundance

Sophora fraseri is restricted to south-eastern Queensland and north-eastern New South Wales where it occurs from the Casino area north to near Miriam Vale. *S. fraseri* was not surveyed during the present study. Details from Queensland Herbarium specimens of *S. fraseri* are listed in Appendix 1.32. Most of the collections have been made in the coastal ranges in south east Queensland. These include the Conondale, D'Aguilar and Taylor Ranges, and the Great Dividing Range south of Toowoomba. Other Queensland records come from the Kingaroy district (1, date unknown),

Kilkivan district (1,1978) and near Miriam Vale (1, 1995). *S. fraseri* has been recorded in Brisbane Forest Park, Main Range National Park and four State Forests (SF 494 Fty 1309, SF 792 Fty 1681, SF 809 Fty 1630 SF 1355 Fty 1526) in south east Queensland. There is no information available on population sizes at these sites. *S. fraseri* has been reported to be rare to common at the collection sites.

Unvouchered records have been reported from Bahrs Scrub, near Beenleigh (Quinn *et al.* 1995), Splityard Creek, Fernvale (Forster *et al.* 1991), Lamington National Park (Forster *et al.* 1991) and Darlington Range near Mt Tamborine (D. Halford, pers. obs.)

3.33.5 Habitat

S. fraseri has been reported growing in hilly terrain on hillslopes and hillcrests at altitudes from 60 to 660 m, mostly shallow stony to shaly soils, of loam to clay texture derived from sandstone or basalt rocks. It has also been noted on sandy soil on a creek bank. It grows in open eucalypt forest and semi-evergreen vine forest. Where it grows in eucalypt forest frequent tree species are *Corymbia citriodora*, *Eucalyptus carnea*, *E. microcorys*, *E. acmenoides*, *E. propinqua* and *Lophostemon confertus*. Evidence suggests that it prefers to grow along rainforest margins, in eucalypt forests in the vicinity of rainforests or in large canopy gaps in closed forest communities.

3.33.6 Life history and ecology

There have been no studies into the biology or autecology of *Sophora fraseri*. *S. fraseri* is in cultivation at Coff Harbours (Quinn, *et al.* 1995). *S. tomentosa* is cultivated and is propagated from scarified seed (Wrigley & Fagg 1996).

Sophora fraseri is a shrub with an unknown life span. The main method of reproduction is by sexually produced seeds. *S. fraseri* has been recorded flowering in January, April and from September to December and fruiting in January, April, July, August and November. Possible pollinators were not recorded. However, the Fabaceae family is principally a bee-pollinated family (Kalin Arroya 1981).

Unlike most other species in the family Fabaceae the fruit does not appear to split at maturity to release seeds. The pod seems to decay slowly and the seeds finally drop to the ground. The seed of *S. fraseri* lack any fleshy attachment which is known in many genera in the Fabaceae.

It appears that *Sophora fraseri* in common with most leguminous plants releases its seed from the fruit in a dormant state (Wrigley and Fagg 1996). For most hard-seeded leguminous species the dormancy is due to seed coat impermeability. The germination of such seeds involves the breaking of seed dormancy by heat or the gradual decay of the seed coat. With these seed characteristics, *S. fraseri* would accumulate a persistent soil seed bank during inter-fire periods. The longevity of such a soil-stored seed bank is unknown.

There is no information on the response of adult plants to fire. However, *S. fraseri* is suspected to be killed by fire. There is no evidence to suggest that it is capable of regenerating from the rootstock.

3.33.7 Threats

With our limited knowledge of the species it is difficult to determine the stability of the populations and what possible threats there are to the long term existence of *Sophora fraseri* in the wild. Its habitat on rainforest margins is susceptible to invasion by exotic weed species such as lantana (*Lantana camara*). The impact that such invasions could have on *S. fraseri* is unknown. However, it can be assumed that weeds would change the vegetation structure and lead to increased competition for available resources. Therefore a potential threat to the species is the invasion of weed species into the habitat.

Anecdotal evidence suggest that fire may play a role in the maintenance of the population levels of *S. fraseri* in its habitat. However the lack of ecological information about this species makes it impossible to assess what would be an appropriate level of frequency and intensity for the long term

benefit of the species. If fires are too frequent, the plants will have insufficient time to build-up a soil seedbank to replace plants that are killed in the fire, and this will lead to population declines. If fires are too infrequent then adult plants will become senescent and the soil seedbank may decline to the point where it is insufficient to maintain population levels. Therefore a potential threat to the species is an inappropriate fire regime.

3.33.8 Management, research and conservation measures

Previously recorded sites should be examined to establish their size and extent. Areas of likely habitat in the vicinity of the known populations should be searched for further occurrences.

Fire intensity, frequency and seasonality are important factors in determining the long term population levels of most hard-seeded leguminous species. It is important to understand the response of *Sophora fraseri* to differing fire regimes in its habitat. Research is required into the fire ecology, reproduction biology and the population dynamics of the species.

APPENDICES

APPENDIX 1. QUEENSLAND HERBARIUM LABEL INFORMATION FOR THREATENED SPECIES OUTLINED

fl = flowering; ft = fruiting; SF = State Forest; NP = National Park

Appendix 1.1 *Acacia attenuata* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|------------------------|-------------------|-----------------|---|----------|-----------|--|----------------|
| 12558 | Lebler, B.A. | – | 28 Nov 1973 | Parrot Park, Miami | 28°04' | 153°27' | remnant wallum vegetation on sandy soil | |
| 22723 | White, C.T. | 1816 | Sep 1922 | Beerwah | 26°5-' | 152°5-' | | |
| 167500 | White, C.T. | 9631 | 17 Nov 1933 | Beerwah, N.C.L. | | | edge of peat swamps | ft |
| 167501 | Hubbard, C.E. | 3090 | 22 Jun 1930 | between Beerwah & Landsborough | | | Euc forest, grey sandy soil | fl |
| 167502 | Clemens, M.S. | – | 27 Jul 1943 | Caloundra, along highway | | | swamp margin | fl |
| 167503 | Pedley, L. | 2351 | 1 Aug 1967 | near Noosaville | | | on edge of wallum swamp | fl |
| 167504 | White, C.T. | 9197 | 1 Sep 1933 | Southport | | | edge of peat swamp | fl |
| 167505 | Wilson, C.L. | 673 | 25 May 1957 | Caloundra district | | | sandy heath | bud & fl |
| 167506 | White, C.T. | | ? Sep 1919 | Beerwah | | | | |
| 167507 | Clemens, M.S. | – | 17 Sep 1948 | Maryborough, wide bay district | | | wallum | ft |
| 167508 | Clemens, M.S. | – | 12 Jun 1943 | Beerwah | | | swamp | fl |
| 167509 | Kajewski, S.F. | 14 | 18 Jan 1928 | mainland opposite southern end of Fraser island | | | swampy, sandy soil | |
| 167510 | Gillieatt, J. | 268 | 6 May 1965 | 1 mile W of Caloundra, on Waterworks road | | | wallum soil | bud |
| 226201 | Harrold, A.G. | – | Jun 1966 | 6.5 km SW of Noosaville on Doonan road | 26°2-' | 153°0-' | | fl |
| 253460 | Olsen, M. & Lebler, B. | – | 8 Jun 1978 | Caloundra rubbish dump, just W of township | 26°4-' | 153°0-' | | |
| 253461 | Olsen, M. & Lebler, B. | – | 8 Jun 1978 | 5 km S of Landsborough | 26°5-' | 152°5-' | roadside | fl |
| 429150 | Thorne, R.F. | 20471 | 10 Apr 1959 | Miami | | | wallum | bud |
| 435783 | Pedley, L. | 5376 | 15 Jul 1987 | ca. 40 km SSE of Maryborough | 25°51' | 152°49' | open forest of <i>E. intermedia</i> with dense shrubby understorey | fl |

Appendix 1.1 cont.

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-----------------------------|-------------------|-----------------|---|-----------|------------|---|----------------|
| 438925 | Bean, A.R. | 817 | 16 May 1988 | N of Mullet Creek, Littabella N.P. | 24°38' | 152°04' | wallum flats with sand | bud |
| 468127 | Boughton, V. | 87 | 24 Apr 1980 | Caloundra | 26°48' | 153°08' | | bud |
| 531694 | Brenan, J.P. | 15088 | 13 Jan 1984 | 3 km S of Tewantin | 26°2-' | 153°0-' | | |
| 548268 | Leiper, G. | — | Nov 1992 | Burleigh Knoll E.P. | 28°0-' | 153°2-' | friable sand, <i>E. racemosa</i> , <i>E. robusta</i> and <i>Mel. quinquenervia</i> | ft |
| 585610 | Thomas, G. | 38 | 27 Nov 1995 | E of Kildey's road, NW of Boreen Point, Noosa Shire | 26°15' | 152°58' | edge of <i>E. robusta</i> open woodland with wet heath | |
| 586634 | Thomas, G. | 48 | 5 Jun 1996 | SE of Lake Entrance Blvd, Noosaville | 26°25' | 153°02' | sandy soil with <i>Corymbia trachyphloia</i> , <i>Corymbia intermedia</i> and <i>Euc. robusta</i> open forest | ft |
| 586636 | Thomas, G. | 47 | 5 Jun 1996 | SE of Lake Entrance Blvd, Noosaville | 26°25' | 153°02' | sandy soil area previously cleared | fl |
| 620616 | Bean, A.R. | 6462 | 8 Sep 1993 | Headwaters of Noosa River, Cooloola N.P. | 26°03' | 152°53' | swampy open forest of <i>E. umbra</i> , <i>E. racemosa</i> , <i>Mel. quinquenervia</i> | ft |
| 635224 | Bean, A.R. & Grimshaw, P. | 8156 | 30 Dec 1994 | Yalanga station, Bates Road, NE of Kin Kin | 26°13' | 152°58' | low open forest of <i>Leptospermum whitei</i> , <i>Mel. nodosa</i> , <i>Mel. cheelii</i> | old fruit |
| 636773 | Hodgon, J. | JH1 | May 1995 | Littabella N.P. | 25°38' | 152°08' | | fl |
| 637365 | Bean, A.R. | 8719 | 18 Jun 1995 | Palmview Conservation Park, 8 km S of Buderim | 26°45' | 153°03' | Shrubland with <i>Lepto. whitei</i> , <i>Baeckea frutescens</i> , sandy soil | fl |
| 640121 | Grimshaw, P. & Turpin, G. | PG2078 | 12 Apr 1995 | northern side of Granville-Maaroom Rd, 18 km ESE of Maryborough, Poona N.P. | 25°37'08" | 152°51'09" | sandy loam, Eucalypt tall open forest | |
| 640157 | Grimshaw, P. & Thompson, S. | PG2108 | 1995 | Poona N.P., just off rd to Maaroom | 25°36'55" | 152°51'27" | low sandy rise, Eucalypt woodland, sandy soil | fl |
| 641362 | Bean, A.R. | 10487 | 14 Aug 1996 | Meadowvale Nature Park, about 9 km NW of Bundaberg | 24°49' | 152°16' | Woodland of <i>Corymbia trachyphloia</i> , <i>Euc. umbra</i> , <i>Banksia oblongifolia</i> | ft |
| 641367 | Bean, A.R. | 10531 | 16 Aug 1996 | State Forest 898, about 6 km N of Watalgan | 24°36' | 152°01' | Wallum with <i>Banksia aemula</i> , <i>Euc. robusta</i> , sandy soil, common at site | ft |
| 655978 | Blake, J. | | 13 Aug 1997 | Gregory St, Caloundra, Golden Beach State School Grounds | 26°4-' | 153°0-' | | |

Appendix 1.2. *Acacia baueri* (extracted Sept. 1997)

| Herbarium AQ Number | Collector (s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|------------------------------|-----------------------|----------------------|--------------------|--|----------|-----------|---|-----------------------------------|
| Queensland localities | | | | | | | | |
| 4365 | Harrold, A.G. | 10 | 3 Jul 1971 | 2.4 km E of Teewah Creek, along King's Bore Track | 26°02' | 153°04' | dry sclerophyll shrub woodland | bud |
| 10358 | Gambling, E.M. | 2 | 29 Jun 1973 | c. 5 km (by road) S of Coolum Beach | 26°36' | 153°05'' | sandy wet wallum plain with <i>Banksia oblongifolia</i> | young fruit |
| 12559 | Harrold, A.G. | - | Oct 1973 | Sunshine Beach, c. 1 km S of Noosa Heads | 26°24' | 153°06' | | fl & ft |
| 167847 | Clemens, M.S. | - | Apr 1944 | Bribie Island | | | | fl |
| 167848 | Clemens, M.S. | - | May 1944 | Stradbroke Islands | | | | fl |
| 167849 | Ross, E.M. | - | 19 Dec 1974 | Moreton Island, C. 4 km NNE of Tangalooma | 27°06' | 153°22' | top of high dune, in middle of rarely used sand track | fl & ft only one plant seen |
| 167850 | Pedley, L. | 2178 | 22 Dec 1966 | Hollywell, near Southport | | | deep sand in heath | fl & ft |
| 167851 | Hubbard, C.E. | 4632 | 10 Oct 1930 | Fraser Island | | | sandy country | fl & ft |
| 167852 | Lovell | - | - | Fraser Island | | | | fl & ft |
| 167853 | White, C.T. | - | Oct 1921 | Fraser Island | | | | fl |
| 195262 | Clarkson, J.R. | 600 | 15 Mar 1977 | Pine Ridge Reserve, Labrador | 27°5'- | 153°2'- | heath on sand | fl |
| 338110 | Blake, S.T. | 5221 | 27 Feb 1934 | Meridan Plains, near Buderim | 26°4'- | 153°0'- | wallum flats | fl |
| 362676 | Blake, S.T. | 13160 | 6 Dec 1937 | near Buderim | 26°4'- | 153°0'- | wallum flats | fl & ft |
| 404072 | Sharpe, P. | 3349 | 5 Aug 1983 | D.P.I. swamp about 1 km SW of Mount Emu and 2 km N of Coolum Beach | 26°30' | 153°04' | open heath | fl |
| 409799 | Leiper, G. | - | Sep 1988 | Peregian Beach | 26°29' | 153°05' | on sand | young fruit |
| 416600 | Everist, S.L. | - | 1969 | between Noosa Heads and Peregian, E of Weyba | 26°3'- | 153°0'- | | bud |
| 429153 | Thorne, R.F. | 20447 | 10 Apr 1959 | Miami | | | wallum | fl |
| 438935 | Bean, A.R. | 816 | 15 May 1988 | along sand track to Beelbi Creek, 7.5 km S of Burrum Heads | 25°15' | 152°38' | wallum flats with deep sand, growing with <i>Banksia aemula</i> , <i>Restio</i> spp. and <i>Bossiaea heterophylla</i> | fl |

Appendix 1.2. cont./

| Herbarium AQ Number | Collector (s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|-----------------------------------|------------------------------|-------------------|-----------------|---|-----------|------------|--|-----------------------------------|
| 478802 | Jessup, L.G. | 3 | 29 Jul 1982 | Beerwah Scientific Reserve | 26°5'- | 152°5'- | roadside bank, wallum | |
| 487833 | Melzer, R. | RM686 | 20 Nov 1995 | Woodgate N.P. | 25°07' | 152°31' | low open woodland of <i>Banksia aemula</i> | bud & flower |
| 489727 | Leiper, G. | - | 1 Jul 1996 | Woodgate N.P. | 25°0'- | 152°5'- | | with young fruit |
| 587808 | Eustace, R. | - | 1 Sep 1996 | Brown Lake, Stradbroke Island | 27°30' | 153°26' | open forest, <i>Euc. racemosa</i> , <i>Banksia serrata</i> | with young fruit few specimens |
| 603627 | Forster, P.I. & Leiper, G. | PIF19976 | 24 Oct 1996 | Burrum Coast N.P., Kinkuna Section | 25°04'28" | 252°29'52" | woodland of <i>Banksia aemula</i> with heath understorey on sand, alt. 5 m | ft occasional |
| 630265 | Bean, A.R. | 7817 | 29 Aug 1994 | 16 km From Old Bruce Highway towards Burrum Heads | 25°12' | 152°36' | tall shrubland with <i>Euc. umbra</i> , <i>Banksia aemula</i> , <i>Ricinocarpos pinifolius</i> ; deep sandy soil; alt 20 m | young fruit |
| 640686 | Sparshott, K.M. & Sharpe, P. | KMS757 | 21 Feb 1996 | Kinkuna N.P., c. 6 km NW of Woodgate | 25°05'12" | 152°21'45" | coastal plain, low open woodland <i>Banksia aemula</i> , sandy soil | fl only one plant seen |
| 653191 | Lowe, M. | 10 | 7 Feb 1997 | Tin Can Bay adjacent Trevally St, Coral Trout Dv. and Tin Can Bay Rd | 25°55'23" | 153°00'05" | | |
| 653436 | Thomas, M.B. | - | 14 Aug 1996 | Southern Bribie Island, c. 1 km N of the end of Armitage Pt between Bongaree E and Woorim | 27°05' | 153°11' | | |
| 654490 | Bean, A.R. | 12020 | 25 May 1997 | W edge of Mooloolah River N.P., S of Buderim | 26°43' | 153°04' | | |
| New South Wales localities | | | | | | | | |
| 167854 | Boorman, J.L. | - | May 1912 | Port Stephens | | | | |
| 167855 | Bowden, E. & Coveny, R. | 3385 | 24 Nov 1970 | "Little Switzerland" on Kings Tableland, Wentworth Falls, Blue Mts | 33°47' | 150°23' | heath among sandstone rocks in association with <i>Casuarina nana</i> , <i>Kunzea ambigua</i> , <i>Banksia ericifolia</i> , etc. alt. 840 m. | |
| 167856 | Coveny, R. | - | 2 Sep 1967 | Nabiac airstrip | | | in sandy soil growing under <i>Leptospermum</i> tree, etc, in swampy situations, in heath | |
| 444195 | Coveny, R. & Bishop, W. | 12219 | 16 Apr 1986 | South West Rocks near oil storage tanks | 30°53'30" | 153°03'30" | swampy heath on white sand with <i>Leptospermum liversidgei</i> , <i>Melaleuca quinquenervia</i> , etc | |

Appendix 1.3. *Acacia grandifolia* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|--|----------|-----------|---|----------------------------|
| 190685 | Pedley, L. | 2897 | 3 Sep 1969 | 8 miles E of Gayndah | 25°37' | 151°34' | on shallow stony loamy soil on roadside | in bud |
| 190686 | Pedley, L. | 4018 | 5 Dec 1972 | 55 km S of Mundubbera | 26°05' | 151°12' | in crevices and outwash from massive sandstone outcrops | - |
| 190687 | Cranny, P. | - | Sep 1968 | 8 miles N of Proston | 26°02' | 151°36' | spotted gum-ironbark country with SW aspect, in stony clay loam | fl |
| 190688 | Bager, A. | - | Jun 1969 | Madoora near Gayndah | 25°37' | 151°36' | open forest, gravelly sand | - |
| 190689 | Pedley, L. | 2891 | 2 Sep 1969 | - | 26°05' | 151°12' | on shallow sandy soil among sandstone outcrops with <i>Ac. julifera</i> in open forest of <i>Corymbia citriodora</i> , <i>Euc. drepanophylla</i> and <i>Angophora leiocarpa</i> | fl |
| 264611 | Heathwood, E.C. | - | 18 Sep 1978 | Roadside, portion 38 | - | - | growing in light brown gravelly soil supporting grey ironbark and blue gum | fl |
| 339473 | Anderson, E.R. | 3163 | 16 Aug 1982 | c. 15 km E of Gayndah on road to Brian Pastures Research Station | 25°39' | 151°41' | plain, clay loam surface duplex, woodland of <i>Euc. tereticornis</i> | in bud |
| 339552 | Forster, P.I. | PIF 1443 | 10 Dec 1982 | 24 km From Gayndah on Boondooma Rd | 25°46' | 151°28' | Eucalyptus forest with <i>Acacia crassa</i> , E aspect; Alt 240 m | very common |
| 347985 | Forster, P.I. | 1128 | 10 Jan 1982 | c. 5 km SW of Mundubbera on Durong Road | 25°3-' | 151°1-' | disturbed ground | - |
| 349046 | Forster, P.I. | 1539 | 6 Mar 1983 | 9 km E of Gayndah, Gayndah Shire | 25°36' | 151°42' | shaly hillside with regrowth <i>Euc. crebra</i> , <i>Euc. polycarpa</i> . <i>Acacia decora</i> , NW aspect; alt. 160 m | - |
| 367321 | Neldner, V.J. | 1373 | 23 Aug 1984 | Brian Pastures Station | 25°3-' | 151°3-' | <i>Eucalyptus crebra</i> , <i>Corymbia citriodora</i> woodland | fl |
| 396769 | Forster, P.I. | 1693 | 11 Sep 1983 | 42 km SSE of Mundubbera, 'Toondahra', Jondarby/Boondooma Rd fork | 25°5-' | 151°2-' | open eucalypt forest, E aspect; alt 270 m | very common young fruit |
| 398249 | Bean, A.R. | 262 | 13 Aug 1985 | 'Romani' S of Gayndah | 25°54' | 151°42' | - | fl |
| 398493 | O'Mara, R.M. | 47 | 23 Oct 1983 | Winderera Mt, 15 km N of Murgon | 26°03' | 151°51' | - | ft |
| 399504 | Bean, A.R. | 377 | 14 Nov 1984 | Abbeywood near Proston | 26°07' | 151°38' | - | ft |
| 404974 | Forster, P.I. | PIF 1960 | 22 Nov 1984 | 41 km SSE of Mundubbera Gayndah to Durong Rd | 25°58' | 151°23' | Eucalyptus open forest, remnant with colonising Acacias; alt 260 m | ft |

Appendix 1.3. cont./

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|---|-----------|------------|--|--------------------|
| 405001 | Bean, A.R. | - | 14 Nov 1984 | Beside Proston-Boondooma Dam Rd, c. 17 km from Proston | 26°0'- | 151°2'- | growing on rocky infertile soil in ironbark woodland | fl |
| 424753 | Pedley, L. | 5348 | 17 Aug 1986 | c. 50 km SSW of Gayndah | 26°02' | 151°26' | on sandy soil on roadside | fl |
| 455160 | Simmons, J.G. + | 2015 | Aug 1988 | Durong-Gayndah Rd | 25°5'- | 151°2'- | - | fl |
| 473284 | Forster, P.I. | PIF 7114 | 20 Aug 1990 | State Forest, 'Manar' road 22 km from Gayndah | 25°46' | 151°29' | open eucalypt forest, on skeletal soil; alt. 200 m | fl |
| 473468 | Forster, P.I. | PIF 7133 | 20 Aug 1990 | Beeron Holding, 7 km W of Toondahra HS, Grid Ref: 9146-314247 | 25°59' | 151°19' | granite rock outcrops, with <i>Euc. petalophylla</i> and <i>Euc. dura</i> ; alt 400 m | fl |
| 487976 | Stephens, K. + | DIN 55 | 7 Mar 1996 | Top of Dawson Range on 'The Parkes' near Dingo | 23°53' | 149°25' | - | - |
| 507285 | Pedley, L. | 5623 | 5 Sep 1991 | 16 km N of Proston | 26°01' | 151°38' | deep sand on roadside, in eucalypt open forest | fl |
| 508225 | Pedley, L. | 5625 | 1 Oct 1991 | 17 km NNW of Proston | 26°01' | 151°32' | sandy soil in woodland of <i>Euc. crebra</i> with understorey of <i>Casuarina luehmannii</i> | fl |
| 601000 | Grimshaw, P. + | G 778 | 1 Jul 1994 | Allies Crk/Boondooma Rd, near Brovinia Crk, Brovinia SF 132 | 26°04'23" | 151°11'41" | rocky hillslope with granite outcrops, tall/very tall woodland with <i>Cory. citriodora</i> , <i>Euc. crebra</i> , <i>Cory. dolichocarpa</i> , Boondooma igneous complex | fl, locally common |
| 601196 | Forster, P.I. | PIF 15822 | 24 Sep 1994 | Toondahra Crk, Toondahra | 25°57' | 151°22' | open woodland of <i>Euc. tessellaris</i> and <i>E. tereticornis</i> on sandy soil; alt. 280 m | fl, v. common |
| 628018 | Thomas, G. | 701 | 17 Mar 1994 | across creek on S side of Coongara Rock, SF 1344 | 25°39' | 151°58' | on rocks, in <i>Euc. exserta</i> and <i>Lophostemon suaveolens</i> forest | in bud, common |
| 641010 | Grimshaw, P. + | PG 2369 | 24 Apr 1996 | Mt Gayndah (SITE 312) | 25°36'11" | 151°32'26" | very tall open forest of Eucalyptus; small mountain top plateau with brown, silty loam; intrusive rhyolite; alt. 320 m | common |

Appendix 1.4. *Acacia perangusta* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|---|----------|-----------|---|-----------------------|
| 22747 | White, C.T. | 3554 | 7-Aug-27 | Castra, near Brisbane | — | — | along creek banks | fl, very common; Type |
| 190279 | Pedley, L. | 798 | 26 Aug 1961 | Eprapah Creek, c. 3 miles W of Victoria Point | — | — | — | fl |
| 190281 | Bray, F. | — | 20 Aug 1956 | Victoria Point | — | — | — | fl |
| 190282 | Michael, N. | 1936 | 24 Aug 1932 | Slacks Creek, Beenleigh District | — | — | — | fl |
| 190283 | Michael, N. | 2004 | 24 Aug 1932 | Slacks Creek, Beenleigh | — | — | — | fl |
| 190285 | White, C.T. | 6286 | 5 Oct 1929 | Burrum River | — | — | overhanging river | ft |
| 440362 | Wieck, J. | — | Aug-86 | near Pialba | 25°1'- | 152°4'- | — | |
| 531123 | Coaldrake, J.F. | 280 | 12 Sep 1953 | Forestry road from Aldershot | 25°2'- | 152°4'- | — | |
| 532220 | Smyrell, G. | — | 28 Feb 1997 | Lenthalls Dam, State Forest 1294 | 25°23' | 152°31' | low open woodland on sandy soil | |
| 542874 | Catchpoole, S. | — | 3 Jun 1992 | Underwood road, Priestdale | 27°3'- | 153°0'_ | — | in bud |
| 542875 | Catchpoole, S. | — | 3 Jun 1992 | Loop Road, Daisy Hill S.F. | 27°41' | 153°10' | — | in bud |
| 545834 | Fisher, L. | — | 8 Aug 1992 | Mount View road, Mt Cotton | 27°37' | 153°13' | — | fl |
| 570951 | Thompson, E.J. | MOR384 | 15 Nov 1993 | Daisy Hill State Forest, Logan City | 27°38' | 153°10' | Woodland of <i>Euc. tindaliae</i> with <i>Cory. henryi</i> and <i>E. carnea</i> with shrubby understorey predominated by <i>P. euchila</i> on undulating terrain with gravelly sandy soil; alt. 100 m | ft common |
| 587996 | Tierney, P. | — | Jun 1996 | Toogoom between Hervey Bay and Burrum Heads | 25°16' | 152°42' | road corridor in eucalypt forest high stony ridge | fl |
| 620123 | Bean, A.R. | 6293 | 29 Jul 1993 | Ford Road, Rochedale | 27°36' | 153°08' | sandstone ridges with <i>E. henryi</i> , <i>E. fibrosa</i> , <i>E. planchoniana</i> , open forest | fl |
| 624663 | Sandercoe, C. | 3141 | 22 Jan 1994 | Springwood E.P., Logan City | 27°37' | 153°09' | <i>E. tindaliae</i> and <i>E. microcorys</i> forest, sandstone outcrop | |

Appendix 1.4. cont./

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|--|----------|-----------|--|----------------|
| 625191 | Sandercoe, C. | 3162 | 25 Feb 1994 | Usher Park, Daisy Hill | 27°38' | 153°10' | edge of closed forest along creek bank | |
| 632048 | Loo, T. | – | 24 Aug 1994 | Rochedale Turf Farm, Ford Road, Burbank | 27°34' | 153°08' | mixed eucalypts | fl |
| 640596 | Foley, O. | – | 14 Dec 1995 | Ellerslie road, Logan City | 27°4'- | 153°1'- | regrowth | |
| 640597 | Foley, O. | – | 14 Dec 1995 | German Church road, Mt Cotton, just off Mt Cotton road | 27°38' | 153°14' | moist gullies | |

Appendix 1.5. *Allocasuarina rigida* subsp. *exsul* (extracted Sept. 1997)

| Herbarium AQ Number | Collector | Collectors Number | Date | Locality | Latitude | Longitude | Habitat | Other comments |
|---------------------|--------------|-------------------|-------------|-----------------------------------|----------|-----------|--|----------------|
| 422452 | Sharpe, P.R. | 3544 | 12 Apr 1984 | Mt Cooroora, c. 1 km SW of Pomona | 26°22' | 152°52' | easterly slope of Mountain, stunted <i>E. racemosa</i> , <i>Xanthorrhoea</i> , <i>Acrotriche</i> etc, trachyte rocks | ft |

Appendix 1.6. *Arthraxon hispidus* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|--------------------|-------------------|-----------------|--|-----------|------------|--|--|
| 251403 | Blake, S.T. | 13778 | 17 Mar 1938 | Coolum | 26°3-' | 153°0-' | on shady creek bank | Diffuse, ca 1-2 ft, green spikelets paler or purplish |
| 251404 | Wilson, J.A. | _ | 22 Mar 1960 | Obi Obi via Nambour | 26°3-' | 152°4-' | _ | _ |
| 251405 | Shirley, J. | _ | _ | Canungra | 28°0-' | 153°1-' | _ | _ |
| 251406 | White, C.T. | _ | Mar 1915 | Stradbroke Island, Myora, near the shore | 27°--' | 153°--' | _ | _ |
| 251407 | Blake, S.T. | 14321 | 14 Apr 1941 | near Glenapp, at foot of Mt Chinghee | 28°1-' | 152°5-' | in Eucalyptus forest, ca 700 ft | culms solitary or very few together, diffuse and rooting from the lower nodes, up to 3-4 ft long, reddish green leaves, spikelets paler or purplish |
| 251408 | Blake, S.T. | 11242 | 22 Apr 1936 | Buderim | 26°4-' | 153°4-' | shaded small gully on hillside, ca. 300 ft | slender more or less tufted annual; culms branched, shortly creeping and ascending or oblique up to 3 ft, reddish, leaves green or purplish green, racemes subterete, violet-black |
| 251409 | Bailey, F.M. | _ | _ | Toowoomba | 27°3-' | 151°5-' | _ | _ |
| 251410 | Smith, L.S. & D.A. | _ | 15 Jul 1943 | Alexandra Bay, near Noosa | 26°1-' | 153°0-' | around fresh water spring just off the beach | _ |
| 251411 | Blake, S.T. | 15941 | 19 Apr 1946 | Noosa Heads | 26°1-' | 153°0-' | at edge of freshwater creek | culms more or less tufted, ascending to 1 ft, leaves green, spikelets pale green or purple |
| 251412 | Blake, S.T. | 13999 | 8 Apr 1939 | near Kenilworth, in Booloumba Creek (SF 274) | 26°3-' | 152°4-' | on sand-spit | shortly creeping and ascending stems 1-2 ft long |
| 450731 | Vellacott, P. | _ | 9 Apr 1984 | Tarome, Boonah Shire | 28°00' | 152°28' | _ | _ |
| 582966 | Fensham, R.J. | 2509 | 22 May 1995 | Boggomoss Reserve, Taroom district | 25°26' | 150°20' | mound spring | weak stem grass |
| 582978 | Fensham, R.J. | 2523 | 23 May 1995 | Mt Rose', Taroom district | 25°27' | 150°10' | mound spring | weak stemmed grass |
| 652727 | Fensham, R.J. | 2975 | 12 Jan 1997 | Major Mitchell Spring, Salvator Rosa | 24°50'36" | 147°11'22" | _ | _ |

Appendix 1.7. *Bothriochloa bunyensis* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) | Collectors number | Collection date | Locality | Latitude | Longitude | Habitat |
|---------------------|---------------|-------------------|-----------------|---|----------|-----------|--|
| 255577 | Pearl M. | _ | 1 May 1976 | Bunya N.P., near creek bank | 26°--' | 151°--' | open eucalypt forest |
| 255578 | Pearl M. | 354 | Mar 1977 | Bunya Mts, Horse Gully | 26°4' | 151°3' | _ |
| 255579 | Clemens M.S. | _ | 19 Mar 1944 | Bunya Mts | 26°5' | 151°3' | |
| 332136 | Simon B.K. | 3530 | 26 Jan 1980 | Mt Mowbulla, Bunya Mts | 26°53' | 151°36' | _ |
| 344908 | Simon B.K. | 3525 | 22 May 1979 | Horse Gully, southern gully foothills of Bunya Mts | 26°5' | 151°3' | associated with <i>Chloris ventricosa</i> , <i>Microlaena stipoides</i> , <i>Bothriochloa decipiens</i> , <i>Echinopogon nutans</i> , grazed by horses |
| 344913 | Simon B.K. | 3529 | 26 Jan 1980 | Bunya Mts, Muro's Camp | 26°5' | 151°3' | grassy area grazed by wallabies |
| 407428 | Young P. | 1119 | Feb 1986 | Mt Lowe, northern end of Mistake Plateau | 27°51' | 152°17' | in grassy open area above steep scarp |
| 438113 | Tohill J.C. + | JT 498 | Jan 1970 | Bunya Mts | 26°53' | 151°37' | |
| 450722 | Russell M.J. | _ | Mar 1984 | Geham Scientific Reserve | 27°2' | 152°0' | flat, lateritic krasnozem, <i>Euc. pilularis</i> , <i>E. saligna</i> and <i>Cas. torulosa</i> forest, burnt every 3 yrs, alt 550 |
| 487638 | Fairfax R.J. | 175 | 10 Mar 1996 | road following Wengen Creek, Bunya Mts (GRID REF 9244 684268) | 26°52' | 151°40' | <i>Euc. tereticornis</i> woodland, basalt, 580, roadside |
| 487639 | Fairfax R.J. | 171 | 13 Mar 1995 | Little Pocket, Bunya Mts (GRID REF 9244 589265) | 26°52' | 151°35' | <i>Poa labillardieri</i> , dominated grassland, basalt, alt 1027 m, beside walking track |

Appendix 1.8. *Clematis fawcettii* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other comments |
|------------------------------|-----------------|-------------------|-----------------|--|----------|-----------|--|-----------------------|
| Queensland localities | | | | | | | | |
| 23372 | Coveny R.G. + | NSW 214918 | 22 Nov 1987 | 0.5 km N of Tick Gate on NSW-Qld Border, near Acacia Crk North Rd to Killarney | 28°22' | 152°19' | dry rainforest with <i>Alyxia ruscifolia</i> , <i>Alectryon diversifolius</i> , <i>Alphitonia excelsa</i> , <i>Melia azedarach</i> , etc, grey-brown loamy soil, alt 600 m | in fl |
| 106727 | Francis W.D. | — | Nov 1920 | MacPherson Range near Emu Vale, 70 miles SW of Brisbane | 28°1-' | 152°1-' | — | — |
| 106728 | Unknown | — | — | Killarney | 28°2-' | 152°2-' | — | fl |
| 106812 | Bick E.W. | — | Dec 1913 | Warwick | 28°1-' | 152°0-' | — | ft |
| 398620 | Mc.Donald W.J. | 4090 | 1 Oct 1985 | Lamington N.P. track to Tullawallal lookout S of Binna Burra | 28°1-' | 153°1-' | complex notophyll vine forest, alt. 920 m | fl |
| 432376 | Bird L.H. + | — | 29 Dec 1986 | Melrose Road, 4 km SW of Killarney | 28°2-' | 152°1-' | dry vine thicket | fl |
| 432646 | Bird L.H. + | — | 17 Jan 1987 | Goombungee | 27°18' | 151°51' | eucalypt forest with scattered softwood scrub species | ft |
| 441578 | Forster P.I. + | PIF 2472 | 9 Jun 1986 | Gladfield 2.5 km SSW of Warwick, grid ref: 9341 186916 | 28°06' | 152°10' | on margins of low semi-evergreen vine thicket, with occasional hoop pine emergent, alt. 720 m | ft uncommon |
| 455499 | Orford D. | — | Nov 1988 | Moss Garden, Qld-NSW Border | 28°17' | 152°27' | alt 980 | ft |
| 457859 | Forster P.I. + | PIF 5789 | 30 Sep 1989 | Bunya Mts SF 151, Saddle Tree L.A., grid ref: 9244-658283 | 26°52' | 151°39' | semi-evergreen vine thicket grading into Araucarian microphyll vine forest, on chocolate coloured soil | — |
| 472300 | Forster P.I. + | PIF 6915 | 8 Jul 1990 | Mt Davidson 5 km S of Withcott | 27°36' | 152°02' | semi-evergreen vine thicket on basalt talus, alt 560 m | — |
| 546304 | Grodecki A. | — | 24 Aug 1992 | Qld side of Levers Plateau | 28°22' | 152°52' | rainforest | fl |
| 548253 | Forster P.I. + | PIF 12157 | 26 Oct 1992 | Mt Lindesay | 28°20' | 152°42' | microphyll moss forest on steep slope | fl occasional in area |
| 561799 | O'Reilly M.R. | 296 | 5 Oct 1992 | Lamington N.P., Black Pool Track | 28°19' | 153°05' | alt. 500 m | fl |

Appendix 1.8. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other comments |
|-----------------------------------|-----------------|-------------------|-----------------|--|-----------|------------|--|------------------------------|
| 587802 | Mc.Donald W.J. | 6218 | 20 Aug 1996 | Numinbah Prison Reserve, c. 3 km SSE of Beechmont State School | 28°09'14" | 153°11'51" | subtropical rainforest (CNVF) with <i>Ficus watkinsiana</i> etc., on colluvial bench with mixed acid and volcanic rocks, alt 500 m | rare in occasional tree gaps |
| 639283 | Mc.Donald W.J. | 6178 | 17 Nov 1995 | Cainbable Ck track, c. 150 m S of falls, Lamington N.P. | 28°11' | 153°06' | warm subtropical rainforest (CNVF) dominated by <i>Argyrodendron trifoliolatum</i> etc., on basalt | fl |
| New South Wales localities | | | | | | | | |
| 106729 | Fawcett C. | — | 1876 | Richmond River | — | — | — | fl |
| 106730 | Unknown | — | — | Richmond River | — | — | — | fl |
| 428632 | Harden G.J. + | 81282 | 10 Jul 1981 | Lismore Wilson Park | 28°49' | 153°16' | dry rainforest above creek | — |
| 430716 | Webb L.J. + | 2183 | 22 Nov 1949 | Tooloom | 28°37' | 152°25' | edge of rainforest, alt 600 m | ft |

Appendix 1.9. *Cycas megacarpa* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Habitat | Other Comments |
|---------------------|-----------------|-------------------|-----------------|--|----------------|
| 3523 | Smith L.S. | 9841 | 12 Jun 1957 | open eucalypt forest | rare |
| 141953 | Keys J. | — | — | — | seed |
| 141954 | Rogers L.J. | — | Jun 1957 | — | — |
| 226115 | Walter C. | — | Oct 1977 | — | — |
| 316154 | Young P. + | 279 | Sep 1979 | — | — |
| 398919 | Forster P.I. | PIF 2134 | 24 Aug 1984 | eucalypt/casuarina open forest, southern aspect, alt. 480 m | only one seen |
| 398795 | Forster P.I. | PIF 2264 | 9 Nov 1985 | — | — |
| 396676 | Forster P.I. | PIF 65 | 25 Dec 1984 | — | — |
| 441743 | Forster P.I. | PIF 2448 | 15 May 1986 | <i>Euc. crebra</i> open forest, alt. 320 | — |
| 474359 | Forster P.I. | PIF 7470 | 28 Sep 1990 | — | — |
| 481094 | Hill K. + | 3807 | 9 Aug 1990 | hoop pine dominated rainforest on slightly elevated area, grey-brown clay-loam | — |
| 481095 | Hill K. + | 3803 | 8 Aug 1990 | grassy forest on SW slope, <i>C. maculata</i> , <i>E. drepanophylla</i> , gritty loam on granite | very localised |
| 560116 | Hill K. + | 4142 | 1 Oct 1991 | — | — |
| 565319 | Forster P.I. + | PIF 9336 | 5 Jan 1992 | — | — |
| 565321 | Forster P.I. + | PIF 9322 | 5 Jan 1992 | — | — |

Appendix 1.9. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Habitat | Other Comments |
|---------------------|--------------------|-------------------|-----------------|---|----------------------------------|
| 590137 | Forster P.I. + | PIF 12247 | 2 Nov 1992 | open eucalypt forest on stony ridge with <i>C. citriodora</i> and <i>E. crebra</i> , alt. 40 m | coning very common |
| 590158 | Forster P.I. + | PIF 12278 | 5 Nov 1992 | <i>Cor. citriodora</i> , <i>Euc. crebra</i> open forest on ridge, alt 300 m | common in area |
| 590160 | Forster P.I. + | PIF 12286 | 5 Nov 1992 | — | — |
| 620088 | Forster P.I. + | PIF 13985 | 24 Sep 1993 | — | — |
| 620757 | Forster P.I. + | PIF 13977 | 24 Sep 1993 | open eucalypt forest on steep slopes, alt. 220 m | occasional in area |
| 626413 | Hind P. | 3279 | 28 Dec 1989 | open eucalypt forest near ridge top | uncommon |
| 517088 | Machin P. | — | 4 Dec 1991 | — | — |
| 592666 | Machin P. | — | Jul 1991 | — | — |
| 635158 | Forster P.I. | PIF 16233 | 16 Feb 1995 | woodland of <i>Euc. crebra</i> , <i>Cor. intermedia</i> , <i>Euc. longirostrata</i> | very common |
| 640161 | Grimshaw P. + | PG 2169 | 31 Aug 1995 | — | — |
| 587537 | Crane R. | 1269 | 12 Aug 1995 | — | — |
| 369295 | Maconochie J.R. | 2760 | 28 Jun 1981 | growing in open eucalypt forest, steep rocky hill slope on western slope | intermediate |
| 440251 | Forster P.I. | PIF 2000 | 8 Apr 1985 | open eucalypt forest on dry stony ridge, alt. 200 m | intermediate |
| 481092 | Hill K. + | 3799 | 8 Aug 1990 | grassy woodland on steep N slope, <i>Euc. melanophloia</i> , <i>C. erythrophloia</i> , shallow red clay-loam on metasediments | intermediate locally frequent |
| 517061 | Machin P. | — | Oct 1991 | open eucalypt forest on steep stony slope, alt. 400 m | intermediate |
| 517062 | Machin P. | — | Oct 1991 | open eucalypt forest on steep stony slope, alt. 400 m | intermediate |
| 517087 | Machin P. | — | Oct 1991 | alt 400 m | intermediate |

Appendix 1.10. *Daviesia discolor* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|---|----------|-----------|---|-------------------------|
| 2286 | Henderson, R.J. | 860 | 26-Apr-71 | Blackdown Tableland, 9.6 km S of Mimosa Ck campsite | 23°5'- | 149°0'- | eucalypt-casuarina forest | |
| 14231 | Henderson, R.J. + | H 1026 | 6-Sep-71 | | 23°5'- | 149°0'- | In open <i>Eucalyptus</i> - <i>Casuarina</i> forest | |
| 19435 | Simmons, H.G. | | Sep-37 | Blackdown Tableland | 23°5'- | 149°0'- | | |
| 19436 | Gittins, C.H. | 926 | Aug-64 | Blackdown, ca 12 miles SSE of Bluff, 3rd Ck | 23°55' | 149°05' | | fl |
| 256354 | Powell, J.M. + | 891 | 21-Sep-77 | Blackdown Tableland, 57 km from Dingo | 23°51' | 149°05' | open dry sclerophyll forest | fl |
| 345560 | Pearson, S.G. | 278 | 1-Aug-81 | Blackdown Tableland | 23°5'- | 149°0'- | On descending slopes, deep red volcanic soil, surrounding growth, <i>E. saligna</i> , <i>E. intermedia</i> , <i>E. resinifera</i> , <i>Pteridium Hardenbergia</i> , <i>Clematis</i> , <i>Casuarina</i> , <i>Eustrephus</i> , and <i>E. sphaerocarpa</i> | fl |
| 437218 | Randall, J. | 420 | 2-Oct-85 | Palm Valley Range S of Mt Walsh | 25°4'- | 152°0'- | eucalyptus forest | fl |
| 501247 | Bean, A.R. | 2259 | 14-Sep-90 | Coast Range S. of Biggenden | 25°40' | 152°01' | open forest with <i>E. montivaga</i> , <i>E. decolor</i> , <i>Acomis acoma</i> | fl |
| 548496 | Forster, P.I. + | PIF 12145 | 25-Oct-92 | TR 375, Coast Range | 25°39' | 152°01' | Open forest on steep slopes with <i>Euc. maculata</i> , <i>E. propinqua</i> , alt. 500 m | ft; very common in area |
| 597591 | Jones, D.L. + | 6325 | 28-Aug-90 | Blackdown Tableland Forestry Area | 23°48' | 149°08' | Top of escarpment, tall woodland with dense <i>Themeda</i> understorey, grey to white sand | fl; common |

Appendix 1.11. *Dodonaea rupicola* (extracted July 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|------------------------------|-------------------|-----------------|--|----------|-----------|---|-------------------------------|
| 14072 | Stephens, I. | | Aug 1974 | Saddleback Mountain | 27°00' | 152°56' | | ft |
| 21310 | Sharpe, P. & Everist, S.L. | 1066 | 5 Sep 1974 | Saddleback, Glasshouse Mountains, c. 60 km N of Brisbane | 27°01' | 152°56' | disturbed site in quarry at base of mountain facing west | growing on quarry floor ft |
| 22517 | White, C.T. | 3225 | 11 Sep 1926 | Saddleback Mountain, Elimbah | 27°02' | 152°56' | | |
| 32990 | White, C.T. | 3321 | 29 Nov 1926 | Saddleback Mountain, Elimbah | 27°02' | 152°56' | | fl |
| 32991 | Shirley, J. | | | Beerburrum | 26°5'- | 152°5'- | | |
| 32992 | Puxley, Miss | | | Glasshouse Mountain District | 26°5'- | 152°5'- | | |
| 32993 | Williams, K. | | 21 Aug 1969 | Saddleback Mountain | 27°02' | 152°56' | | ft |
| 106985 | Stanley, T.D. & Clarkson, J. | 8 | 7 Sep 1974 | Saddleback Mountain | 27°02' | 152°56' | in cracks in exposed rocky outcrop on W on Mountain in open woodland | ft |
| 197905 | Elsol, J.A. | 149 | 16 Jun 1977 | Wildhorse Mountain, Beerwah Forestry area | 26°56' | 153°00' | | fl & ft |
| 339819 | Blake, S.T. | 13173 | 11 Dec 1937 | Elimbah | 27°0'- | 152°5'- | on damp rocky slope | fl & ft |
| 386753 | Smith, L.S. | | 20 Sep 1969 | Saddleback Mountain | 27°02' | 152°56' | | ft |
| 565547 | Bean, A.R. | 5918 | 2 Apr 1993 | Wildhorse Mountain, NE of Beerburrum | 26°56' | 153°00' | skeletal slopes in shrubland of <i>Baeckea</i> aff. <i>camphorata</i> , <i>Leptospermum microcarpum</i> and <i>Calytrix tetragona</i> , alt. 50 m | occasional at site fl & ft |

Appendix 1.12. *Eucalyptus hallii* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|------------------------------------|-------------------|-----------------|---|----------|-----------|---|----------------|
| 23866 | Brooker, M.I.H. | 3788 | 3 Sep 1972 | 2 miles E of the Goodwood railway Station | 25°09' | 152°27' | on sandy plain with laterite, associated with <i>Euc. fibrosa</i> , <i>Corymbia intermedia</i> , <i>Euc acmenoides</i> | ft |
| 99185 | Chippendale, G. & Brennan, M.J. | GC1137 | 20 Sep 1974 | 19.6 km NE of Childers P/O towards Goodwood | 25°09' | 152°24' | in depression in sandy silt | bud and ft |
| 99973 | Stanton, J.P. | — | 29 Jul 1969 | between Goodwood and Woodgate | 25°05' | 152°3' | — | ft |
| 113318 | Boyland, D.E. | 1547 | 23 Apr 1970 | 3.2 km E of Goodwood | 25°08' | 152°26' | on slightly undulating plain in Eucalyptus forest on sandy clay loam | bud |
| 134463 | Johnson, R.D. & Chippendale, G.M. | 550 | 7 Jun 1968 | 2 miles E of Goodwood railway station | 25°09' | 152°27' | common in fine silty grey soil | ft |
| 134464 | Johnston, R.D. & Chippendale, G.M. | 548 | 7 Jun 1968 | 5.9 miles E of Childers | — | — | — | — |
| 134477 | Johnston, R.D. & Chippendale, G.M. | 547 | 7 Jun 1968 | 5.9 miles E of Childers | — | — | in small depressions in grey silty soil associated with <i>Euc. umbra</i> , <i>Corymbia intermedia</i> , <i>Acacia</i> sp. and <i>Melaleuca</i> sp. | bud and ft |
| 134478 | Johnston, R.D. & Chippendale, G.M. | 561 | 8 Jun 1968 | 5.2 miles SE of Bundaberg | — | — | fine light brown silty soil associated with <i>C. intermedia</i> , <i>E. umbra</i> and <i>Melaleuca</i> sp. | bud |
| 134531 | Williams, W.T. | 58/79 | 5 Mar 1958 | Fraser Island | — | — | — | ft |
| 147312 | Vos, H. & Johnston, R.D. | 232 | 14 Sep 1966 | 12 miles NE of Childers | — | — | growing with <i>C. trachyphloia</i> and <i>Melaleuca leucadendra</i> | bud |
| 147313 | Vos, H. & Johnston, R.D. | 228 | 14 Sep 1966 | Goodwood Rd, 6 miles E of Childers | — | — | with <i>C. citriodora</i> , <i>Lophostemon suaveolens</i> and <i>Melaleuca</i> sp. | bud |
| 369050 | Brooker, M.I.H. | — | 28 Apr 1985 | c. 1 km N of Isis River on Bruce highway | — | — | with <i>C. trachyphloia</i> and <i>E. umbra</i> | |
| 369050 | Brooker, M.I.H. | 8954 | 28 Apr 1985 | 1 km N of Isis River on Bruce Highway | — | — | with <i>Corymbia trachyphloia</i> and <i>Euc umbra</i> | young ft |

Appendix 1.12. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|--------------------------------|-------------------|-----------------|---|-----------|------------|---|--------------------------------|
| 376675 | Brooker, M.I.H. | 7399 | 11 Mar 1982 | 30 km from Bundaberg toward Goodwood | 25°05' | 152°19' | white sand-swamp with <i>E. umbra</i> , <i>Angophora costata</i> , <i>Banksia robur</i> , alt 50 m | bud |
| 376676 | Brooker, M.I.H. | 7400 | 11 Mar 1982 | 30.1 km from Bundaberg towards Goodwood | 25°05' | 152°19' | – | bud |
| 442149 | Bean, A.R. | 199 | 25 May 1985 | Bundaberg - Goodwood road, 4 km S of the Coonarr turnoff | 25°02' | 152°22' | white sand soil with <i>C. intermedia</i> and <i>E. umbra</i> | bud |
| 531394 | Slee, A.V. & Lepschi, B.J. | 3408 | 20 Oct 1993 | E of Goodwood | 25°09' | 152°24' | undulating; white sandy soil with some gravel; <i>E. umbra</i> , bloodwood woodland with <i>Casuarina</i> , <i>Mel. quinquenervia</i> and <i>Acacia</i> sp. | ft |
| 532511 | Johnson, L.A.S. & Briggs, B.G. | 7100 | 31 May 1971 | c. 4 km E of Goodwood | 25°09' | 152°27' | Co-dominant with <i>Xanthorrhoea</i> , <i>Euc fibrosa</i> , <i>E. exserta</i> , etc., on flat low country | young ft abundant |
| 592734 | Hill, K. & Noble, P. | 4328 | 6 Nov 1992 | 6.5 km N of Woodgate turnoff on Childers - Bundaberg road | 25°06'11" | 152°21'26" | dry sclerophyll woodland on alluvial grey clay on flat; alt 40 | ft |
| 603527 | Forster, P.I. & Leiper, G. | PIF19858 | 22 Oct 1996 | Burrum Coast National Park, Woodgate Section | 25°08'19" | 152°28'50" | Woodland of <i>Angophora leiocarpa</i> , <i>Corymbia intermedia</i> , <i>Euc. hallii</i> and <i>Euc. umbra</i> on sandy soil, alt. 10 m | bud and ft very common in area |
| 636592 | Jermyn, D. | – | 1 Dec 1994 | Burrum Heads N.P. | 25°12' | 152°33' | – | bud |
| 641746 | Bean | 11023 | 16 Oct 1996 | Delta L.A., SF 840, S of Bundaberg | 24°59' | 152°18' | Woodland of <i>Angophora leiocarpa</i> , <i>Euc. umbra</i> , <i>Euc. exserta</i> , <i>Corymbia intermedia</i> , sandy loam, alt. 20 m | young bud rare at site |

Appendix 1.13. *Eucalyptus taurina* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Phenology | Other Comments |
|---------------------|--------------------------|-------------------|-----------------|---|-----------|------------|--|------------|------------------|
| 429549 | Forster P.I. + | PIF4734 | 2 Oct 1988 | Falls Creek, 4 km NW of Haldon, Helidon 9342-091289 | 27°45' | 152°04' | open eucalypt forest on sandstone | fl | — |
| 446847 | Brooker, M.I.H. | 9797 | 17 Oct 1987 | Crow's Nest N.P. | — | — | on granite with <i>E. dura</i> and <i>E. acmenoides</i> | bud | — |
| 470510 | Bean, A.R. | 1387 | 10 Mar 1990 | David's road, Helidon Hills, NNE of Helidon | — | — | brown sandy loam, with <i>Cory. gummifera</i> , <i>E. acmenoides</i> and <i>Angophora woodsiana</i> , <i>Letpo. attenuatum</i> | ft | — |
| 482401 | Blaxell, D.F. + | 89/283 | 15 Aug 1989 | Crows Nest Falls NP on track to valley of Diamonds | 27°16'00" | 152°05'30" | valley sides in tall woodland | — | — |
| 482444 | Hill, K. & Stanberg, L. | 3821 | 11 Aug 1990 | Crows Nest Falls, c. 500 m along walking track | 27°15' | 152°06' | Dry sclerophyll woodland, <i>Euc. pilularis</i> , <i>Euc. dura</i> , <i>Euc acmenoides</i> , <i>Melaleuca</i> , skeletal gritty sandy loam on coarse granite | bud and ft | locally frequent |
| 502012 | Bean, A.R. & Cummins, B. | 2511 | 17 Oct 1990 | 10 km NW of Gatton | 27°29' | 152°13' | on sandstone ridge with <i>E. baileyana</i> , <i>C. trachyphloia</i> and <i>Angophora woodsiana</i> | fl | — |
| 502013 | Bean, A.R. | 2514 | 17 Oct 1990 | 7.5 km NE of Helidon | 27°30' | 152°10' | growing with <i>Cor. henryi</i> , <i>Euc. baileyana</i> and <i>Angophora woodsiana</i> | bud | — |
| 567182 | Halford, D. | Q1693 | May 1993 | 8 km NE of Helidon, along 17 mile road | 27°30' | 152°09' | rocky slope, sandy soil in mixed eucalypt forest | — | — |
| 567781 | Bean, A.R. | 6131 | 29 Jun 1993 | Goldmine road, Helidon Hills | 27°29' | 152°09' | open forest of <i>E. taurina</i> , <i>Cory. henryi</i> , <i>E. acmenoides</i> and <i>A. woodsiana</i> | ft | — |
| 567782 | Bean, A.R. | 6132 | 29 Jun 1996 | Goldmine road, Helidon Hills | 27°29' | 152°09' | open forest of <i>E. taurina</i> <i>Cory. henryi</i> , <i>E. acmenoides</i> and <i>A. woodsiana</i> , alt. 450 m | — | — |
| 567786 | Bean, A.R. | 6136 | 29 Jun 1993 | 7 km NE of Helidon | 27°30' | 152°09' | open forest of <i>Euc. pilularis</i> , <i>Euc. microcorys</i> , <i>Euc. baileyana</i> , sandy soil, alt. 420 m | ft | rare at site |

Appendix 1.14. *Haloragis exaltata* var. *velutina* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Phenology | Other Comments |
|---------------------|----------------------------|-------------------|-----------------|---|----------|-----------|--|-----------|---------------------------|
| 628075 | Halford, D. & Grimshaw, P. | Q2172 | 11 Apr 1994 | Mount Brisbane, 42.3 km W of Caboolture, grid ref 9443-528034 | 27°05' | 152°31' | steep rocky slope, shallow loamy soil, in eucalypt/rainforest margin | fl & ft | frequent |
| 137068 | Bailey, F.M. | - | 2 Oct 1939 | Brisbane River, near Hamilton | - | - | swamp | ft | - |
| 637254 | Fairfax, R.J. | 214 | 15 Feb 1995 | Tim Shea Creek, Bunya Mountains, 9244-628283 | 26°51' | 151°37' | Poa/Themeda grassland, basalt | fl | grazed and disturbed site |
| 137066 | Smith, L.S. | 6220 | 15 Dec 1954 | Bunya Mountains, Big Falls track | 26°-- | 151°-- | in rainforest | sterile | - |
| 137067 | White, C.T. | - | Oct 1919 | Bunya Mountains | - | - | - | sterile | - |

Appendix 1.15. *Lasiopetalum* sp. (Proston J.A.Baker 17) (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|------------------|-----------------|---------------------------------|----------|-----------|--|----------------------|
| 264630 | Hockings, D. | - | Oct 1978 | near Abbeywood | 26°0'- | 151°3'- | - | fl |
| 641505 | Bean, A.R. | 10666 | 10 Sep 1996 | Stalworth road north of Proston | 26°07' | 151°36' | open forest with <i>Eucalyptus fibrosa</i> , <i>E. melanoleuca</i> , <i>E. apothalassica</i> , <i>Corymbia intermedia</i> , <i>Melaleuca groveana</i> shrubby understorey; red loam soil | fl common at site |
| 653780 | Bean, A.R. | 11359 | 26 Nov 1996 | Stalworth road north of Proston | 26°07' | 151°36' | open forest with <i>Eucalyptus fibrosa</i> , <i>E. intermedia</i> , <i>Melaleuca groveana</i> , <i>Boronia</i> sp.; red loam soil | fl common at site |

Appendix 1.16. *Leucopogon recurvisepalus* (extracted Sept. 1997)

| Herbarium AQ number | Collector(s) Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|--|-----------|------------|--|----------------|
| 10417 | Dowling, R. | 18 | 16 Apr 1973 | - | 26°52' | 152°57' | | |
| 187746 | White, C.T. | - | 26 Aug 1923 | Plunkett | 27°5-' | 153°0-' | | |
| 187747 | White, C.T. | 5584 | 24 Feb 1929 | - | 27°5-' | 153°1-' | | |
| 410893 | Smith, L.S. | 14031 | 24 Aug 1968 | Coochin Hills, E Peak | 26°52' | 152°56' | rocky SE midslope | |
| 454598 | Sharpe, P.R. + | 4683 | 26 Apr 1987 | Coochin Hills, Glasshouse Mt, c. 70 km N of Brisbane | 26°52' | 152°56' | summit of mountains, open heath of <i>E. curtisii</i> , <i>L. luehmannii</i> , on exposed rocks with pockets on humus; alt. 230 m | |
| 567762 | Bean, A.R. | 6143 | 30 Jun 1993 | Plunkett, SSW of Beenleigh | 27°5-' | 153°0-' | Open forest of <i>Eucalyptus dura</i> , <i>E. planchoniana</i> , <i>A. woodsiana</i> ; sandy soil | |
| 600789 | Grimshaw P. | G 517 | 8 Mar 1994 | TR 766, proposed Plunkett E.P. | 27°49'00" | 153°08'29" | Moderate slope with sandstone boulders and rock pavement; woodland and tall shrubland (<i>Cory. trachyphloia</i> , <i>E. planchoniana</i> , <i>E. curtisii</i> , <i>Angophora woodsiana</i>) | locally common |
| 633964 | Forster, P.I. + | PIF 16095 | 19 Jan 1995 | Coochin Hills, W. Peak | 26°51' | 152°55' | low open heathland, <i>L. microcarpum</i> , <i>L. luehmannii</i> and <i>Corymbia trachyphloia</i> , skeletal soil over trachyte; alt 235 m | rare in area |
| 638092 | Forster, P.I. + | PIF 17386 | 4 Aug 1995 | SF 893, Mt Mee | 27°06'48" | 152°41'17" | open forest of <i>Euc gummifera</i> and <i>E. racemosa</i> on sandy soil; alt 500 m | |

Appendix 1.17. *Macrozamia lomandroides* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Habitat | Other comments |
|---------------------|-------------------|-------------------|-----------------|--|---------------------------|
| 489808 | Leiper G. | | 1 Jul 1996 | forest on sand, alt 40 m | common |
| 489809 | Leiper G. | | 1 Jul 1996 | sandy soil, alt 40 m | — |
| 516427 | Forster P.I. + | PIF 9311 | 9 Jan 1992 | open eucalypt forest with scattered heath understorey on sandy soil, alt. 40 m | common in area |
| 517080 | Erskine P. | | 29 May 1992 | open woodland with <i>Eucalyptus hallii</i> , sandy soil, alt 40 m | — |
| 517081 | Erskine P. | | 29 May 1992 | open woodland (<i>E. hallii</i>), sandy soil, alt 20 m | — |
| 517089 | Machin P. | | Nov 1991 | eucalypt woodland (<i>E. hallii</i>), sandy soil | — |
| 517090 | Podberscek M. | | 18 Feb 1992 | <i>E. hallii</i> woodland, sandy soil | — |
| 587398 | Erskine P. | | 29 May 1992 | open eucalyptus woodland, sandy soil | intermediate |
| 590165 | Forster P.I. + | PIF 12318 | 6 Nov 1992 | eucalypt woodland on white sandy soil, alt. 20 m | — |
| 590861 | Erskine P. | | 29 May 1992 | heathy vegetation with <i>E. hallii</i> present in area, sandy soil | — |
| 590862 | Erskine P. | | 29 May 1992 | heathy vegetation with <i>E. hallii</i> present in area, sandy soil | — |
| 620908 | Forster P.I. + | PIF 13957 | 23 Sep 1993 | woodland of <i>E. intermedia</i> and <i>E. hallii</i> on deep sandy soil, alt 10 m | rare in area only 12 seen |
| 636283 | Brushe J. | JB 552A | 20 Apr 1994 | alt 20 m | — |

Appendix 1.18. *Macrozamia parcifolia* (extracted Sept. 1997)

| Herbarium AQ Number | Collector Name | Collectors Number | Collection Date | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|--|---------------------|
| 473961 | Randall, J. | — | Jul 1990 | open forest | |
| 520831 | Forster, P.I. + | PIF 9318B | 5 Jan 1992 | — | |
| 565638 | Forster, P.I. + | PIF 12301B | 6 Nov 1992 | open eucalypt forest on red stony ridge, with <i>Euc. citriodora</i> , <i>Euc. fibrosa</i> , <i>Acrotriche aggregata</i> and <i>Alphitonia</i> .; alt 120 m | very common in area |
| 565639 | Forster, P.I. + | PIF 12301A | 6 Nov 1992 | open eucalypt forest on red stony ridge, with <i>Euc. citriodora</i> , <i>Euc. fibrosa</i> , <i>Acrotriche aggregata</i> and <i>Alphitonia</i> .; alt 120 m | very common in area |
| 594215 | Forster, P.I. + | PIF 12569 | 29 Dec 1992 | open eucalypt forest on hard red-brown clay loam of basaltic origin; overstorey dominated by <i>Cor. citriodora</i> and <i>Euc. fibrosa</i> ; alt 100 m | very common in area |
| 594216 | Forster, P.I. | PIF 9260A | 23 Dec 1991 | open eucalypt forest on hard red-brown clay loam of basaltic origin, overstorey dominated by <i>Euc. citriodora</i> , understorey dominated by <i>Jacksonia scoparia</i> and <i>Psychotria daphnoides</i> ; alt 180 m. | |
| 594217 | Forster, P.I. | PIF 9260B | 23 Dec 1991 | open eucalypt forest on hard red-brown clay loam of basaltic origin, overstorey dominated by <i>Euc. citriodora</i> , understorey dominated by <i>Jacksonia scoparia</i> and <i>Psychotria daphnoides</i> ; alt 180 m. | |
| 594218 | Forster, P.I. + | PIF 9318A | 5 Jan 1992 | — | |
| 627614 | Forster, P.I. + | PIF 13322 | 14 Jun 1993 | open forest of <i>Euc. citriodora</i> , <i>Euc. crebra</i> on red soil ridge; alt 120 m | rare in area |
| 628983 | Forster, P.I. + | PIF 13107 | 26 Feb 1993 | open forest on red stony ridge with <i>Euc. citriodora</i> and <i>Euc. fibrosa</i> | very common in area |
| 634654 | Forster, P.I. | PIF 16056 | 31 Dec 1994 | open eucalypt forest on red soil, alt 30 m | occasional in area |
| 640710 | Sparshott, K.M. + | KMS 730 | 30 Jan 1996 | very tall woodland of <i>Euc. acmenoides</i> , <i>Cor. trachyphloia</i> with <i>Cor. intermedia</i> , <i>Euc. fibrosa</i> , and <i>Cor. citriodora</i> ; alt 140 m | |
| 641220 | Sparshott, K.M. + | KMS 838 | 29 May 1996 | very tall woodland of <i>Euc. fibrosa</i> , <i>Cor. citriodora</i> , <i>Cor. trachyphloia</i> , over <i>Lophostemon confertus</i> , <i>Acacia complanata</i> , <i>A. fimbriata</i> , <i>Macrozamia mountperriensis</i> , <i>Petalostigma triloculare</i> , <i>Alyxia ruscifolia</i> , <i>Solanum gympiense</i> ; stony soil; alt 120 m | |
| 654929 | Munt, P. | — | 3 Jul 1997 | — | |

Appendix 1.19. *Macrozamia pauli-guilielmi* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection Date | Habitat | Other comments |
|---------------------|-------------------|-------------------|-----------------|---|---------------------|
| 4194 | Williams, K.A. | - | 14 Jun 1971 | eucalypt forest on slopes close to creek banks, sandy soil | |
| 5931 | Harrold, A.G. | 273 | 29 Jun 1972 | dry sclerophyll shrub woodland | |
| 8462 | Harrold, A.G. | 273 | 29 Jun 1972 | dry sclerophyll shrub woodland | |
| 142071 | Kajewski, S.F. | 68 | 19 Jan 1928 | eucalypt forest | |
| 142072 | Clemens, M.S. | - | Sep 1946 | - | |
| 142074 | Clifford, D. | - | 14 Dec 1964 | - | |
| 142075 | White, C.T. | 3544 | 21 Jun 1927 | open forest land, sandy soil | |
| 142076 | Unknown | - | Apr 1961 | - | |
| 142077 | Hall, W.T. | - | 18 Jan 1952 | - | |
| 142078 | Unknown | - | May Y1953 | - | |
| 473960 | Randall, J. | - | Jul 1990 | open forest | |
| 516425 | Forster, P.I. + | PIF 9350 | 5 Jan 1992 | open eucalypt forest with closed heath understorey on sandy soil, alt 20 m | very common in area |
| 565320 | Forster, P.I. + | PIF 9345 | 5 Jan 1992 | - | |
| 565636 | Forster, P.I. + | PIF 12329 | 7 Nov 1992 | open eucalypt forest with closed heath understorey on sandy soil, alt 20 m | very common in area |
| 568768 | Machin, P. | PM 8 | 26 Jun 1993 | low heathland with scattered eucalypts on deep sand; alt 20 m | common in area |
| 568769 | Machin, P. | PM 9 | 26 Jun 1993 | eucalypt forest with dense understorey on deep sandy soil; alt. 20 m | common in area |
| 584089 | Crane, R. | 1167 | 26 May 1995 | open forest, alt 50 m | occasional in area |
| 620756 | Forster, P.I. + | PIF 13894 | 20 Sep 1993 | eucalypt forest with dense understorey, alt 2 m | one plant |
| 627615 | Forster, P.I. + | PIF 13378A | 20 Jun 1993 | open forest on deep sandy soil, canopy dominated by <i>Angophora</i> , dense midstorey of <i>Leptospermum</i> ; alt 230 m | locally common |
| 627616 | Forster, P.I. + | PIF 13378B | 20 Jun 1993 | open forest on deep sandy soil, canopy dominated by <i>Angophora</i> , dense midstorey of <i>Leptospermum</i> ; alt 230 m | locally common |
| 636273 | Brushe, J. | JB 709 | 24 Apr 1994 | eucalypt woodland, alt 20 m | |
| 637233 | Hockings, F.D. | - | 22 Aug 1965 | in deep sand under <i>Eucalyptus</i> and <i>Banksia</i> | |
| 640012 | Grimshaw, P. + | PG 1079 | 20 Feb 1995 | very tall open forest with <i>E. fibrosa</i> , <i>Cory. citriodora</i> , <i>Angophora leiocarpa</i> , Tiaro Coal Measures, alt. 100 m | uncommon at site |
| 640103 | Grimshaw, P. + | PG 2061 | 10 Apr 1995 | eucalypt very tall open forest, undulating creek flat, red brown loam, sandstone | occasional at site |
| 640112 | Grimshaw, P. + | PG 2074 | 11 Apr 1995 | eucalypt very tall open forest, crest of low rise, tertiary sandstone or alluvium | occasional at site |
| 640118 | Grimshaw, P. + | PG 2070 | 10 Apr 1995 | eucalypt tall woodland, narrow sloping drainage swamp, gritty siliceous loam (grey-brown) Quartzose sandstone | occasional at site |
| 640595 | Foley, O. | - | 14 Dec 1995 | eucalyptus forest, pink bloodwood | |

Appendix 1.20. *Marsdenia coronata* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-----------------|-------------------|-----------------|--|----------|-----------|--|---------------------------|
| 216643 | Wedd, J. | | 6 May 1907 | Mt Buderim | 26°4-' | 153°0-' | | fl |
| 216645 | White, C.T. | | 6 Sep 1939 | Ridge N of Tibrogargan, Glasshouse Mts | 26°5-' | 152°5-' | | |
| 377367 | Sharpe, P.R. + | 3005 | 18 Sep 1981 | Mt Coolum, c. 3 km S of Coolum Beach | 26°33' | 153°05' | open grassy forest of <i>Loph. confertus</i> , <i>Cory. intermedia</i> etc., rhyolite rocks, alt 150 m | fl |
| 431197 | Bird, L.H. | | 4 Feb 1985 | Ebbw Vale, 16 High St | 27°37' | 152°49' | eucalypt forest, stony ridge | fl |
| 453761 | Williams, K.A. | 89000 | 2 Jan 1989 | Bergins Hill, Bundamba SE of Ipswich | 27°37' | 152°49' | open hardwood forest with understorey of shrubs, clay loam | fl |
| 454861 | Bird, L.H. | | 18 Jan 1988 | New Chum Rd, Ipswich, 9442-835463 | 27°36' | 152°50' | <i>E. fibrosa</i> open forest | fl |
| 454862 | Forster, P.I. + | PIF 3500 | 13 Feb 1988 | Ben Lomond, 6 km N of Maroon, Grid Ref: 9441-735896 | 28°06' | 152°44' | rock ledges along cliff lines rhyolite, alt 400 m | rare at locality |
| 459530 | Bird, L.H. | | 30 May 1986 | Bundamba, Bergins Hill | 27°37' | 152°49' | on shale and sandstone, in <i>E. fibrosa</i> open forest | fl fairly rare at site |
| 459531 | Bird, L.H. | | 31 Oct 1987 | Ipswich Dinmore, 1 km S of on New Chum-Dinmore Rd | 27°36' | 152°50' | <i>Cory. citriodora</i> , <i>E. fibrosa</i> , Clay over Coal Measures, alt. 40 m | fl |
| 459537 | Gilby, G. | | 6 Feb 1985 | Ebbw Vale, 51 High St | 27°37' | 152°49' | <i>Euc. fibrosa</i> open forest, disturbed | fl |
| 459550 | Bird, L.H. | | 18 Jan 1988 | Bundamba Bergins Hill, Barclay St | 27°37' | 152°49' | <i>Euc. fibrosa</i> open forest remnant | fl |
| 459590 | Forster, P.I. + | PIF 3189 | 15 Nov 1987 | New Chum Rd, Grid Ref: 9442-835403 | 27°36' | 152°50' | <i>Euc. fibrosa</i> open forest | fl |
| 459645 | Bird, L.H. | | 19 Jun 1988 | White Rock, 6.5 km SE of Swanbank Power Station | 27°42' | 152°52' | open eucalypt forest on sandstone | fl |
| 459651 | Forster, P.I. + | PIF 1872 | 19 Aug 1984 | Ivorys Rock, 17 km S of Ipswich, Grid Ref: 9442-784280 | 27°46' | 152°47' | Eucalypt forest, with fern and <i>Astrotricha</i> sp., southern side of rock alt. 200 m | |
| 471070 | Forster, P.I. + | PIF 6623 | | Mt Moon, 5 km SW of Mt Alford township | 28°06' | 152°33' | open forest with <i>Euc. dura</i> , <i>Euc. acmenoides</i> , alt. 780 m | |

Appendix 1.20. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-----------------|-------------------|-----------------|---|----------|-----------|--|--------------------------|
| 471220 | Rider, E. | 43 | 13 Mar 1990 | Imbil, Parish SF 256, near top of Mt Kandanga | 26°27' | 152°34' | alt 500 m | |
| 472835 | Bean, A.R. | 1543 | 5 May 1990 | The Steamers E of Emu Vale | 28°13' | 152°25' | open forest of <i>E. carnea</i> , <i>E. propinqua</i> and <i>E. acmenoides</i> | rare at site |
| 473638 | Bird, L.H. | | 30 Aug 1990 | 10 km NW of Ipswich, Pine Mt | 27°32' | 152°43' | dry gravelly ridge with <i>Euc.</i> woodland, alt 150 m | |
| 473954 | Bird, L.H. | | 9 Sep 1990 | Ipswich, 3 km S of Dinmore | 27°36' | 152°50' | open eucalypt woodland on sandstone, with <i>Euc. fibrosa</i> | |
| 502893 | Bird, L.H. | | 27 Jan 1991 | Barclay St, Bergins Hill, Bundamba, Ipswich | 27°37' | 152°49' | <i>Cory. citriodora</i> , <i>Euc dura</i> , <i>Cory. henryi</i> woodland, on stony soil with sandstone and ironstone present | fl |
| 503189 | Bean, A.R. + | 2864 | 13 Feb 1991 | Ten Mile Rd, SSE of Jimna | 26°48' | 152°31' | | |
| 503753 | Bird, L.H. | | 15 Dec 1990 | 2 km S of Dinmore, Ipswich | 27°36' | 152°50' | dry eucalypt woodland, <i>E. fibrosa</i> , <i>C. henryi</i> , <i>Ac. fimbriata</i> , alt. 150 | fl |
| 544397 | Bird, L.H. | | 1 Jul 1992 | Possum Ck, 2 km SE of Goodna Ipswich | 27°40' | 152°54' | among sandstone boulders in eucalypt woodland | c. 12 plants |
| 563276 | Forster, P.I. + | PIF 13145 | 27 Feb 1993 | SF 256, Imbil Mitchell L.A. | 26°27' | 152°34' | scrubby eucalypt forest | fl common in area |
| 563277 | Forster, P.I. + | PIF 13141 | 27 Feb 1993 | SF 639, Wrattens | 26°16' | 152°21' | scrubby eucalypt forest on steep ridge | fl occasional in area |
| 563612 | Bird, L.H. + | | 18 Dec 1992 | Opossum Ck, Camira | 27°39' | 152°54' | open eucalypt woodland dominated by <i>E. fibrosa</i> , rocky area with sandstone | fl |
| 563689 | Bean, A.R. | 5791 | 6 Mar 1993 | Swain Peak, 7 km NW of Yandina | 26°31' | 152°54' | open forest with <i>E. carnea</i> and <i>E. propinqua</i> | rare at site |
| 563826 | Halford, D. + | Q 1641 | 24 Mar 1993 | 7 km S of Tewantin, near Toll Rd | 26°27' | 153°02' | on hillock, skeletal sandy soil rhyolite, mixed eucalypt woodland | fl |
| 563964 | Bird, L.H. | | 23 Dec 1992 | 6 km S of Redbank Plains, 1 km S of White Rock, Ipswich | 27°42' | 152°51' | sandstone ridge, in dry eucalypt woodland | fl |
| 566109 | Bean, A.R. | 5886 | 29 Mar 1993 | 2 km NW of Mt Beerburum | 26°57' | 152°56' | skeletal rhyolite ridge with <i>E. carnea</i> , <i>L. luehmannii</i> , <i>L. microcarpum</i> , alt. 100 m | rare at site |

Appendix 1.20. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-----------------|-------------------|-----------------|--|-----------|------------|--|-------------------------|
| 568010 | Bean, A.R. | 6106 | 23 Jun 1993 | Canning Rd, SF 792, S of Jimna | 26°49' | 152°32' | open forest of <i>Euc. carnea</i> , <i>E. propinqua</i> and <i>E. acmenoides</i> , alt. 500 m | rare at site |
| 570687 | Thompson, E.J. | MOR 120 | 15 May 1993 | Daisy Hill SF, Logan City | 27°38' | 153°10' | woodland of <i>E. tindaliae</i> with <i>C. henryi</i> and <i>E. carnea</i> with shrubby understorey on undulating terrain with gravelly/sandy soil | locally rare small vine |
| 622241 | Bean, A.R. | 6785 | 25 Oct 1993 | Redwood Rd, 6 km NE of Eumundi | 26°28' | 153°00' | open forest of <i>E. pilularis</i> , <i>E. microcorys</i> , <i>C. intermedia</i> | fl occasional at site |
| 640104 | Grimshaw, P. + | PG 2062 | 10 Apr 1995 | SF944, Red Ridge L.A., Parish of Neerdie | 25°59'33" | 152°45'08" | undulating creek flat, red brown loam, eucalypt open forest | uncommon at site |

Appendix 1.21. *Medicosma elliptica* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collector Number | Collection Date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|----------------------------------|------------------|-----------------|--|-----------|------------|---|---------------------------------------|
| 296355 | McDonald, W.J.F. & Stanton, J.P. | 2394 | 22 Jul 1978 | SF 67, Bulburin, c. 24 km W of Lowmead | 24°3'- | 151°3'- | Araucarian notophyll vine forest along upper granite creek | ft very common understorey species |
| 322214 | McDonald, W.J.F. + | 3163 | 15 Apr 1980 | Bulburin SF 67, western side of Boyne L.A., adjacent to plantations, 2 km NE of Forest Station | 24°3'- | 151°3'- | closed-forest formerly with <i>Araucaria cunninghamii</i> emergents | fl |
| 322534 | McDonald, W.J.F. + | 3172 | 15 Apr 1980 | Bulburin SF 67, upper Boyne River near Scott road crossing | 24°3'- | 151°3'- | closed-forest with occasional emergent <i>F. macrophylla</i> and <i>Lopho. confertus</i> | fl |
| 322535 | McDonald, W.J.F. + | 3258 | 17 Apr 1980 | Bulburin SF 67, loading ground near Podargus Creek, upper granite creek valley | 24°3'- | 151°3'- | closed-forest selectively logged for hoop pine emergents | fl |
| 339628 | Sarnadsky, K.D. | 327 | 3 Jul 1983 | Dawes Range SF 391, Bulburin | 24°3'- | 151°3'- | dense rainforest | |
| 407827 | McDonald, W.J. | 3444A | 29 Dec 1981 | S.F. 391, Bulburin (now granite creek SF) | 24°3'- | 151°3'- | closed forest, heavily logged and infested with Lantana, moderate slope, NW aspect, parent rock andesite | fl |
| 458811 | Forster, P.I. + | PIF5852 | 26 Oct 1989 | 0.5 km along Scott road, off Boyne road, Boyne L.A., Bulburin S.F. 391, grid ref 9148 470850 | 24°33' | 151°29' | complex notophyll vine forest on red krasnozem soil, alt 500 m | |
| 488603 | Worthington, M. | 1659 | 14 Dec 1995 | Granite Creek, 9 km E of Bullyan | 24°32' | 151°29' | ?vine common, edge forest road | ft |
| 602546 | Forster, P.I. + | PIF18291 | 30 Dec 1995 | Boyne L.A., SF 391, Bulburin | 24°32'25" | 151°29'19" | complex notophyll vine forest on red soil | fl & ft |
| 622909 | Forster, P.I. + | PIF14561 | 31 Dec 1993 | Boyne L.A., SF 391, Bulburin, 0.5 km along Scott road off Boyne road | 24°32' | 151°29' | Araucarian notophyll vineforest on red-brown soil, alt 580 | fl & ft very common in area |
| 635699 | Thomas, G. + | RFR140 | 1 Jun 1993 | Granite Creek Road, Bulburin SF | 24°35' | 151°32' | simple notophyll very tall mixed closed forest with <i>Ficus</i> and <i>Flindersia</i> emergents to 40 m, Alt 200 | |
| 635710 | Barry, S. + | RFR149 | 30 May 1993 | about 0.3 km along Scott's Road heading E, Bulburin SF | 24°33' | 151°29' | complex notophyll very tall mixed closed forest with <i>Argyrodendron</i> , <i>Ficus</i> and <i>Lophostemon</i> emergents to 40 m | Bd |
| 635711 | Thomas, G. + | RFR136 | 1 Jun 1993 | Granite Creek about 250 m N of Scott's Road crossing, Bulburin SF | 24°34' | 151°31' | simple notophyll very tall mixed closed forest with <i>Ficus</i> and <i>Flindersia</i> emergents to 40 m, Alt 200 | ft & bd |

Appendix 1.22. *Notelaea lloydii* (extracted Sept. 1997)

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat notes | Other Comments |
|---------------------|--------------------|-------------------|-----------------|---|----------|-----------|--|----------------|
| 348158 | Bird, L. | — | 5 Jul 1981 | Banks of Brisbane River near Karana Downs | 27°3-' | 152°5-' | margins of low microphyll vine forest | fl |
| 348213 | Bird, L. | — | 13 Jun 1981 | Above Brisbane River near Karana Downs | 27°3-' | 152°5-' | low microphyll vine forest | bud |
| 395662 | Bird, L.H. | — | Jul 1984 | End of Frenchs Ck Road, c. 12 km SW of Boonah | 28°0-' | 152°3-' | remnant patch of softwood scrub, <i>Araucaria cunninghamii</i> vine scrub | fl |
| 408114 | Bird, L.H. | — | 31 Oct 1987 | near Rhonda Colliery on road between Dinmore and Redbank Plains | 27°37' | 152°47' | dry eucalypt forest, soil very shallow and stony, clay and shale over coal measures | ft |
| 424617 | Bostock, P.D. | — | — | Anstead, Corner of Chalcott and Mt Crosby Rds | 27°3-' | 152°4-' | on roadside | — |
| 431199 | Bird, L.H. | — | 28 Oct 1985 | Kholo Ck on Scouting Association Land (Tymolum) | 27°3-' | 152°4-' | Eucalypt forest, soil stony brown, alt. 100 m | ft |
| 433719 | Guymer, G.P. | 1990 | 30 Jul 1985 | 13.8 km W of Kenmore P.O. Bunya St end | 27°31' | 152°52' | — | — |
| 433720 | Self, A.J. + | — | 18 Jul 1985 | Kenmore Mt Crosby road, opposite Bunya St | 27°32' | 152°43' | — | fl |
| 433721 | Bird L. | — | 17 Nov 1985 | Scouting assc. land, Tymolum at end off Bunya St, Brisbane-Mt Crosby Rd | 27°32' | 152°43' | shallow gully drainage into Kholo Creek, Soil shallow, well drained, very stony, alt 50 m | ft |
| 433722 | Guymer, G.P. + | 1989 | 12 Jul 1985 | End of Bunya St off Mt Crosby Rd, 13.8 km W of Kenmore | 27°32' | 152°43' | eucalypt open forest adjoining vine thicket | — |
| 433723 | Guymer, G.P. + | 1987 | 12 Jul 1985 | Mt Crosby Rd opposite Bunya St | 27°32' | 152°43' | margin of notophyll vine thicket | fl |
| 433724 | Guymer, G.P. + | 1988 | 12 Jul 1985 | End of Bunya St, 13.8 km W of Kenmore PO | 27°32' | 152°43' | open forest of <i>Euc. crebra</i> , <i>Cor. citriodora</i> adjoining vine thicket | — |
| 433725 | Dillewaard, H.A. + | — | 18 Jul 1985 | End of Bunya St off Mt Crosby Rd | 27°32' | 152°43' | eucalypt open forest | fl |
| 436035 | Bird, L.H. | — | 21 Dec 1987 | Ipswich between Dinmore and Redbank Plains near Rhonda Colliery | 27°37' | 152°47' | dry eucalypt forest, soil shallow and stony mostly sandstone, alt. 50 m | ft |
| 441682 | Bird, L.H. | — | 15 Dec 1985 | Tymolum Bunya St, Kholo Ck off Mt Crosby Rd | 27°3-' | 152°5-' | eucalypt forest with scattered rainforest trees present, soil brown shallow, stony, alt 80 m | ft |
| 442071 | Bird, L.H. | — | 30 Jun 1985 | c. 12 km SW of Laidley Newmans Lookout | 27°35' | 152°25' | edge of bottletree scrub | — |

Appendix 1.22. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat notes | Other Comments |
|---------------------|-----------------|-------------------|-----------------|---|----------|-----------|---|-------------------|
| 442072 | Bird, L.H. | — | 21 Aug 1985 | Mt Berryman, c. 1 km Newmans Lookout | 27°43' | 152°20' | scrub | — |
| 442073 | Bird, L.H. | — | 21 Aug 1985 | Mt Berryman, c. 1 km Newmans Lookout | 27°43' | 152°20' | low vine thicket near lookout | — |
| 457921 | Bird, L.H. | — | 15 Oct 1989 | Rosewood, c. 2 km E of Perrys Knob | 27°38' | 152°34' | remnant Araucarian notophyll/mesophyll vine forest | — |
| 473156 | Bird, L.H. | — | 26 Jul 1990 | Mt Pine Reserve Forest 476, 12 km NW of Ipswich | 27°42' | 152°20' | on bank of moist gully, eucalypt woodland | — |
| 473957 | Bird, L.H. | — | 12 Jul 1990 | Mt Crosby, 1 km E of, on Karana Downs area | 27°32' | 152°48' | sheltered moist gully, on eucalypt forest, on stony well-drained soil | fl |
| 474843 | Bird, L.H. | — | 24 Oct 1990 | Bigger Camp P Grandchester | 27°40' | 152°28' | eucalypt forest | — |
| 476393 | Bird, L.H. | — | 9 May 1989 | Mt Blaine 5 km NE of Peak Crossing | 27°47' | 152°50' | margin of hoop pine scrub, very rocky | — |
| 477320 | Bird, L.H. | — | 24 Jun 1989 | Mt Brisbane (2 km E) Rough L.A. Timber Reserve | 27°0-' | 152°3-' | microphyll vine thicket margin, alt. 200 m | — |
| 488214 | Searle, J. | — | 25 Mar 1996 | Voyka St Pullenvale near Mt Elphinstone | 27°31' | 152°53' | — | — |
| 489216 | Bird, L.H. | 8 | — | Whitwood road, Ebbwvale Ipswich | 27°37' | 152°47' | — | — |
| 489217 | Bird, L.H. | — | 1 Jun 1996 | Whitwood road, Ebbw Vale Ipswich 400 m E of the road | 27°37' | 152°47' | remnant eucalypt open forest <i>E. fibrosa</i> with an understorey of shrubs, area contains numerous clay pits and mine dumps | fl |
| 505026 | Bird, L.H. | — | 9 Aug 1990 | Dinmore 1 km S of Ipswich | 27°36' | 152°50' | in stony gully, shale sandstone soil, with open eucalypt woodland, alt 100 m | — |
| 506336 | Bird, L.H. + | — | 25 Jul 1991 | 1 km E of Ivorys Rock, Peak Crossing, 18 km S of Ipswich GRID REF 9442-797278 | 27°46' | 152°47' | on rock outcrop, eucalypt woodland, with a few stunted rainforest plants, alt. 300 m | — |
| 506337 | Bird, L.H. + | — | 27 Jul 1991 | 1 km S of Dinmore Ipswich beside southern bypass GRID REF 9442-832465 | 27°36' | 152°49' | in open eucalypt woodland | fl |
| 506590 | Bird, L.H. | — | 3 Aug 1991 | Beside southern bypass, 1 km S of Dinmore Ipswich | 27°34' | 152°50' | open eucalypt woodland | fl |
| 544037 | Holmes, G. | — | 21 Jun 1992 | Cainbale Ck road, SE of Beaudesert, steep hill, ca. 400 m before first crossing | 28°05' | 153°05' | steep dry slope, in eucalypt woodland, igneous rock | only a few plants |

Appendix 1.22. cont./

| Herbarium AQ Number | Collectors Name | Collectors Number | Collection Date | Locality | Latitude | Longitude | Habitat notes | Other Comments |
|---------------------|--------------------|-------------------|-----------------|--|----------|-----------|---|----------------|
| 547379 | Forster, P.I. + | PIF 11484 | 16 Sep 1992 | Mt Edwards | 28°01' | 152°32' | open forest with <i>Euc. acmenoides</i> and <i>Acacia concurrens</i> , alt. 480 m | rare in area |
| 588016 | Bird, L.H. | – | 15 Aug 1996 | Camerons Ck, 2 km NE of Mt Crosby Township | 27°--' | 152°--' | growing on a steep stony ridge adjacent to the creekline | – |
| 626262 | Ramsden, M. | – | 10 Apr 1994 | Banksia Drive, Mt Crosby, 10 km to Ipswich | 27°32' | 152°48' | slope down to creek, in eucalypt forest | – |

Appendix 1.23. *Oldenlandia* sp. (Wietalaba N.Gibson 1344) (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|--------------------|------------------|-----------------|---------------------------------------|-----------|------------|--|--------------------|
| 568109 | Gibson, N. | TOI1315 | 17 Jun 1992 | SF583, Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | Araucarian microphyll vineforest, alt 450 | common |
| 603511 | Forster, P.I. | PIF19164 | 23 May 1996 | SF583 Wietalaba | 24°17'06" | 151°13'05" | Araucarian microphyll vineforest on brownish soil, dominated by <i>Choricarpia</i> and <i>Barklya</i> | locally common |
| 632216 | Gibson, N. | 1343 | 11 Nov 1994 | SF583, Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | scree hillside, dry rainforest, alt 400 m. | – |
| 632217 | Gibson, N. | 1344 | 13 Apr 1994 | SF583, Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | scree hillside, dry rainforest, alt. 400 m | – |
| 639706 | Forster, P.I. + | PIF18265 | 29 Dec 1995 | SF583 Wietalaba | 27°17'12" | 151°13'30" | Araucarian microphyll vineforest, reddish soil, steep slope; canopy dominated by <i>Choricarpia subargentea</i> , <i>Backhousia kingii</i> and <i>Barklya syringifolia</i> , alt. 540 m. | occasional in area |

Appendix 1.24. *Parsonsia kroombitensis* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------------------|------------------|-----------------|---|-----------|------------|--|---|
| 571319 | Thompson, E.J. + | BIL58 | 21 Mar 1995 | Kroombit Tops SF | 24°23'06" | 150°53'24" | Open woodland of <i>E. trachyphloia</i> and <i>E. acmenoides</i> , SE facing slope, alt 860 m | fl |
| 571652 | Thompson, E.J. & Turpin, G.P. | CAL310 | 6 Jul 1995 | TR423, Boyne Range, c 2 km W of Targoola | 24°06'17" | 151°11'50" | NE facing slope of hilly terrain with brown gravelly loam, tall open woodland of <i>E. crebra</i> and <i>E. erythrophloia</i> , mudstone; alt. 120 m | ft |
| 632226 | Gibson, N. | 1348 | 17 Sep 1993 | SF 316, Kroombit Tops, 44 km E of Biloela | 24°22' | 150°55' | growing on rock crevices, rock faces, dry escarpment, 800 m alt | ft |
| 634564 | Forster, P.I. | PIF16248 | 16 Feb 1995 | SF 316, Kroombit Tops | 24°21'29" | 150°56'43" | Woodland of <i>E. eugenioides</i> , <i>E. montivaga</i> and <i>E. longirostrata</i> on metamorphosed sandstone | fl occasional on clifflines and outcrops |

Appendix 1.25. *Parsonsia larcomensis* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|--------------------------------|------------------|-----------------|---|----------|-----------|---|--------------------------|
| 213177 | Blake S.T. | 22450 | 23 Mar 1966 | near top of Mt Larcom | 23°4' | 150°5' | — | — |
| 213182 | Keys, J. | 859 | May 1886 | Mt Perry [TR 157] | — | — | on rocks on the summit of high cliffs | SF fl |
| 213183 | Keys J. | 413 | — | Mt Perry | 25°11' | 151°39' | — | fl |
| 489298 | Plumb, J. | JPF | Feb 1996 | Upper Stoney | 22°50' | 150°30' | riverine rainforest | fl |
| 550022 | Batianoff, G.N. & Robins, P.A. | WH9108023 | 30 Aug 1991 | Mount Wheeler, 12 km SW of Yeppoon | 23°12' | 150°41' | serpentinite gully at base of rockface, <i>Euc. fibrosa</i> woodlands | — |
| 568751 | Forster, P.I. + | PIF13791 | 7 Aug 1993 | Mount Wheeler, SE side, Grid ref. 9051-629290 | 23°12' | 150°40' | trachyte clifflines with scattered vegetation | fl common in crevices |
| 624927 | Forster, P.I. | PIF14653 | 25 Jan 1994 | Mount Larcom, 5 km NW of Yarwun, Summit | 23°48' | 151°04' | Cliffines and exposed outcrops with scattered vegetation in open woodland/shrubland, alt. 630 m | fl rare in area |

Appendix 1.26. *Paspalidium grandispiculatum* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat |
|---------------------|-------------------|------------------|-----------------|---|----------|-----------|---------------------------------|
| 297975 | Thomas J.A. | 1454M | Apr 1979 | Beaudesert | 27°5-' | 153°0-' | native pastures, cleared forest |
| 306776 | Pearl M. | 1480 | 26 Feb 1979 | Ravensbourne to Helidon road | 27°2-' | 152°0-' | — |
| 321744 | Pearl M. | 1990 | 9 Feb 1980 | 14 km N of Helidon on Ravensbourne road | 27°2-' | 152°0-' | — |
| 321745 | Pearl M. | 1991 | 28 Mar 1980 | Helidon-Ravensbourne road | 27°2-' | 152°0-' | — |
| 343227 | Pearl M. | 1913 | 29 Nov 1979 | Helidon-Ravensbourne road | 27°2-' | 152°0-' | — |

Appendix 1.27. *Plectranthus nitidus* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|-----------------------------------|----------------------------|-------------------|-----------------|---|----------|-----------|---|----------------|
| Queensland localities | | | | | | | | |
| 508167 | Forster, P.I. & Leiper, G. | PIF7800 | 24 Feb 1991 | 4.3 km past bridge over Little Nerang Creek, Mudgeeraba to Springbrook road, Qld | 28°08' | 153°16' | complex notophyll vineforest on rocky gully | ifl NP? |
| New South Wales localities | | | | | | | | |
| 333784 | Coveny, R. | 10625 | 15 Feb 1908 [?] | Terania Creek, 10 km NNE of The Shannon, NSW | 28°35' | 153°18' | damp rocks on cliff adjacent to rainforest; alt 180 m. | ifl |
| 503958 | Forster, P.I. | PIF 7812 | 15 Mar 1991 | cultivated, Rainworth, Brisbane, Qld, ex Terania Creek Basin, NSW | 27°3-' | 153°0-' | — | — |
| 540182 | Hardwick, P. | — | 20 May 1991 | cultivated, Byron Bay, NSW | 28°3-' | 153°3-' | — | — |
| 596182 | Hardwick, P. | — | 16 Feb 1988 | cultivated, Wollongbar NSW, ex 2-3 km into Terania Ck section of Nightcap N.P., NSW | 28°4-' | 153°2-' | wild source information: on a rock cliff face bordering on subtropical rainforest | 2 plants seen |

Appendix 1.28. *Plectranthus omissus* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------|-------------------|-----------------|---|----------|-----------|---|----------------|
| 455298 | Forster, P.I. | PIF4977 | 21 Feb 1988 | Mudlow Gap, Timber Reserve 26, 8 km N of Kilkivan | 26°10' | 152°14' | on rocks in open area next to scrub | fl SF |
| 625962 | Bean, A.R. | 7542 | 7 Mar 1994 | cultivated ex Mt Boulder, SE of Gympie | 26°15' | 152°48' | growing on steep rocky outcrops, with small shrub and herbs | fl SF |

Appendix 1.29. *Plectranthus torrenticola* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|------------------------------|------------------|-----------------|--|----------|-----------|---|----------------------|
| 433781 | Sharpe, P.R. & Tan, L. | 4676 | 17 Apr 1987 | Poole's Dam, Stop 3, Mapleton Forestry Drive, about 8 km N of Mapleton | 26°34' | 152°52' | creek bank, open forest of <i>Eucalyptus</i> , <i>Casuarina</i> , rocks prominent, growing on open rock | fl SF |
| 457727 | Sharpe, P.R. | 4867 | 18 Apr 1989 | Kondallilah Falls National Park, about 6 km S of Mapleton | 26°40' | 152°51' | creek bank, open rock face at side of creek, growing on bare rock in humus, alt. 300 m | fl NP |
| 503957 | Forster, P.I. + | PIF 7795 | 20 Feb 1991 | Skenes Ck, near Kondalilla N.P., GRID REF 9444-866495 | 26°40' | 152°51' | on bareback outcrop, along creek, with <i>Omalanthus stillingifolius</i> , <i>Plectranthus parviflorus</i> , <i>Lomandra longifolia</i> , <i>Peperomia leptostachys</i> and <i>Pyrrosia rupestris</i> | fl NP |
| 506962 | Leiper, G. | — | Aug 1991 | Dunethin Rock, Bli Bli | 26°36' | 153°02' | — | specimen missing |
| 540091 | Forster, P.I. & Sharpe, P.R. | PIF7797 | 20 Feb 1991 | Poole's Dam, Cooloolabin State Forest Drive, Grid Ref 9444-867617 | 26°33' | 152°51' | bare rock outcrops along creek with <i>Lepto. petersonii</i> , <i>Ottochloa nodosa</i> and <i>Lomandra confertifolia</i> | type fl SF |
| 563684 | Bean, A.R. | 5785 | 6 Mar 1993 | Swain Peak, 7 km NW of Yandina | 26°31' | 152°54' | on rock outcrop with <i>Drynaria rigidula</i> , <i>Peperomia leptostachya</i> , surrounded by open eucalypt forest, alt 250 m | fl common at site |
| 565525 | Bean, A.R. | 5892 | 31 Mar 1993 | Boughan Break, Mapleton SF, north of Mapleton | 26°33' | 152°51' | rock outcrop in <i>Euc. pilularis</i> open forest; seems to grow on all outcrops in the area with dappled shade for much of the day, alt 380 m | fl |
| 566442 | Bean, A.R. | 6008 | 22 Apr 1993 | Walli State Forest, S of Kenilworth, SF918 | 26°41' | 152°43' | rock outcrop in open forest of <i>Euc. grandis</i> , <i>Lophostemon confertus</i> E. <i>propinqua</i> , alt. 450 m | fl SF |

Appendix 1.30. *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781) (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collectors Number | Date | Locality | Latitude | Longitude | Habitat | Other comments | Phenology |
|---------------------|-------------------|-------------------|-------------|---|----------|-----------|--|---------------------|-----------|
| 438741 | Sandercoe, C. | C1286 | 26 Nov 1987 | Tewantin S.F. | 26°2'- | 153°0'- | <i>Eucalyptus resinifera</i> , <i>Syncarpia glomulifera</i> and <i>Corymbia intermedia</i> woodland | SF | fl |
| 457643 | Sharpe, P.R. | 4781 | 19 Jan 1988 | Mt Tinbeerwah about 6 km WNW of Tewantin | 26°24' | 152°59' | open forest of <i>Eucalyptus</i> , <i>Syncarpia</i> , <i>Lophostemon</i> with <i>Gahnia</i> and <i>Melastoma</i> | Freehold | fl |
| 635582 | Thomas, G. | 29 | 18 Apr 1995 | N of Illoura Place - Tewantin Noosa shire, between ringtail creek and Illoura place | 26°21' | 152°58' | <i>Eucalyptus racemosa</i> forest | Freehold occasional | fl |

Appendix 1.31. *Rhodamnia* sp. (Calliope N. Gibson 1335) (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|---------------------|-------------------------------|------------------|-----------------|---------------------------------------|-----------|------------|---|------------------------|
| 568108 | Gibson, N. | - | 19 May 1993 | SF 583 Wietalaba | 24°18' | 151°16' | dry rainforest | Sf two plants seen |
| 571773 | Thompson, E.J. & Turpin, E.J. | CAL355 | 1995 | SF583 near headwaters of Cedar Ck | 24°17' | 151°13' | S facing upper slope on ridge with brown loam | SF |
| 602498 | Forster, P.I. + | PIF18272 | 29 Dec 1995 | SF583 Wietalaba | 24°17'02" | 151°12'53" | Araucarian microphyll vine forest on reddish soil, steep slopes, canopy dominated by <i>Choricarpia subargentea</i> , <i>Backhousia kingii</i> and <i>Barklya syringifolia</i> , alt. 360 m | SF rare in area 3 seen |
| 632211 | Gibson, N. | - | 11 Nov 1993 | SF 583 Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | dry rainforest, scree hillside, alt. 400 m | SF rare |
| 632212 | Gibson, N. | - | 13 Apr 1994 | SF 583 Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | dry rainforest, under closed canopy, alt. 400 m | SF rare |
| 632213 | Gibson, N. | - | 11 Nov 1993 | SF 583 Wietalaba, 32 km S of Calliope | 24°17' | 151°12' | dry rainforest, open ridgeline, in full sun along track, alt. 400 m | SF rare |

Appendix 1.32. *Sophora fraseri* (extracted Sept. 1997)

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|------------------------------|-------------------|------------------|-----------------|--|----------|-----------|--|----------------|
| Queensland localities | | | | | | | | |
| 237557 | Ford W. | — | — | Kingaroy | 26°3-' | 151°5-' | — | in fl |
| 237558 | Boorman J.L. | — | Jan 1912 | Killarney | 28°1-' | 152°1-' | — | in fl |
| 237559 | Smith L.S. | 10534 | 30 Mar 1959 | Mt Colliery | 28°1-' | 152°1-' | — | — |
| 237560 | Unknown | — | Oct 1891 | Killarney | 28°1-' | 152°1-' | — | in fl |
| 237561 | White C.T. | 8766 | Sep 1930 | Helidon | 27°3-' | 152°0-' | — | in fl |
| 237562 | White C.T. | — | 1 Jul 1916 | Pine Mt, Upper Brisbane River | 27°3-' | 152°4-' | — | in fl |
| 237563 | Swan G.J. | — | Oct 1950 | Caffey, via Gatton | 27°4-' | 152°1-' | — | in fl |
| 237564 | Everist S.L. | — | 3 Oct 1954 | Heifer Ck road | 27°4-' | 152°0-' | in yellow clay on steep hillside, alt. 60 m | — |
| 237565 | White C.T. | — | Nov 1914 | Brisbane, Enoggera Creek | 27°27' | 152°57' | — | in fl |
| 237566 | Moriarty V.K. | 910 | 19 Apr 1972 | D'Aguilar Range, NW of Brisbane | 27°15' | 152°40' | — | — |
| 237567 | Bailey F.M. | — | — | Brisbane, Enoggera Creek | 27°27' | 152°57' | — | in fl |
| 237568 | Moriarty V.K. | 1258 | 12 Apr 1973 | D'Aguilar Range, SF 809, Sim Jue L.A. | 27°16' | 152°39' | wet sclerophyll forest marginal to complex notophyll vineforest, alt. 660 m | in fl |
| 237569 | Simmonds J.H. | — | Jun 1887 | Mt Mistake | 27°5-' | 152°2-' | — | — |
| 237570 | Simmonds J.H. | — | 17 Aug 1888 | Peachey's Scrub | 27°2-' | 152°5-' | — | in fl |
| 265967 | Phillips R.E. | — | 16 Oct 1978 | Portion of 36, Parish of Nangur, Shire of Kilkivan | 26°0-' | 152°1-' | growing in combination with belah trees in friable-marginal scrub soil | in fl |
| 323183 | Mc.Donald W.J. | 2016 | 30 Nov 1977 | Upper Freestone area, 17 km NE of Warwick | 28°0-' | 152°1-' | remnant area of softwood scrub dominated by <i>Geijera salicifolia</i> and <i>Excoecaria dallachyana</i> , undulating to low hilly terrain on Walloon Coal Measures, soil a brown clay | in fl |
| 338189 | Blake S.T. | 15413 | 23 Sep 1944 | Brookfield | 27°2-' | 152°5-' | on roadside through eucalyptus forest | in fl |
| 339344 | Young P. | 608 | Sep 1982 | Brisbane Forest Park, Cabbage Tree Creek | 27°26' | 152°48' | — | — |
| 416824 | Dillewaard H. + | 265 | 5 Nov 1980 | W side of Mt Glorious | 27°2-' | 152°4-' | dry open forest on slope | in fl |

Appendix 1.32. cont./

| Herbarium AQ Number | Collector(s) Name | Collector Number | Collection date | Locality | Latitude | Longitude | Habitat | Other Comments |
|-----------------------------------|-------------------|------------------|-----------------|--|-----------|------------|---|---------------------------|
| 440656 | Bird L.H. | – | 26 Sep 1984 | Wivenhoe Dam, Fernvale, 300 m from Splyard Ck Powerhouse | 27°2' | 152°4' | margin of hoop pine vine scrub, area very stony, alt 150 m | in fl |
| 489846 | Aspland S. | 1526 | 29 Aug 1995 | Koolkooroom Ck, Boyne Valley, 14.5 km SW of Nagoorin | 24°25' | 151°13' | creek bank, riverine vine scrub, sandy soil | in ft uncommon in area |
| 503181 | Bean A.R. + | 2858 | 5 Feb 1991 | Yielo rd, Conondale Range, SF792 | 26°41' | 152°30' | in open forest with <i>Euc. microcorys</i> and <i>Lophostemon confertus</i> | rare at site |
| 508779 | Bostock P.D. + | 1320 | 24 Nov 1991 | Ugly Gully, Kholo Ck, Anstead-Mt Crosby Border | 27°31' | 152°51' | in eucalypt forest, on slopes above creek | in ft about 12 plant seen |
| 520251 | Forster P.I. + | PIF 9356 | 6 Jan 1992 | Brisbane Forest Park | 27°26' | 152°48' | scrubby eucalypt forest on skeletal soil | in fl rare in area |
| 543855 | Bird L.H. | – | 8 Mar 1992 | The Bluff, 10 km W of Rosewood | 27°3' | 152°2' | margin of semi-evergreen vine forest, disturbed area along roadway, basalt soil | – |
| 561805 | Bird L.H. + | – | 25 Nov 1992 | The Bluff, 8 km W of Rosewood | 27°37' | 152°32' | in remnant semi-evergreen vine forest | in fl |
| 561991 | Bird L.H. | – | 12 Jan 1993 | The Bluff, 5 km W of Rosewood | 27°37' | 152°32' | on roadside, in area cleared of semi-evergreen vine forest, alt. 220 m | in ft |
| 569019 | Phillips S. | – | 20 Dec 1992 | Lawton road, near Northbrook Mt | 27°19' | 152°44' | – | – |
| 601289 | Grimshaw P. + | G 1045 | 13 Dec 1994 | Lacey's Ck, 4 WD track, SF 809, D'aguilar Range | 27°16'23" | 152°41'23" | very tall open forest with <i>Euc. acmenoides</i> , <i>C. citriodora</i> , <i>E. propinqua</i> , grassy understorey, Neranleigh-Fernvale Beds | uncommon |
| 602272 | Leiper G. + | GL 85 | 15 Oct 1995 | Mt Mee Forestry Road, SF1355 Kipper Creek | 27°17' | 152°42' | open forest on shaly soil with <i>E. propinqua</i> and <i>Lophostemon confertus</i> | in fl common in area |
| 622087 | Grimshaw P. | G 171N | 26 Oct 1993 | Northbrook Mt, Brisbane Forest Park, D'aguilar Range | 27°19' | 152°44' | vine thicket of saddle of ridge; reddish brown shaly soil | in fl |
| 635215 | Bean A.R. | 8123 | 16 Dec 1994 | Slopes of Northbrook Mt, near Mt Glorious | 27°20' | 152°45' | open forest of <i>Cory. citriodora</i> , <i>E. carnea</i> , <i>E. microcorys</i> ; with rocky outcrop | in fl rare at site |
| New South Wales localities | | | | | | | | |
| 569205 | Halford D. + | Q 1751 | 16 Aug 1993 | Toonumbar SF, 6.5 km SSE of Grevillea, 700 m along O'Donnell Ck road from Toonumbar road | 28°30' | 152°51' | steep south facing slope, loam soil in mixed tall forest, <i>Euc. siderophloia</i> and <i>Lophostemon confertus</i> | – |

APPENDIX 2. SITE DATA COLLECTED AT SITES SURVEYED SEPTEMBER TO DECEMBER 1997

Appendix 2.1 *Allocasuarina rigida* subsp. *exsul*

Location: Mt Cooroora, ca 2 km WSW of Pomona, SF 963 Fty 517.

Easting : 483783 **Northing:** 7082950 **Latitude:** 26°22'24" **Longitude:** 152°50'14"

Land tenure: State Forest **Controlling Body:** Departments of Natural Resources and Primary Industries

Date recorded: 7 Oct 1997 **Map reference:** Cooroy 9445-2

Landform pattern: hills **Landform element:** hillslope **Morphological type:** upper slope

Aspect: 80°-190°, E to S **Slope:** 30°-45° **Slope class:** very steep to precipitous **Altitude:** 390 m

Soil : texture: fine sandy loam **Colour:** brownish black, 7.5YR 3/1 **pH:** 4.6-4.8 **Surface rock outcrop %:** 14

Geology map unit: T1: Tertiary; Trachyte, comendite, trachyrhyolite, mangerite, syenite

Geology map reference: Gympie 1 : 250,000 SG56-10

Vegetation description Mid-tall to tall shrubland (1.5 m high) with emergent low to mid-tall trees.

Trees layer: *Eucalyptus racemosa* and *E. exserta*.

Shrub and ground layer: Dominant species: *Allocasuarina rigida* subsp. *exsul*, *Xanthorrhoea latifolia*, *Monotoca scoparia*, *Leptospermum polygalifolium*, *Pultenaea retusa* and *Patersonia glabrata*. **Other species present:** *Caustis blakei*, *Micrantheum ericoides*, *Syncarpia* sp., *Lomandra confertifolia* subsp. *pallida*, *Themeda triandra*, *Hakea florulenta*, *Acrotriche aggregata*, *Lomatia silaifolia*, *Acacia aulacocarpa*, *Allocasuarina littoralis*, *Cleistochloa subjuncea*, *Cassytha glabella*, *Xanthosia pilosa*, *Lasiopetalum ferrugineum*, *Banksia integrifolia*, *Acacia viscidula* and *Leucopogon rupicola*.

Area of occupancy : 1875 m² (75 m across the slope and 25 down to cliff face (population may extend down the cliff face))

Population: (density 2.2 plants/m², s² = 2.97, n = 25, 1 m² quadrats) 4050 ± 2271 plants (95% confidence interval)

Notes: population occupying area just above cliff face

Appendix 2.2. *Daviesia discolor*

Site: 1 Location: Coast Range, 16 km south of Biggenden, Mt Walsh National Park.

Easting: 401823 **Northing:** 7162190 **Latitude:** 25°39'16" **Longitude:** 152°01'18"

Land tenure: National Park **Controlling Body:** Department of Environment

Date surveyed: 21 Oct 1997 **Map reference:** Biggenden 9346-4

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope (upper part of)

Aspect: 140°-210°, SE to SW **Slope:** 25°-35° **Slope class:** steep to very steep **Altitude:** 580 m

Soil: **Texture:** sandy clay **Colour:** brownish black, 7.5YR 2/2 **pH:** 5.7 **Comments:** shallow stony soil

Geology map unit: Johnngboon Rhyolite; Raj: Crystal-poor (quartz) rhyolitic ignimbrite

Geology map reference: Maryborough 1: 250 000, SG56-6

Fire management and history: Not recorded; fire has occurred at the site within the last 2 years (field observation).

Vegetation description: Very tall open forest with low to tall dense shrub layer and dense ground layer

Trees layer: *Eucalyptus acmenoides*, *E. decolor*, *E. montivaga* and *Corymbia trachyphloia*.

Shrub and ground layer:

Common species: *Daviesia discolor*, *Calochlaena dubia*, *Astrotricha* sp., *Logania albiflora*, *Lophostemon confertus*, *Pteridium esculentum* and *Podolobium ilicifolium*

Other species present: *Blechnum cartilagineum*, *Smilax glycyphylla*, *Olearia gravis*, *Dampiera purpurea*, *Acacia falciformis*, *Hibbertia aspera*, *Lomandra multiflora*, *Goodenia rotundifolia*, *Acomis acoma*, *Acrotriche aggregata*, *Breynia oblongifolia*, *Imperata cylindrica*, *Lepidosperma laterale*, *Eustrephus latifolius*, *Hardenbergia violacea*, *Phyllanthus gasstroemii*, *Jacksonia scoparia*, *Xanthorrhoea latifolia* and *Macrozamia* sp. (Mt Walsh P. Machin 16).

Estimated area of occupancy: 1 ha (200 m along crest and 50 m across crest)

Estimated population: (plant density 1.6, $s^2 = 0.906$, $n = 25$, 2 m² quadrats) 16,000 ± 3704 plants (95% confidence interval)

Site: 2 Location: Coast Range, 17 km south of Biggenden, SF 1344, Fty 1534.
Easting: 401002 **Northing:** 7161060 **Latitude:** 25°39'53" **Longitude:** 152°00'49"
Land tenure: State Forest **Controlling Body:** Department of Primary Industries, Forestry
Date surveyed: 21 Oct 1997 **Map reference:** Biggenden 9346-4

Landform pattern: mountains **Landform element:** hillcrest & hillslope **Morphological type:** crest & simple slope (upper part of)
Aspect: 80°-190°, E to S **Slope:** 4°-8° **Slope class:** gently to moderately inclined **Altitude:** 500 m
Soil: Texture: sandy loam **Colour:** brownish black, 10YR 3/2 **pH:** 6.1 **Comments:** shallow stony soil
Geology map unit: Johnboon Rhyolite; Raj: Crystal-poor (quartz) rhyolitic ignimbrite
Geology map reference: Maryborough 1: 250 000, SG56-6

Fire management and history: Not recorded; fire has occurred over 50 % of the site within the last 2 years (field observation).

Vegetation description: Very tall open forest with mid-tall, very sparse mid-stratum and low to mid-tall sparse shrub layer and sparse ground layer.

Trees layer: *Corymbia trachyphloia*, *Eucalyptus acmenoides* and *E. major*.

Midstratum: *Allocasuarina littoralis*.

Shrub and ground layer:

Common species: *Jacksonia scoparia*, *Imperata cylindrica*, *Podolobium ilicifolium* and *Themeda triandra*.

Other species present: *Daviesia discolor*, *Smilax glycyphylla*, *Dampiera purpurea*, *Lomandra multiflora*, *Goodenia rotundifolia*, *Acrotriche aggregata*, *Breynia oblongifolia*, *Lepidosperma laterale*, *Eustrephus latifolius*, *Hardenbergia violacea*, *Xanthorrhoea latifolia*, *Allocasuarina littoralis*, *Cymbopogon refractus*, *Entolasia stricta* and *Panicum effusum* var. *effusum*.

Estimated area of occupancy: 1.5 ha (consisting of 2 patches approximately 100 m apart: 1) 100 m along slope and 100 down slope and 2) 100 m along slope and 50 m down slope)

Estimated population: (plant density 0.12, $s^2 = 0.032$, $n = 25$, 2 m² quadrats) 1800 ± 576 plants (95% confidence interval)

Appendix 2. 3. *Dodonaea rupicola*

Site: 1 Location: Mt Cooe, ca 4 km north north west of Beerburrum; Glasshouse Mountains National Park, Tibrogargan Section.

Easting: 494920 **Northing:** 7022160 **Latitude:** 26°55'20" **Longitude:** 152°56'55"

Land tenure: National Park **Controlling Body:** Department of Environment

Date surveyed: 23 Sep 1997 **Map reference:** Nambour 9444

Landform pattern: low hills **Landform element:** hillcrest **Morphological type:** crest

Aspect: - **Slope:** - **Slope class:** - **Altitude:** 160 m

Soil: texture: Sapric loam **Colour:** Black, 10YR 1.7/1 **pH:** 5.3 **Comments:** soils shallow on and around rock outcrops

Surface rock outcrop %: 12

Geology map unit: Ti: Tertiary, trachyte, comendite, trachyrhyolite, mangerite, syenite

Geology map reference: Gympie 1: 250, 000 SG56-10

Fire management and history: The present approach is to have fuel reduction burns in the central part of the park every 5-7 years and around the margins of the park every 3-5 years (M. Lythall pers. comm.).

Vegetation description: Mid-high to tall woodland with a mid-dense, tall to very tall shrub layer and mid-dense ground layer.

Tree layer: *Eucalyptus crebra*, *E. tindaliae* and *Corymbia trachyphloia*.

Shrub and ground layer: Common species: *Commersonia fraseri*, *Acacia hubbardiana*, *Dodonaea rupicola*, *Lophostemon confertus*, *Acacia maidenii*, *Lomandra confertifolia* subsp. *pallida*, *Themeda triandra*, *Digitaria parviflora* and *Breynia oblongifolia*. **Other species present:** *Leptospermum microcarpum*, *Acacia leiocalyx*, *Eucalyptus* spp. (seedlings), *Aristida benthamii* var. *benthamii*, *Eragrostis brownii*, *Lantana camara**, *Dianella revoluta* var. *revoluta*, *Chorizema parviflorum*, *Mirbelia pungens*, *Cheilanthes* sp., *Cissus opaca*, *Indigofera australis*, *Zieria minutiflora* and *Xanthorrhoea latifolia*.

Area of occupancy: 1 ha (200 m along crest and 50 m across crest)

Population: (density 4.3, $s^2 = 82.4$, $n = 50$, 2 m^2 quadrats) 42650 ± 230925 plants (95% confidence interval)

Notes: individuals with a patchy distribution over the area.

Site: 2 Location: Mt Cooe, ca 4 km north north west of Beerburrum; Glasshouse Mountains National Park, Tibrogargan Section.

Easting: 494616 **Northing:** 7022384 **Latitude:** 26°55'15" **Longitude:** 152°56'44"

Land tenure: National Park **Controlling Body:** Department of Environment

Date surveyed: 15 Dec 1997 **Map reference:** Nambour 9444

Landform pattern: low hills **Landform element:** hillslope **Morphological type:** lower slope

Aspect: 310°, NW **Slope:** 2° **Slope class:** gently inclined **Altitude:** 60 m

Soil: texture: sandy loam **Colour:** dull yellowish brown 10YR 5/3 **pH:** 5.9

Surface rock outcrop %: 0

Geology map unit: Ti: Tertiary, trachyte, comendite, trachyrhyolite, mangerite, syenite

Geology map reference: Gympie 1: 250, 000 SG56-10

Fire management and history: The present approach is to have fuel reduction burns in the central part of the park every 5-7 years and around the margins of the park every 3-5 years (M. Lythall pers. comm.).

Vegetation description: Mid-high to tall open forest

Tree layer: *Eucalyptus tindaliae* and *Corymbia trachyphloia*.

Shrub and ground layer: lower stratum not recorded

Estimated area of occupancy: 200 m² (20 x 10 m)

Population: 65 plants (counted)

Site: 3 **Location:** Mt Saddleback, ca 8 km north north west of Caboolture; Glasshouse Mountains National Park, Mt Saddleback section.

Easting: 492709 **Northing:** 7011818 **Latitude:** 27°00'56" **Longitude:** 152°55'35"

Land tenure: National Park **Controlling Body:** Department of Environment

Date surveyed: 25-Sep-97 **Map reference:** Caboolture 9443

Landform pattern: low hills **Landform element:** hillslope and crest **Morphological type:** simple slope & crest

Aspect: 40°-275°, NE to W **Slope:** 5°-25° **Slope class:** moderately inclined to steep **Altitude:** 40-109 m

Soil: shrubland area **Texture:** Sapric Loam **Colour:** Black, 10YR 1.7/2 **pH:** 5.5

Comments: shallow stony soil, stones up to 10 cm diameter

Geology map unit: Tt: Trachytic intrusion **Geology map reference:** Ipswich 1: 250, 000 SG 56-14

Fire management and history: The present approach is to have fuel reduction burns in the central part of the park every 5-7 years and around the margins of the park every 3-5 years.

Vegetation description: Mosaic of: Rock pavement; Mid-high woodland with mid-tall to tall shrub layer; and Open shrubland to shrubland.

Trees layer: *Eucalyptus tindaliae*, *Corymbia trachyphloia*, *E. crebra* and *E. carnea*

Shrub and ground layer: Common species: *Acacia hubbardiana*, *Lophostemon confertus*, *Calytrix tetragona*, *Leptospermum microcarpum*, *Acrotriche aggregata*, *Schoenus vaginatus*, *Themeda triandra* and *Xanthorrhoea latifolia* **Other species present:** *Acacia juncifolia*, *Alphitonia excelsa*, *Aristida queenslandica* var. *dissimilis*, *Boronia polygalifolia*, *Cheilanthes sieberi* subsp. *sieberi*, *Chorizema parvifolium*, *Crotalaria montana*, *Goodenia bellidifolia*, *Hibbertia stricta*, *Keraudrenia hillii* var. *hillii*, *Lepidosperma laterale*, *Leptospermum luehmannii*, *Lophostemon confertus*, *Melinis minutiflora**, *Mirbelia pungens*, *Panicum effusum*, *Plectranthus suaveolens*, *Pultenaea myrtoides*, *Tricoryne elatior*, *Vernonia cinerea* and *Westringia eremicola*.

Area of occupancy: area of approximately 9 ha (150 m from the summit down the western and north-eastern slopes and 250 m along north north west ridge)

Population: 657 individuals (counted)

Site: 4 **Location:** Wildhorse Mountain, State Forest Park No. 24, 5 km north east of Beerburrum, SF 611, Fty 1387.

Easting: 499517 **Northing:** 7021431 **Latitude:** 26°55'44" **Longitude:** 152°59'42"

Land tenure: State Forest **Controlling Body:** Department of Primary Industries, Forestry

Date surveyed: 15-Dec-97 **Map reference:** Nambour 9444

Landform pattern: low hills **Landform element:** hillslope & hillcrest **Morphological type:** simple slope & crest

Aspect: 100°-240°, E to WSW **Slope:** 8°-20° **Slope class:** moderately inclined to steep **Altitude:** 40-120 m

Soil: Woodland site **Texture:** Silty clay loam **Colour:** Greyish yellow brown, 10YR 5/2 **pH:** 5.7 **Comments:** shallow stony soil

Geology map unit: Ti: Tertiary, trachyte, comendite, trachyryholite, mangerite, syenite **Geology map reference:** Gympie 1: 250, 000 SG56-10

Fire management and history: The present approach is to have fuel reduction burns approximately every 3-5 years (depending on fuel loads). Fuel accumulation on the mountain is slow because of the sparse tree cover (R. Jack, Forest Ranger, pers. comm.). Hazard Reduction burns are cool burns and are undertaken during the winter months. Fire management on Wildhorse Mountain is aimed at protecting the surrounding pine plantations from wildfires that may start in the native vegetation on the mountain. Forestry records go back as far as 1972. Fires have occurred on the mountain in 1994, 1990, 1987, 1984, 1983, 1981 and 1972/73. Although the area is due for a reduction burn it will probably not be burnt for another 3 or 4 years.

Vegetation description: Mosaic of: Rock pavement; Mid-high woodland with sparse shrub layer and grassy ground layer; and open shrubland to shrubland.

Trees layer: *Eucalyptus crebra*, *E. tindaliae* and *Corymbia trachyphloia*

Shrub and ground layer: **Common species:** *Acacia hubbardiana*, *Leptospermum microcarpum*, *Themeda triandra*, *Acrotriche aggregata*, *Calytrix tetragona*, *Hibbertia stricta* and *Triplarina volcanica* subsp. *volcanica*. **Other species present:** *Lophostemon confertus*, *Dodonaea rupicola*, *Acacia leiocalyx*, *Acacia falcata*, *Allocasuarina littoralis*, *Jacksonia scoparia*, *Acacia juncifolia*, *Alloteropsis semialata*, *Aristida benthamii* var. *benthamii*, *Baccharis halimifolia**, *Bidens pilosa**, *Cheilanthes sieberi* subsp. *sieberi*, *Chorizema parviflorum*, *Cymbopogon refractus*, *Dianella revoluta* var. *revoluta*, *Entolasia stricta*, *Eragrostis brownii*, *Fimbristylis dichotoma*, *Gompholobium pinnatum*, *Goodenia bellidifolia*, *Goodenia rotundifolia*, *Grevillea leiophylla*, *Imperata cylindrica*, *Lantana camara**, *Lepidosperma laterale*, *Lophostemon confertus*, *Melinis minutiflora**, *Melinis repens**, *Phyllanthus fuernrohrii*, *Pimelea linifolia*, *Pinus* sp.*, *Pultenaea myrtoides*, *Pultenaea villosa*, *Richardia brasiliensis**, *Schoenus vaginatus*, *Stachytarpheta australis*, *Stackhousia viminea*, *Thysanotus tuberosus*, *Tricoryne elatior*, *Vernonia cinerea* and *Xanthorrhoea latifolia*.

Area of occupancy: approximately 15 ha (500 m from near telecommunication tower to near lookout and 150 m on either side of track)

Population: 549 individuals (counted) **Notes:** A large portion of the plants occur along edge of the track leading up to lookout.

Appendix 2.4. *Leucopogon recurvisepalus*

Site: 1 **Location:** Plunkett, ca 12 km SSW of Beenleigh, Plunkett Conservation Park, site 1.

Easting : 514147 **Northing:** 6923308 **Latitude:** 27°48'52" **Longitude:** 153°08'37"

Land tenure: Conservation Park **Controlling body:** Department of Environment

Date surveyed: 1 Sep 1997 **Map reference:** Wolffdene 9542-31

Landform pattern: hills **Landform element:** hillslope **Morphological type:** simple slope

Aspect: 180°, S **Slope:** 10° **Slope class:** moderately inclined **Altitude:** 120-130 m

Soil : texture: heathland: light medium clay; woodland: sandy clay loam **Colour:** heathland: light brownish black 10YR 3/1; woodland: greyish brown 7.5YR 6/2 **pH:** heathland: 4.6; woodland: 4.8 **Surface rock outcrop %:** 14 **Rock type at site:** coarse grained sandstone

Cryptophyte %: 0

Geology map unit: Ipswich Coal Measures; Ri: conglomerate, sandstone, shale, tuff, coal seams

Geology map reference: Beenleigh 1 :100,000 series

Vegetation description: Mosaic of 1) mid-high to tall woodland/open forest with a sparse, low, mid-stratum and sparse to mid-dense, low to tall shrub layer, and 2) low to tall closed heathland.

Woodland/open forest: **Trees:** *Angophora woodsiana* and *Eucalyptus planchoniana*

Mid-stratum: *Eucalyptus curtisii* and *Leptospermum trinervium*

Shrub and ground layer: **Dominant species.** *Leptospermum polygalifolium*, *Eucalyptus curtisii*, *Leptospermum trinervium*, *Entolasia stricta*, *Acrotriche aggregata* and *Daviesia ulicifolia*. **Other species present:** *Calytrix tetragona*, *Persoonia tenuifolia*, *Melichrus adpressus*, *Xanthorrhoea johnsonii*, *Notelaea ovata*, *Leptospermum microcarpum*, *Leucopogon recurvisepalus*, *Patersonia sericea*, *Gompholobium pinnatum*, *Pultenaea retorta*, *Banksia spinulosa*, *Austrostipa pubescens*, *Cassytha glabella*, *Platysace ericoides*, *Aristida benthamii*, *Hakea florulenta*, *Lepidosperma laterale*, *Pimelea linifolia*, *Cassytha muelleri*, *Goodenia glabra*, *Acacia quadrilateralis*, *Hibbertia stricta*, *Astrotricha biddulphiana*, *Gompholobium virgatum*, *Hovea pannosa*, *Leucopogon muticus*, *Aristida warburgii* and *Pultenaea villosa*.

Heathland: **Shrub and ground layer:** **Dominant species.** *Calytrix tetragona*, *Xanthorrhoea johnsonii*, *Ptilothrix deusta*, *Eucalyptus curtisii*, *Leptospermum polygalifolium*, *Amphipogon strictus* and *Leptospermum microcarpum*. **Other species present:** *Leucopogon recurvisepalus*, *Melichrus adpressus*, *Gompholobium pinnatum*, *Entolasia stricta*, *Persoonia tenuifolia*, *Austrostipa pubescens*, *Goodenia glabra*, *Acrotriche aggregata*, *Daviesia ulicifolia*, *Patersonia sericea*, *Pultenaea retorta*, *Cassytha glabella*, *Lepidosperma laterale*, *Pimelea linifolia*, *Acacia quadrilateralis* and *Phyllota phyllicoides*.

Area of occupancy : 3.12 ha (260 m down slope and 120 m across slope)

Population: (density 2.6, $s^2 = 5.60$, $n = 34$, 1 m² quadrats) 79,606 ± 60936 plants (95% confidence interval)

Site: 2 **Location:** Plunkett, ca 12 km SSW of Beenleigh, Plunkett Conservation Park, site 2.
Easting : 513836 **Northing:** 6923630 **Latitude:** 27°48'42" **Longitude:** 153°08'25"
Land tenure: Conservation Park **Controlling Body:** Department of Environment
Date surveyed: 1 Sep 1997 **Map reference:** Wolffdene 9542-31

Landform pattern: hills **Landform element:** hillslope **Morphological type:** simple slope
Aspect: 255°, WSW **Slope:** 3° **Slope class:** gently inclined **Altitude:** 130-140 m
Soil : texture: sandy clay loam to light sandy clay loam **Colour:** brownish black 10YR 3/1 and 2.5Y 3/1 **pH:** 4.3
Surface rock outcrop %: 3 **Rock type at site:** coarse grained sandstone **Cryptophyte %:** 72
Geology map unit: Ipswich Coal Measures; Ri: conglomerate, sandstone, shale, tuff, coal seams
Geology map reference: Beenleigh 1 :100,000 series

Vegetation description Low to tall closed heathland with scattered dwarf to mid-high trees.

Trees: *Corymbia trachyphloia*, *Eucalyptus dura*, *Allocasuarina littoralis*, *E. curtisii*, *Angophora woodsiana* and *Melaleuca decora*.

Shrub and ground layer: Dominant species *Calytrix tetragona*, *Persoonia tenuifolia*, *Leptospermum microcarpum*, *Ptilothrix deusta*, *Hibbertia vestita* and *Leucopogon recurvisepalus*. **Other species present:** *Schoenus ericetorum*, *Panicum effusum*, *Patersonia sericea*, *Gompholobium pinnatum*, *Melichrus adpressus*, *Entolasia stricta*, *Cassytha glabella*, *Drosera peltata*, *Pultenaea retorta*, *Lepidosperma laterale*, *Pimelea linifolia*, *Allocasuarina littoralis*, *Leptospermum polygalifolium* and *Phyllota phyllicoides*.

Area of occupancy : 0.48 ha (120 m down slope and 40 m across slope)

Population: (density 2.3, $s^2 = 7.34$, $n = 50$, 1 m² quadrats) 10944 ± 9976 plants (95% confidence interval)

Site: 3 **Location:** D'Aguilar Range, ca 15 km NW of Dayboro, Mt Mee State Forest SF 893, Fty 1532, site 1.
Easting : 470667 **Northing:** 7000902 **Latitude:** 27°06'50" **Longitude:** 152°42'14"
Land tenure: State Forest **Controlling Body:** Department of Primary Industries, Forestry
Date surveyed: 5 Sep 1997 **Map reference:** Caboolture 9443

Landform pattern: mountains **Landform element:** hillcrest **Morphological type:** crest
Aspect: 140°, SE **Slope:** 0-1° **Slope class:** flat to very gently inclined **Altitude:** 500 m
Soil : texture: light clay **Colour:** dull reddish brown 5YR 5/3 **pH:** 4.9 **Surface rock outcrop %:** 0
Geology map unit: Mount Byron Volcanics; Rm: Rhyolitic and andesitic flow, agglomerate, granophyre, tuff
Geology map reference: Ipswich 1 : 250,000 SG50-14

Vegetation description Mid-tall to tall woodland with mid-dense, low to tall shrub layer

Trees layer: *Eucalyptus racemosa* and *Corymbia gummifera*.

Shrub and ground layer: **Dominant species:** *Xanthorrhoea johnsonii*, *Banksia oblongifolia*, *Gahnia melanocarpa*, *Caustis flexuosa*, *Hakea sericea* and *Leptomeria acida*. **Other species present:** *Acrotriche aggregata*, *Leptospermum polygalifolium*, *Leucopogon recurvisepalus*, *Lepidosperma laterale*, *Patersonia sericea*, *Phyllota phyllicoides*, *Brachyloma daphnoides*, *Gompholobium pinnatum*, *Sphaerolobium vimineum*, *Cassytha glabella*, *Drosera peltata*, *Isopogon petiolaris*, *Monotoca scoparia* and *Pimelea linifolia*.

Area of occupancy : 0.01 ha (10 x 10 m on east side of track)

Population: 63 plants (counted)

Site: 4 **Location:** D'Aguilar Range, ca 15 km NW of Dayboro, Mt Mee State Forest SF 893, Fty 1532, site 2.
Easting : 470431 **Northing:** 7000704 **Latitude:** 27°06'56" **Longitude:** 152°42'06"
Land tenure: State Forest **Controlling Body:** Department of Primary Industries, Forestry
Date surveyed: 5 Sep 1997 **Map reference:** Caboolture 9443

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope
Aspect: 270°, W **Slope:** 1° **Slope class:** very gently inclined **Altitude:** 500 m
Soil : texture: light clay **Colour:** pale yellow 2.5Y 8/3 to greyish yellow 2.5Y 7/2 **pH:** 4.6 **Surface rock outcrop %:** 0
Geology map unit: Mount Byron Volcanics; Rm: Rhyolitic and andesitic flow, agglomerate, granophyre, tuff
Geology map reference: Ipswich 1 : 250,000 SG50-14

Vegetation description Mid-tall to tall woodland with very sparse, very tall shrub layer and mid-dense, low to tall ground layer

Trees layer: *Eucalyptus racemosa* and *Corymbia gummifera*.

Shrub and ground layer: Dominant species: *Xanthorrhoea johnsonii*, *Gahnia melanocarpa*, *Phyllota phyllicoides*, *Caustis flexuosa*, *Hakea sericea*, *Leptospermum polygalifolium* and *Petrophile canescens*. **Other species present:** *Acrotriche aggregata*, *Banksia oblongifolia*, *Leucopogon recurvisepalus*, *Lepidosperma laterale*, *Leptomeria acida*, *Patersonia sericea*, *Brachyloma daphnoides*, *Gompholobium pinnatum*, *Sphaerolobium vimineum*, *Cassytha glabella*, *Drosera peltata*, *Isopogon petiolaris*, *Monotoca scoparia* and *Pimelea linifolia*.

Area of occupancy : 4 ha (200 m NW from track and 200 m along to the track)

Population: (density 5.6, $s^2 = 47.7$, $n = 48$, 1 m² quadrats) 224,167 ± 555954 plants (95% confidence interval)

Comments: 2 dead plants observed in approximately the centre of the transect.

Site: 5 Location: Mt Coochin, ca 3 km SW of Beerwah, Glasshouse Mts National Park.
Easting : 493450 **Northing:** 7027978 **Latitude:** 26°52'11" **Longitude:** 152°56'02"
Land tenure: National Park **Controlling Body:** Department of Environment
Date surveyed: 3 Sep 1997 **Map reference:** Nambour 9444

Landform pattern: hills **Landform element:** hillslope **Morphological type:** simple slope
Aspect: 230°, SW **Slope:** 30° **Slope class:** steep to very steep **Altitude:** 60-120 m
Soil : texture: clay loam **Colour:** dark greyish yellow 2.5Y 5/2 4/2 **pH:** 4.9 **Surface rock outcrop %:** 48
Geology map unit: Ti: Tertiary; trachyte, comendite, trachyrhyolite, mangerite, syenite
Geology map reference: Gympie 1 : 250,000 SG56-10

Vegetation description Low to mid-tall woodland with low to tall open heath understorey.

Trees layer: *Corymbia trachyphloia*, *Leptospermum trinervium*, *Eucalyptus curtisii* and *E. tindaliae*.

Shrub and ground layer: Dominant species: *Leucopogon recurvisepalus*, *Leptospermum microcarpum*, *Acacia hubbardiana*, *Schoenus vaginatus*, *Xanthorrhoea johnsonii* and *Lasiopetalum ferrugineum*. **Other species present:** *Calytrix tetragona*, *Ptilothrix deusta*, *Hibbertia stricta*, *Themeda triandra*, *Schoenus vaginatus*, *Cryptandra longistaminea*, *Acrotriche aggregata*, *Gompholobium pinnatum*, *Banksia spinulosa*, *Triplarina volcanica* subsp. *volcanica*, *Aristida warburgii*, *Leptospermum trinervium*, *Zieria minutiflora*, *Allocasuarina littoralis*, *Cassytha glabella*, *Cleistochloa subjuncea*, *Eriostemon myoporoides* subsp. *queenslandicus*, *Entolasia stricta*, *Monotoca scoparia* and *Westringia eremicola*.

Area of occupancy : 2.5 ha (250 m along the spur and 100 m down the slope)

Population: (density 2.9, $s^2 = 11.6$, $n = 50$, 1 m² quadrats) 73,500 ± 82490 plants (95% confidence interval)

Appendix 2.5. *Macrozamia lomandroides*

Site: 1

Land tenure: Vacant Crown Land **Controlling body:** Department of Natural Resources

Date surveyed: 31-Oct-97

Landform pattern: gently undulating plain **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1-2° **Slope class:** very gently inclined **Aspect:** 320°, NW **Altitude:** 20-30 m

Soil: not recorded

Geology map unit: Kb: Feldspatholithic labile sandstone, siltstone, mudstone, shale, coal, conglomerate, glauconitic sandstone

Geology map reference: Maryborough 1 : 250,000 SG56-6

Vegetation description: tall open forest with low sparse mid-stratum and mid-dense ground cover

Tree layer: *Corymbia trachyphloia*, *Eucalyptus umbra* and *E. hallii*.

Mid stratum: *Xylomelum salicinum*.

Shrub and ground layer: not recorded

Estimated population area (m) (m²): 40 x 70 (2800)

Estimated population: 200-300 plants

Site: 2

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** _ **Altitude:** 40 m

soil: not recorded

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-8

Vegetation description: tall open forest with mid-dense ground cover

Tree layer: *Eucalyptus umbra* and *E. hallii*.

Shrub and ground layer: *Xanthorrhoea latifolia* (dominant)

Estimated population area (m) (m²): 20 x 20 (400)

Estimated population: 54 plants (counted)

Site: 3

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** 175°, S **Altitude:** 20-30 m

Soil: texture: sandy clay loam **colour:** greyish yellow brown, 10YR 5/2 **pH:** 5.52 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-8

Vegetation description: tall open forest with mid-tall mid-dense mid-stratum, tall sparse shrub layer and sparse ground cover

Tree layer: *Corymbia intermedia*, *C. trachyphloia* and *Eucalyptus umbra*.

mid stratum: *Acacia leiocalyx*, *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar*, *Melaleuca quinquenervia* and *Xylomelum salicinum*.

Shrub layer and ground layer: *Acacia flavescens*, *Jacksonia scoparia*, *Petalostigma pubescens*, *Xylomelum salicinum*, *Patersonia sericea*, *Themeda triandra*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Caustis recurvata*, *Grevillea leiophylla*, *Hibbertia stricta*, *Pimelea linifolia*, *Platysace linearifolia* and *Strangea linearis*.

Estimated population area (m) (m²): 30 x 50 (1500)

Estimated population: (density 0.46, $s^2 = 0.136$, $n = 20$, 10 m² quadrats) 690 ± 64 plants (95% confidence interval)

Site: 4

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 29-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** 330°, NW **Altitude:** 40 m

Soil: texture: sandy clay loam **colour:** greyish brown, 5YR 4/2 **pH:** 5.21 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-8

Vegetation description: tall open forest with tall sparse midstratum, tall mid-dense shrub layer and mid-dense ground cover

Tree layer: *Corymbia trachyphloia*, *Eucalyptus umbra* and *E. hallii*.

Mid stratum: *Eucalyptus* spp. and *Corymbia* spp. saplings.

Shrub and ground layer: *Acacia complanata*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Aristida* sp., *Boronia* sp., *Entolasia stricta*, *Gompholobium pinnatum* and *Lepidosperma laterale*.

Estimated area of occupancy (m) (m²): 30 x 100; 30 x 70 (4400)

Estimated population: (density 0.09, s²= 0.024, n = 40, 10 m² quadrats) 409 ± 23 plants (95% confidence interval)

Site: 5

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 29-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** 340°, NW **Altitude:** 40 m

Soil: texture: sandy clay loam **colour:** dull brown, 7.5YR 6/3 **pH:** 5.25 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-8

Vegetation description: :tall open forest with low to mid-tall sparse midstratum, tall sparse shrub layer and mid-dense ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia trachyphloia* and *C. intermedia*.

Mid stratum: *Eucalyptus umbra* and *Leptospermum trinervium*.

Shrub and ground layer: *Acacia complanata*, *Banksia oblongifolia*, *Xylomelum salicinum*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Gompholobium pinnatum*, *Lepidosperma laterale*, *Daviesia filipes*, *Eriachne pallescens*, *Hibbertia stricta*, *Persoonia virgata*, *Schoenus vaginatus*, *Syncarpia glomulifera* subsp. *glomulifera* and *Themeda triandra*.

Estimated area of occupancy (m) (m²): 200x 30, 220 x 30, 50 x 40 (14000)

Estimated population: (density 0.49, $s^2 = 0.396$, $n = 60$, 10 m² quadrats) 6804 ± 1338 plants (95% confidence interval)

Site: 6

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: _ **Slope class:** level **Aspect:** _ **Altitude:** 40-50 m

Soil: **texture:** fine sandy clay loam **colour:** dull yellowish brown, 10YR 5/3 **pH:** 5.00 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-9

Vegetation description: tall open forest with tall sparse shrub layer and dense ground cover

Tree layer: *Eucalyptus umbra* and *Corymbia trachyphloia*.

Shrub and ground layer: *Acacia complanata*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Daviesia filipes*, *Hibbertia stricta*, *Persoonia virgata*, *Schoenus vaginatus* and *Pimelea linifolia*.

Estimated area of occupancy (m) (m²): 37 x 20 (740)

Estimated population: (density 0.30, $s^2 = 0.207$, $n = 12$, 10 m² quadrats) 220 ± 58 plants (95% confidence interval)

Site: 7

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 29-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** 330°, NW **Altitude:** 40 m

Soil: texture: sandy clay loam **colour:** dark reddish brown, 5YR 3/2 **pH:** 5.38 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-11

Vegetation description: tall open forest with mid-tall to tall sparse mid-stratum, tall sparse shrub layer and mid-dense to dense ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia trachyphloia*, *E. hallii* and *Syncarpia glomulifera* subsp. *glomulifera*,

Mid stratum: *Syncarpia glomulifera* subsp. *glomulifera*

Shrub and ground layer: *Acacia complanata*, *Acacia aulacocarpa*, *Grevillea* sp., *Persoonia virgata*, *Syncarpia glomulifera* subsp. *glomulifera*, *Xanthorrhoea latifolia*, *Hibbertia stricta*, *Lepidosperma laterale*, *Daviesia filipes*, *Eriachne pallescens*, *Aristida* sp., *Dianella revoluta*, *Imperata cylindrica* and *Leucopogon leptospermoides*.

Estimated area of occupancy (m) (m²): 200 x 100 (20000)

Estimated population: (density 0.33, s² = 0.094, n = 20, 10 m² quadrats) 6640 ± 856 plants (95% confidence interval)

Site: 8

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: _ **Slope class:** level **Aspect:** _ **Altitude:** 20-40 m

Soil: texture: fine sandy loam **colour:** greyish yellow brown, 10YR 4/2 **pH:** 5.26 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-12

Vegetation description: tall open forest with mid-tall mid-dense mid-stratum and mid-dense ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia trachyphloia* and *E. racemosa*.

Mid stratum: *Acacia aulacocarpa*, *Acacia flavescens*, *Acacia leiocalyx*, *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar* *Grevillea* sp. and *Xylomelum salicinum*.

Ground layer: *Xanthorrhoea latifolia*, *Hibbertia stricta*, *Lepidosperma laterale*, *Acrotriche aggregata*, *Persoonia virgata*, *Gompholobium pinnatum*, *Entolasia stricta* and *Dianella caerulea* var. *vannata*.

Estimated area of occupancy (m) (m²): 50 x 50 (2500)

Estimated population: (density 0.24, $s^2 = 0.128$, $n = 20$, 10 m² quadrats) 605 ± 120 plants (95% confidence interval)

Site: 9

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** 280°, W **Altitude:** 20-40 m

Soil: **texture:** fine sandy loam **colour:** greyish yellow brown 10YR 5/2 **pH:** 4.86 **Surface rock (%):** 0

Comments: ironstone pebbles present in soil

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-13

Vegetation description: tall open forest with low sparse mid-stratum, tall sparse shrub layer and mid-dense ground layer

Tree layer: *Eucalyptus umbra*, *Corymbia trachyphloia* and *E. hallii*.

Mid stratum: *Eucalyptus umbra*, *Acacia leiocalyx* and *Xylomelum salicinum*.

Shrub and ground layer: *Acacia hubbardiana*, *Daviesia filipes*, *Acacia complanata*, *Persoonia virgata*, *Syncarpia glomulifera* subsp. *glomulifera*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Entolasia stricta*, *Hibbertia stricta*, *Dianella revoluta*, *Imperata cylindrica*, *Pimelea linifolia*, *Themeda triandra*, *Acacia aulacocarpa*, *Acacia flavescens*, *Acacia leptocarpa*, *Arundinella nepalensis*, *Chorizema parviflorum*, *Jacksonia scoparia*, *Lomandra* sp., *Patersonia sericea*, *Petalostigma pubescens* and *Strangea linearis*.

Estimated area of occupancy (m) (m²): 100 x 100, 250 x 50 (22500)

Estimated population: (density 0.39, $s^2 = 0.066$, $n = 40$, 10 m² quadrats) 8775 ± 470 plants (95% confidence interval)

Site: 10

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 31-Oct-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: _ **Slope class:** level **Aspect:** _ **Altitude:** 20-30 m

Soil: texture: clayey sand **colour:** dark greyish yellow, 2.5Y 5/2 **pH:** 5.58 **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-15

Vegetation description: tall open forest with mid-tall mid-dense mid-stratum, tall sparse shrub layer and sparse ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia trachyphloia*, *E. racemosa*, *C. intermedia* and *Angophora leiocarpa*.

Mid stratum: *E. umbra*, *Banksia integrifolia* subsp. *compar* and *Lophostemon suaveolens*.

Shrub layer and ground layer: *Acacia aulacocarpa*, *Banksia oblongifolia*, *Acacia leiocalyx*, *Banksia integrifolia* var. *compar*, *Jacksonia scoparia*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Themeda triandra*, *Crotalaria montana* and *Goodenia rotundifolia*.

Estimated area of occupancy (m) (m²): 150 x 75 (11250)

Estimated population: (density 0.69, $s^2 = 0.425$, $n = 20$, 10 m² quadrats) 7808 ± 2139 plants (95% confidence interval)

Site: 11

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 31-Oct-97

Landform pattern: gently undulating plain **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 100°, E **Altitude:** 70-80 m

Soil: not recorded **Surface rock (%):** 0

Geology map unit: Td/Te: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; Te: Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale **Geology map reference:** Maryborough 1: 250 000 SG56-16

Vegetation description: tall to very tall open forest with mid-tall sparse mid-stratum, tall sparse shrub layer and unknown ground cover

Tree layer: *Corymbia trachyphloia*, *C. intermedia* and *Syncarpia glomulifera* subsp. *glomulifera*.

Mid stratum: *Allocasuarina torulosa*.

Shrub layer: *Acacia leiocalyx* and *A. complanata*.

Comments: area recently burnt.

Estimated area of occupancy (m) (m²): single cluster of plants within 1 m²

Estimated population: 18 plants

Site: 12

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 31-Oct-97

Landform pattern: gently undulating plain **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1-2° **Slope class:** very gently inclined **Aspect:** 230°, NW **Altitude:** 40 m

Soil: texture: sandy loam colour: dark reddish grey, 10R 3/1 **pH:** 5.35 **Surface rock (%):** 0

Geology: x **Geology map reference:** x

Vegetation description: tall open forest with mid-tall mid-dense mid-stratum, tall sparse shrub layer and mid-dense ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia intermedia* and *Syncarpia glomulifera* subsp. *glomulifera*.

Mid stratum: *Eucalyptus umbra* and *Acacia aulacocarpa*.

Shrub layer and ground layer: *Acacia leiocalyx*, *Dodonaea triquetra*, *Xanthorrhoea latifolia*, *Acrotriche aggregata*, *Entolasia stricta*, *Imperata cylindrica* and *Daviesia filipes*.

Comments: Population extends through an area of remnant native vegetation into the pine plantation and out onto a 50 m fire break.

Estimated area of occupancy (m) (m²): 100 x 37 (3700)

Estimated population: (density 0.26, $s^2 = 0.083$, $n = 20$, 10 m² quadrats) 962 ± 125 plants (95% confidence interval)

Site: 13

Land tenure: National Park **Controlling body:** Department of Environment

Date surveyed: 21-Nov-97

Landform pattern: gently undulating plain **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 55°, NE **Altitude:** 10 m

Soil: texture: sandy loam **colour:** greyish brown, 7.5YR 4/2 **pH:** 5.12 **Surface rock (%):** 0

Geology map unit: Quaternary alluvial deposits **Geology map reference:** Maryborough 1: 250 000 SG56-16

Vegetation description: tall open forest with mid-tall sparse mid-stratum, tall sparse shrub layer and sparse ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia intermedia* and *E. hallii*.

Mid stratum: *Lophostemon confertus*.

Shrub and ground layer: *Acacia complanata*, *Grevillea* sp., *Acacia flavescens*, *Acacia maidenii*, *Lophostemon confertus*, *Entolasia stricta*, *Themeda triandra*, *Hibbertia stricta*, *Acacia leiocalyx*, *Alloteropsis semialata*, *Alphitonia excelsa*, *Aristida benthamii* var. *benthamii*, *Brunoniella australis*, *Chrysopogon fallax*, *Crinum* sp., *Desmodium rhytidophyllum*, *Eragrostis spartinoides*, *Eremochloa bimaculata*, *Parsonsia australis*, *Xanthorrhoea fulva* and *Zornia dyctiocarpa*.

Estimated area of occupancy (m) (m²): 40 x 20 (800)

Estimated population: 50 plants

Site: 14

Land tenure: National Park **Controlling body:** Department of Environment

Date surveyed: 21-Nov-97

Landform pattern: gently undulating plain **Landform element:** plain **Morphological type:** flat

Slope: <1° **Slope class:** level **Aspect:** _ **Altitude:** 11 m

Soil: texture: clayey sand **colour:** greyish brown, 7.5YR 4/2 **pH:** 4.80 **Surface rock (%):** 0

Geology map unit: Quaternary alluvial deposits **Geology map reference:** Maryborough 1: 250 000 SG56-17

Vegetation description: tall open forest with mid-tall to tall midstratum, tall sparse shrub layer and unknown ground cover

Tree layer: *Eucalyptus umbra*, *Corymbia intermedia* and *E. hallii*.

Mid stratum: *Eucalyptus umbra* and *Allocasuarina littoralis*.

Shrub layer and ground layer: *Grevillea* sp., *Acacia flavescens*, *Acacia leiocalyx*, *Jacksonia scoparia*, *Petalostigma pubescens*, *Entolasia stricta*, *Hibbertia stricta*, *Alloteropsis semialata*, *Brunoniella australis*, *Chrysopogon fallax*, *Crinum* sp., *Eragrostis spartinooides*, *Eremochloa bimaculata*, *Xanthorrhoea latifolia*, *Imperata cylindrica*, *Dianella revoluta*, *Lepidosperma laterale*, *Gompholobium pinnatum*, *Dianella caerulea* var. *vannata*, *Leucopogon leptospermoides*, *Astrotricha longifolia*, *Babingtonia* sp., *Boronia bipinnata*, *Breynia oblongifolia*, *Eustrephus latifolius*, *Gahnia aspera*, *Hibiscus heterophylla*, *Lomandra laxa*, *Lomandra longifolia*, *Lomandra multiflora*, *Panicum effusum* var. *simile*.

Estimated area of occupancy (m) (m²): 50 x 20 (1000)

Estimated population: 13 plants

Site: 15

Land tenure: National Park **Controlling body:** Department of Environment

Date surveyed: 21-Nov-97

Landform pattern: gently undulating plain **Landform element:** flat **Morphological type:** _

Slope: <1° **Slope class:** level **Aspect:** _ **Altitude:** 10 m

Soil: texture: loamy sand **colour:** very dark brown, 7.5YR 2/3 **pH:** 5.05 **Surface rock (%):** 0

Geology map unit: Quaternary alluvial deposits **Geology map reference:** Maryborough 1: 250 000 SG56-5

Vegetation description: tall open forest with a sparse tall to mid-tall mid-stratum, sparse tall shrub layer and sparse to mid-dense ground cover.

Tree layer: *Corymbia intermedia*, *Eucalyptus hallii*, *C. trachyphloia* and *Angophora leiocarpa*.

Mid stratum: *Banksia integrifolia* subsp. *integrifolia* and *Acacia flavescens*.

Shrub and ground layer: *Jacksonia scoparia*, *Leucopogon leptospermoides*, *Alloteropsis semialata*, *Aristida benthamii* var. *benthamii*, *Aristida calycina* var. *calycina*, *Chrysocephalum apiculatum*, *Crotalaria montana*, *Cymbopogon refractus*, *Desmodium rhytidophyllum*, *Hybanthus stellarioides*, *Pteridium esculentum*, *Themeda triandra*, *Tricoryne elatior*, *Vernonia cinerea* and *Xanthorrhoea fulva*.

Estimated area of occupancy (m) (m²): 50 x 20 (1000)

Population: 24 counted

Appendix 2.6. *Macrozamia parcifolia*

Site: 1

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Sep-97

Landform pattern: undulating low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 180°-90°-10°, S, E to NNE **Altitude:** 140 m

Soil: texture: light clay **colour:** brown, 7.5YR 4/4 **pH:** 4.81 **Comments:** stones up to 10 mm diam.

Rock type at site: fine grained siltstone/sandstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1995

Vegetation description tall open forest with tall sparse shrub layer and mid-dense ground layer

Tree layer: *Corymbia trachyphloia*, *Eucalyptus acmenoides*, *Angophora leiocarpa* and *E. crebra*.

Shrub and ground layer *Lophostemon confertus*, *Acacia aulacocarpa*, *Persoonia sericea*, *Acacia leiocalyx*, *Jacksonia scoparia*, *Acrotriche aggregata*, *Xanthorrhoea latifolia*, *Aristida* spp., *Themeda triandra*, *Cleistochloa subjuncea*, *Hardenbergia violacea*, *Chrysocephalum apiculatum*, *Dianella revoluta*, *Eragrostis brownii*, *Dianella caerulea* and *Podolobium scandens*.

Estimated area of occupancy (m) (m²): 300 x 150 (45000)

Population: 269 plants

Site: 2

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 28-Oct-97

Landform pattern: undulating low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 5°-10° **Slope class:** gently to moderately inclined **Aspect:** 220° to 50°, SW, SE to NE **Altitude:** 140 m

Soil: texture: clay loam **colour:** dull reddish brown, 5YR 4/3 **pH:** 5.01 **Comments:** stones up to 5 mm diam.

Rock type at site: siltstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1996

Vegetation description: very tall open forest with mid-tall to tall sparse mid-stratum, tall sparse shrub layer and sparse ground cover

Tree layer: *Eucalyptus acmenoides*, *E. fibrosa* and *Corymbia citriodora*.

Mid stratum: *Lophostemon confertus*.

Shrub layer: *Acacia aulacocarpa*, *A. leiocalyx*, *A. fimbriata*, *A. falcata*, *Acrotriche aggregata*, *Xanthorrhoea latifolia*, *Aristida* spp., *Lepidosperma laterale*, *Cymbopogon refractus*, *Entolasia stricta*, *Acacia complanata* and *Daviesia ulicifolia*.

Estimated area of occupancy (m) (m²): 200 x 50 (10000)

Estimated population: (density 0.03, s² = 0.003, n = 20, 10 m² quadrats) 310 ± 12 plants (95% confidence interval)

Site: 3

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: undulating low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 280°, W **Altitude:** 120 m

Soil: texture: sandy loam **colour:** dark brown, 10YR 3/3 **pH:** 5.13

Rock type at site: coarse grained sandstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: logged 1994

Vegetation description: very tall open forest with mid-tall to tall mid-stratum, tall sparse shrub layer and sparse ground cover

Tree layer: *Eucalyptus acmenoides*, *Corymbia trachyphloia* and *C. citriodora*.

Mid stratum: *Lophostemon confertus* and *Acacia aulacocarpa*.

Shrub and ground layer: *Acacia leiocalyx*, *Lophostemon confertus*, *Jacksonia scoparia*, *Acrotriche aggregata*, *Lepidosperma laterale*, *Cleistochloa subjuncea*, *Lomandra* sp. and *Pultenaea villosa*.

Estimated area of occupancy (m) (m²): 200 x 50 (10000)

Estimated population: (density 0.12, $s^2 = 0.029$, $n = 20$, 10 m² quadrats) 1200 ± 110 plants (95% confidence interval)

Site: 4

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: rolling low hills **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 180 m **Soil: texture:** n/r **colour:** n/r **pH:** n/r

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last prescribe burn 1993; site heavily utilised by cattle

Vegetation description: tall open forest with tall sparse shrub layer and sparse ground cover

Tree layer: *Corymbia trachyphloia*, *C. citriodora* and *Angophora leiocarpa*.

Shrub layer: *Acacia leiocalyx*, *Jacksonia scoparia*, *Acacia bancroftii*, *Lepidosperma laterale*, *Lomandra* sp., *Xanthorrhoea latifolia*, *Cymbopogon refractus*, *Themeda triandra*, *Hardenbergia violacea*, *Chrysocephalum apiculatum*, *Jacksonia scoparia*, *Dianella* sp., *Acacia leiocalyx*, *Lantana camara* and *Sida subspicata*.

Estimated area of occupancy (m) (m²): 300 x 100 (30000)

Estimated population: (density 0.10, $s^2 = 0.011$, $n = 20$, 10 m² quadrats) 3075 ± 156 plants (95% confidence interval)

Site: 5

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: steep low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 15° **Slope class:** moderately inclined **Aspect:** 220°, SW **Altitude:** 180 m

Soil: texture: n/r **colour:** n/r **pH:** n/r

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: logged 1994

Vegetation description: tall open forest with tall mid-dense shrub layer and mid-dense ground cover

Tree layer: *Corymbia citriodora*, *Angophora leiocarpa* and *Eucalyptus acmenoides*.

Shrub and ground layer: *Acacia leiocalyx*, *A. bancroftii*, *Lophostemon confertus*, *Acacia aulacocarpa*, *A. penninervis* subsp. *penninervis*, *Xanthorrhoea latifolia*, *Cymbopogon refractus*, *Hardenbergia violacea*, *Chrysocephalum apiculatum*, *Jacksonia scoparia*, *Dianella* sp., *Acacia leiocalyx*, *Acrotriche aggregata*, *Aristida* spp., *Entolasia stricta*, *Acacia complanata*, *Dianella revoluta* and *Podolobium scandens*.

Estimated area of occupancy (m) (m²): 50 x 50 (2500)

Population: 5 plants

Site: 8

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: steep hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 5° **Slope class:** gently inclined **Aspect:** 170°, S **Altitude:** 220 m

Soil: texture: light clay **colour:** brown, 7.5YR 4/4 **pH:** 4.81

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: logged 1994

Vegetation description: very tall open forest with mid-tall to tall very sparse mid-stratum, tall to very tall shrub layer and mid-dense ground layer

Tree layer: *Corymbia trachyphloia*, *Eucalyptus fibrosa*, *C. citriodora*, *E. acmenoides* and *E. major*.

Midstratum: *Eucalyptus* saplings

Shrub layer: *Acacia penninervis* subsp. *penninervis*, *Lophostemon confertus*, *Acacia aulacocarpa*, *Persoonia sericea*, *Acrotriche aggregata*, *Macrozamia mountperriensis*, *Xanthorrhoea latifolia*, *Aristida* spp., *Themeda triandra*, *Cleistochloa subjuncea*, *Lepidosperma laterale*, *Monotoca scoparia* and *Cymbopogon refractus*.

Estimated area of occupancy (m) (m²): 200 x 50 (10000)

Estimated population: (density 0.13, s² = 0.025, n = 20, 10 m² quadrats) 1320 ± 94 plants (95% confidence interval)

Comments: 9 mature and 8 seedlings observed dead within the transect area

Site: 9

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 1-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 260°, W **Altitude:** 120 m

Soil: texture: light clay **colour:** brown, 7.5YR 4/4 **pH:** 5.25 **Comments:** ironstone present in soil to 10 mm diameter

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burns Aug 1997; logged 1975

Vegetation description: very tall open forest with tall to very tall sparse shrub layer

Tree layer: *Eucalyptus acmenoides*, *E. fibrosa*, *Corymbia trachyphloia*, *C. citriodora*, *Angophora leiocarpa* and *E. exserta*.

Shrub layer: *Lophostemon confertus* and *Acacia leiocalyx*.

Estimated area of occupancy (m) (m²): 60 x 80 (4800)

Population: 65 plants

Site: 10

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 1-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 2° **Slope class:** very gently inclined **Aspect:** 330°, NNW **Altitude:** 100 m

Soil: texture: n/r **colour:** n/r **pH:** n/r

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn Aug 1997; logged 1983/84

Estimated area of occupancy (m) (m²): 10 x 10 (100)

Population: 9 plants

Site: 11

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 23-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1°-3° **Slope class:** very gently to gently inclined **Aspect:** 120°, ESE **Altitude:** 120 m

Soil: texture: light clay **colour:** brownish black, 5YR 2/2 **pH:** 5.20

Rock type at site: fined grained sandstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1993; logged 1996 & 1956

Vegetation description, very tall open forest with mid-tall to tall very sparse mid-stratum, mid-tall mid-dense shrub layer and mid-dense ground cover

Tree layer: *Eucalyptus acmenoides*, *E. fibrosa* and *Corymbia trachyphloia*.

Mid stratum: *Lophostemon confertus*.

Shrub and ground layer: *Lophostemon confertus*, *Acacia complanata*, *Petalostigma triloculare*, *Acrotriche aggregata*, *Lepidosperma laterale*, *Lomandra* sp., *Acacia conferta*, *Goodenia rotundifolia*, *Lomandra longifolia*, *Entolasia stricta*, *Macrozamia mountperriensis*, *Solanum densevestitum* and *Zieria smithii*.

Estimated area of occupancy (m) (m²): 400 x 200 (80000)

Estimated population: (density 0.04, $s^2 = 0.002$, $n = 20$, 10 m² quadrats) 3360 ± 84 plants (95% confidence interval)

Site: 12

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 28-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 40° to 140°, NE to SE **Altitude:** 120 m

Soil: texture: clay loam **colour:** very dark reddish brown, 5YR 2/3 **pH:** 5.29

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn Aug 1997

Vegetation description: very tall open forest with tall shrub layer

Tree layer: *Eucalyptus acmenoides*, *E. fibrosa*, *Lophostemon confertus* and *C. intermedia*.

Shrub layer: *Lophostemon confertus* and *Acacia maidenii*.

Estimated area of occupancy (m) (m²): 200 x 200 (40000)

Estimated population: (density 0.09, $s^2 = 0.005$, $n = 20$, 10 m² quadrats) 3760 ± 85 plants (95% confidence interval)

Site: 14

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 30-Sep-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope
Slope: 2°-5° **Slope class:** gently to moderately inclined **Aspect:** 260°, W **Altitude:** 140 m
Soil: texture: N/R **colour:** N/R **pH:** N/R
Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff
Geology map reference: Maryborough 1: 250,000 SG56-6
Comments: last prescribe burn 1997; logged 1965

Vegetation description: very tall open forest
Tree layer: *Eucalyptus acmenoides*, *Angophora leiocarpa* and *E. fibrosa*.
Ground layer: *Pultenaea spinosa*, *Jacksonia scoparia* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 200 x 200 (40000) **Population:** 43 plants

Site: 16

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry
Date surveyed: 2-Oct-97

Landform pattern: rolling low hills **Landform element:** hillcrest **Morphological type:** crest
Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 140 m
Soil: texture: loamy sand **colour:** dull yellowish brown, 10YR 4/3 **pH:** 5.15
Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff
Geology map reference: Maryborough 1: 250,000 SG56-6
Comments: last hazard reduction burn 1997; logged 1997

Vegetation description: very tall open forest with tall mid-dense shrub layer
Tree layer: *Eucalyptus acmenoides*, *Angophora leiocarpa*, *Corymbia citriodora* and *E. fibrosa*.
Shrub and ground layer: *Acacia aulacocarpa*, *Jacksonia scoparia* and *Pultenaea spinosa*.

Estimated area of occupancy (m) (m²): 100 x 100 (10000)
Population: 42 plants

Site: 17

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: rolling low hills **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 100 m

Soil: texture: light clay **colour:** dark brown, 10YR 3/3 **pH:** 5.01 **Comments:** ironstone gravel present in soil profile

Rock type at site: ferruginous siltstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1996; logged 1990

Vegetation description: very tall open forest with tall sparse shrub layer and sparse ground cover

Tree layer: *Eucalyptus acmenoides*, *Angophora leiocarpa* and *Corymbia citriodora*.

Shrub and ground layer: *Acacia leiocalyx*, *Lophostemon confertus*, *Acacia aulacocarpa*, *A. fimbriata*, *Jacksonia scoparia*, *Xanthorrhoea latifolia*, *Imperata cylindrica* and *Pultenaea spinosa*.

Estimated area of occupancy (m) (m²): 100 x 100 (10000)

Population: 194 plants

Site: 18

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: rolling low hills **Landform element:** hillcrest **Morphological type:** crest

Slope: <1° **Slope class:** level **Aspect:** _ **Altitude:** 100 m

Soil: texture: n/r **colour:** n/r **pH:** n/r

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1996; logged 1991; one plant in old log dump area

Vegetation description: very tall open forest with mid-dense ground layer

Tree layer: *Eucalyptus acmenoides*, *Angophora leiocarpa* and *Corymbia trachyphloia*.

Ground layer: *Aristida* spp., *Jacksonia scoparia*, *Themeda triandra*, *Xanthorrhoea latifolia*, *Dianella* sp., *Imperata cylindrica*, *Acacia complanata*, *Hardenbergia violacea*, *Acrotriche aggregata*, *Gompholobium pinnatum* and *Lepidosperma laterale*.

Estimated area of occupancy (m) (m²): 50 x 50 (2500)

Population: 9 plants

Site: 19

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 2-Oct-97

Landform pattern: rolling low hills **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 100 m

Soil: texture: light clay **colour:** dark brown, 10YR 3/3 **pH:** 4.90 **Comments:** contains stones up to 5 mm diam.

Rock type at site: fine grained sandstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1996; logged 1997

Vegetation description: very tall open forest with mid-tall to tall sparse mid-stratum and tall mid-dense shrub layer.

Tree layer: *Corymbia citriodora*, *Eucalyptus acmenoides* and *E. fibrosa*.

Mid stratum: *Eucalyptus* saplings and *Lophostemon confertus*.

Shrub layer: *Acacia leiocalyx*, *Lophostemon confertus*, *Alphitonia excelsa* and *Jacksonia scoparia*.

Estimated area of occupancy (m) (m²): 100 x 100 (10000)

Population: 29 plants

Site: 20

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 3-Oct-97

Landform pattern: undulating low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1°-3° **Slope class:** very gently to gently inclined **Aspect:** 195°, S **Altitude:** 90 m

Soil: texture: light clay **colour:** dark reddish brown, 5YR 3/3 **pH:** 5.29 **Comments:** ironstone gravel on surface

Geology map unit: Td/Te: Td: Duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile;

Te: Elliott formation; Quartzose to sublabile sandstone, conglomerate, siltstone, mudstone, shale

Geology map reference: Maryborough 1: 250,000 SG56-6

Comments: last hazard reduction burn 1997, but area with *Macrozamia* not burnt; logged 1971

Vegetation description: open forest with tall sparse shrub layer and mid-dense ground cover

Tree layer: *Corymbia citriodora*, *Eucalyptus crebra*, *Angophora leiocarpa* and *E. acmenoides*.

Shrub layer and ground layer: *Acacia leiocalyx*, *A. aulacocarpa*, *A. falcata*, *Canthium coprosmoides*, *Aristida* spp., *Jacksonia scoparia*, *Themeda triandra*, *Xanthorrhoea latifolia*, *Cleistochloa subjuncea*, *Gahnia aspera*, *Geitonoplesium cymosum* and *Lophostemon confertus*.

Estimated area of occupancy (m) (m²): 50 x 40 (2000)

Population: 25 plants

Site: 21

Land tenure: Freehold and road reserve **Controlling body:** unknown and local council

Date surveyed: 30-Sep-97

Landform pattern: undulating low hills **Landform element:** hillslope & hillcrest **Morphological type:** simple slope & crest

Slope: 0-2° **Slope class:** level to gently inclined **Aspect:** various aspects **Altitude:** 120 m

Soil: texture: N/R **colour:** N/R **pH:** N/R

Rock type at site: fine medium grained quartz sandstone

Geology map unit: Brooweena Formation; Rb: sandstone siltstone, mudstone, shale, conglomerate, tuff

Geology map reference: Maryborough 1: 250,000 SG56-6

Vegetation description: tall to very tall open forest with tall sparse shrub layer and sparse ground cover

Tree layer: *Corymbia citriodora*, *Eucalyptus crebra*, *E. acmenoides*, *C. trachyphloia* and *E. major*.

Shrub layer and ground layer: *Acacia leiocalyx*, *A. aulacocarpa*, *Lophostemon confertus*, *Aristida* spp., *Dianella* sp., *Imperata cylindrica*, *Lomandra* sp., *Acacia complanata*, *A. conferta*, *Chrysocephalum apiculatum*, *Cymbopogon refractus*, *Dianella revoluta*, *Eragrostis brownii*, *Goodenia rotundifolia*, *Hardenbergia violacea*, *Jacksonia scoparia*, *Themeda triandra* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 1200 x 20 (2400)

Population: 22 plants

Site: 22

Land tenure: Freehold land

Date surveyed: 23-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 320°, NW **Altitude:** 180 m

Soil: texture: sandy clay **colour:** very dark reddish brown, 10R 2/2 **pH:** 5.65

Rock type at site: coarse grained sandstone

Geology map unit: Pg: Permian; mudstone, siltstone, sandstone limestone, chert, basaltic to andesitic flows and pyroclastics

Geology map reference: Maryborough 1: 250,000 SG56-6

Vegetation description: tall open forest with mid-tall to tall sparse midstratum, tall to very tall very sparse shrub layer and very sparse ground cover

Tree layer: *Corymbia citriodora*, *Eucalyptus exserta*, *Lophostemon confertus*, *E. crebra*, *E. acmenoides* and *E. longirostrata*.

Mid stratum: *Acacia aulacocarpa* and *Eucalyptus* saplings.

Shrub and ground layer: *Acacia leiocalyx*, *Alectryon subdentatus*, *Alphitonia excelsa*, *Canthium lamprophyllum*, *Denhamia pittosporoides*, *Diospyros fasciculosa*, *Grevillea whiteana*, *Maytenus sylvestris*, *Petalostigma pubescens*, *Pittosporum undulatum*, *Rapanea variabilis*, *Aristida* spp., *Lantana camara**, *Breynia oblongifolia*, *Carissa ovata*, *Jasminum didymum*, *Parsonsia eucalyptophylla* and *Secamone elliptica*,

Estimated area of occupancy (m) (m²): 400 x 50 (20000)

Estimated population: (density 0.14, $s^2 = 0.011$, $n = 6$, 500 m² quadrats) 2780 ± 154 plants (95% confidence interval)

Site: 23

Land tenure: National Park **Controlling body:** Department of Environment

Date surveyed: 23-Oct-97

Landform pattern: rolling low hills **Landform element:** hillslope **Morphological type:** waning lower slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 170°, S **Altitude:** 180 m

Soil: texture: clay loam **colour:** very dark reddish brown, 7.5R 2/2 **pH:** 6.05 **Comments:** contains small stones to 2-3 mm diam.

Geology map unit: Pg: Permian; mudstone, siltstone, sandstone limestone, chert, basaltic to andesitic flows and pyroclastics

Geology map reference: Maryborough 1: 250,000 SG56-6

Vegetation description: open forest with mid-tall to tall sparse mid stratum, tall sparse shrub layer and mid-dense ground cover

Tree layer: *Corymbia citriodora* and *Eucalyptus crebra*.

Mid stratum: *Lophostemon suaveolens*.

Shrub layer and ground layer: *Acacia aulacocarpa*, *A. leiocalyx*, *Lophostemon suaveolens*, *Aristida* spp., *Cassinia collina*, *Dianella* sp., *Imperata cylindrica*, *Lantana camara**, *Lomandra longifolia*, *Lomandra* sp., *Psychotria daphnoides*, *Sida subspicata* and *Smilax australis*.

Estimated area of occupancy (m) (m²): 100 diameter (7850)

Estimated population: (density 0.08, s² = 0.011, n = 20, 10 m² quadrats) 655 ± 34 plants (95% confidence interval)

Appendix 2.7. *Macrozamia pauli-guilielmi*

Site: 1

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 3-Oct-97

Landform pattern: hills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 12° **Slope class:** moderately inclined **Aspect:** 190°, S **Altitude:** 80 m

Soil: texture: light clay **colour:** very dark brown, 7.5YR 2/3 **pH:** 5.11 **other comments:** stones up to 10 mm diam.

Surface rock (%): 0

Geology map unit: Kin Kin Beds; Rlk: Phyllitic shale, shale, feldspathic arenite, lithic greywacke

Geology map reference: Gympie 1: 250, 000 SG 56-10

Fire history: wildfire burnt from freehold land to forestry track in 7 Nov. 1994; last prescribed burn in 1991

Vegetation description: mid-tall to tall open forest with tall shrub layer and mid-dense ground cover

Trees: *Angophora leiocarpa*, *Corymbia citriodora*, *Eucalyptus acmenoides* and *E. major*.

Shrubs and ground layer: *Acacia aulacocarpa*, *A. leiocalyx*, *Cleistochloa subjuncea*, *Cymbopogon refractus*, *Daviesia ulicifolia*, *Dianella caerulea* var. *vannata*, *Geitonoplesium cymosum*, *Hardenbergia violacea*, *Hibbertia* sp., *Indigofera australis*, *Jacksonia scoparia*, *Leucopogon juniperinus*, *Lomandra multiflora*, *Lophostemon confertus*, *Oplismenus aemulus* and *Xanthorrhoea johnsonii*.

Estimated area of occupancy (m) (m²): 100x300 (30000)

Estimated population: 105 plants

Site: 2

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 3-Oct-97

Landform pattern: hills **Landform element:** hillcrest **Morphological type:** crest

Slope: 1° **Slope class:** _ **Aspect:** _ **Altitude:** 100 m

Soil: texture: loam **colour:** dark reddish brown **pH:** 4.89 **other comments:** stones up to 10 mm diam.

Surface rock (%): 0

Geology map unit: Kin Kin Beds; Rlk: Phyllitic shale, shale, feldspathic arenite, lithic greywacke

Geology map reference: Gympie 1: 250, 000 SG 56-10

Fire history: appears to have been burnt in the last 2 years

Vegetation description: mid-tall to tall open forest with a tall to very tall sparse shrub layer and mid-dense ground cover

Trees: *Corymbia citriodora*, *E. acmenoides* and *E. major*.

Shrubs and ground layer: *Acacia aulacocarpa*, *A. leiocalyx*, *Cleistochloa subjuncea*, *Cymbopogon refractus*, *Daviesia ulicifolia*, *Jacksonia scoparia*, *Xanthorrhoea johnsonii*, *Aristida* sp., *Dianella revoluta*, *Persoonia sericea* and *Themeda triandra*.

Estimated area of occupancy (m) (m²): 10 m r (314)

Estimated population: 2 plants

Site: 3

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 9-Oct-97

Landform pattern: plain **Landform element:** levee **Morphological type:** ridge

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 10 m

Soil: texture: sand **colour:** N/R **pH:** N/R **Surface rock (%):** 0

Geology map unit: Myrtle Creek Sandstone: R-Jy: Sandstone, shale, siltstone, conglomerate

Geology map reference: Gympie 1: 250, 000 SG 56-10

Vegetation description: mid-tall to tall open forest with a low mid-dense mid-stratum, tall sparse shrub layer and dense ground cover.

Trees: *Eucalyptus racemosa*.

Midstratum: *Acacia aulacocarpa*, *Allocasuarina littoralis*, *Alphitonia excelsa* and *Banksia integrifolia* subsp. *compar*.

Shrubs and ground layer: *Themeda triandra*, *Acrotriche aggregata*, *Leucopogon* sp., *Livistona australis*, *Persoonia virgata*, *Pteridium esculentum* and *Xanthorrhoea fulva*.

Estimated area of occupancy (m) (m²): 10 m r (314)

Population: 23 plants

Site: 4

Land tenure: National Park **Controlling body:** Department of Environment

Date surveyed: 9-Oct-97

Landform pattern: lowhills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 8° **Slope class:** moderately inclined **Aspect:** 170°, S **Altitude:** 60 m

Soil: texture: sandy clay loam **colour:** dark reddish brown, 7.5YR 3/2 **pH:** 5.04

Surface rock (%): 0

Geology map unit: Qa: Quaternary alluvium **Geology map reference:** Gympie 1: 250, 000 SG 56-10

Vegetation description: very tall open forest with a mid-tall to tall sparse mid-stratum, tall sparse shrub layer and mid-dense ground cover

Trees: *Lophostemon confertus*, *Corymbia intermedia* and *Eucalyptus microcorys*.

Midstratum: *Alphitonia excelsa*, *Euroschinus falcata*, *Flindersia schottiana*, *Pilidiostigma rhytispermum*, *Elaeocarpus obovatus*, *Diospyros pentamera*, *Lophostemon suaveolens*, *Glochidion ferdinandi*, *Litsea reticulata*, *Livistona australis*, *Notelaea longifolia* and *Planchonella queenslandica*.

Shrubs and ground layer: *Alphitonia excelsa*, *Xanthorrhoea macronema*, *Austromyrtus dulcis*, *Acrotriche aggregata*, *Acacia aulacocarpa*, *Gahnia aspera*, *Pilidiostigma rhytispermum*, *Lomandra longifolia*, *Ottochloa nodosa*, *Dianella* sp., *Elaeocarpus obovatus*, *Themeda triandra*, *Imperata cylindrica*, *Rapanea variabilis*, *Cleistochloa subjuncea*, *Caelospermum paniculatum*, *Morinda jasminoides*, *Psychotria loniceroides*, *Breynia oblongifolia*, *Austrosteenisia blackii*, *Elaeocarpus reticulatus*, *Flagellaria indica*, *Glochidion ferdinandi* and *Lantana camara**.

Estimated area of occupancy (m) (m²): 100x50 (5000)

Population: 62 plants

Site: 5

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 20-Oct-97

Landform pattern: lowhills **Landform element:** hillslope **Morphological type:** simple slope

Slope: 2° **Slope class:** gently inclined **Aspect:** 80°, E **Altitude:** 100 m

Soil: **texture:** N/R **colour:** N/R **pH:** N/R **Surface rock (%):** 0

Geology map unit: Duckinwilla group; Tiaro Coal Measures; Jdt: Shale, mudstone, siltstone, sandstone, coal, limestone

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Vegetation description: mid-tall to tall open forest with a mid-tall to tall sparse shrub layer and sparse ground cover

Trees: *Corymbia citriodora*, *Eucalyptus acmenoides*, *Angophora leiocarpa* and *E. crebra*.

Shrubs and ground layer: *Themeda triandra*, *Acacia leiocalyx*, *Cymbopogon refractus*, *Jacksonia scoparia*, *Persoonia sericea*, *Acacia complanata*, *Cheilanthes sieberi*, *Desmodium rhytidophyllum*, *Entolasia stricta* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 20 x 5 (100)

Population: 2 plants

Site: 6

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 27-Oct-97

Landform pattern: lowhills **Landform element:** hillcrest **Morphological type:** crest

Slope: <1° **Slope class:** _ **Aspect:** 270°, W **Altitude:** 40 m

Soil: **texture:** loamy sand **colour:** yellowish grey. 2.5Y 5/1 **pH:** 5.00

Surface rock (%): 0

Geology map unit: Duckinwilla group; Undivided; RJd: Sandstone, siltstone, shale, mudstone, coal

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: 'The Lagoons' is burnt on a 7 year cycle since 1989, 3/4 year cycle prior to 1989. Forestry comment was that since the cycle has been lengthened increase in shrubs becoming very dense understorey. Area surveyed last prescribe burn Aug 1997.

Vegetation description: tall open forest with tall sparse midstratum, tall sparse shrub layer

Trees: *Angophora leiocarpa*, *Corymbia intermedia*, *Eucalyptus racemosa* and *C. trachyphloia*.

Midstratum: *Alphitonia excelsa*, *Notelaea longifolia*, *Acacia aulacocarpa* and *Allocasuarina littoralis*.

Shrubs and ground layer: *Desmodium rhytidophyllum*, *Entolasia stricta*, *Alphitonia excelsa*, *Acrotriche aggregata*, *Acacia aulacocarpa*, *Lomandra longifolia*, *Imperata cylindrica*, *Hakea florulenta* and *Lepidosperma laterale*.

Estimated area of occupancy (m) (m²): 400x200 (80000)

Estimated population: (density 0.06, $s^2 = 0.032$, $n = 40$, 5 m² quadrats) 5120 ± 799 plants (95% confidence interval)

Site: 7

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 22-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 30 m

Soil: texture: sand **colour:** greyish yellow brown, 10YR 4/2 **pH:** 4.96

Surface rock (%): 0

Geology map unit: Td/RJd: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; RJd: Duckinwilla group; Undivided: Sandstone, siltstone, shale, mudstone, coal

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: prescribe burns 1995, 1992, 1989, 1982

Vegetation description, mid-tall to tall woodland with a tall sparse shrub layer and mid-dense ground cover.

Trees: *Eucalyptus racemosa* and *E. umbra*.

Shrubs and ground layer: *Entolasia stricta*, *Acrotriche aggregata*, *Lepidosperma laterale*, *Themeda triandra*, *Xanthorrhoea johnsonii*, *Acacia hubbardiana*, *Banksia oblongifolia*, *Banksia spinulosa* var. *spinulosa*, *Daviesia umbellulata*, *Gompholobium pinnatum*, *Grevillea leiophylla*, *Hakea plurinervia*, *Hakea sericea*, *Hovea* sp. (Deepwater Creek N.P. N.Gibson TOI593), *Leptospermum trinervium*, *Monotoca scoparia*, *Petrophile shirleyae* and *Strangea linearis*.

Estimated area of occupancy (m) (m²): 500x50 (25000)

Population: 158 plants

Site: 8

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 22-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 130°, SE **Altitude:** 20 m

Soil: texture: N/R **colour:** N/R **pH:** N/R

Surface rock (%): 0

Geology map unit: Td/RJd: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; RJd: Duckinwilla group; Undivided: Sandstone, siltstone, shale, mudstone, coal

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: prescribed burns 1997, 1994, 1991, 1990, 1983

Vegetation description: mid-tall to tall open forest with a mid-tall sparse mid-stratum

Trees: *Corymbia intermedia*, *C. trachyphloia* and *Eucalyptus racemosa*.

Midstratum: *Allocasuarina littoralis* and *Banksia integrifolia* subsp. *compar.*

Estimated area of occupancy (m) (m²): 50x50 (2500)

Population: 214 plants

Site: 9

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 22-Oct-97

Landform pattern: gently undulating plain **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 280°, W **Altitude:** 10 m

Soil: texture: loamy sand, slightly sapric **colour:** brownish black 10YR 2/3 **pH:** 4.74

Surface rock (%): 0

Geology map unit: TQc/RJd: TQc: undifferentiated coastal plain: sand, silt, mud, minor gravel; RJd: Duckinwilla group; Undivided: Sandstone, siltstone, shale, mudstone, coal **Geology map reference:** Maryborough 1: 250, 000 SG 56-6

Vegetation description: mid-tall to tall open forest with a low to mid-tall sparse midstratum and mid-dense ground cover

Trees: *Angophora leiocarpa*, *Corymbia intermedia*, *E. racemosa* and *E. umbra*.

Midstratum: *Acacia aulacocarpa*, *A. flavescens*, *Alphitonia excelsa*, *Banksia integrifolia* subsp. *compar* and *Lophostemon suaveolens*.

Shrubs and ground layer: *Acacia aulacocarpa*, *Acacia flavescens*, *Acrotriche aggregata*, *Alphitonia excelsa*, *Dianella* sp., *Dodonaea triquetra*, *Elaeocarpus reticulatus*, *Imperata cylindrica*, *Leucopogon* sp., *Schizaea bifida*, *Smilax glycyphylla* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 100 x 100 (10000)

Population: 10 plants

Site: 10

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 22-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 30 m

Soil: texture: loamy sand **colour:** greyish yellow, 2.5Y 6/2 **pH:** 5.33

Surface rock (%): 0

Geology map unit: Duckinwilla group; Undivided; RJd: Sandstone, siltstone, shale, mudstone, coal

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: partly burnt in 1997, previous burns 1985, 1981, area observed was not burnt by 97 fire.

Vegetation description: mid-tall to tall woodland with tall very sparse shrub layer and mid-dense shrub layer

Trees: *Eucalyptus racemosa* and *E. umbra*.

Shrubs and ground layer: *Acacia leiocalyx*, *Aristida* sp., *Banksia oblongifolia*, *Banksia spinulosa* var. *spinulosa*, *Cyathochaeta diandra*, *Daviesia umbellulata*, *Entolasia stricta*, *Gompholobium pinnatum*, *Grevillea leiophylla*, *Hakea plurinervia*, *Hakea sericea*, *Hibbertia* sp., *Lepidosperma laterale*, *Leptospermum trinervium*, *Lomatia silaifolia*, *Monotoca scoparia*, *Persoonia virgata*, *Petrophile shirleyae*, *Strangea linearis*, *Themeda triandra* and *Xanthorrhoea johnsonii*.

Estimated area of occupancy (m) (m²): 500 x 200 (50000)

Estimated population: (density 0.04, $s^2 = 0.003$, $n = 20$, 5 m² quadrats) 3600 ± 380 plants (95% confidence interval)

Site: 11

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 22-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 10 m

Soil: texture: loamy sand **colour:** dull yellow brown, 10YR 4/3 **pH:** 5.70

Surface rock (%): 0

Geology map unit: TQc/RJd: TQc: undifferentiated coastal plain: sand, silt, mud, minor gravel; RJd: Duckinwilla group; Undivided: Sandstone, siltstone, shale, mudstone, coal **Geology map reference:** Maryborough 1: 250, 000 SG 56-6

Fire history: N/R, hasn't been burnt for many years

Vegetation description: mid-tall to tall open forest with a mid-tall sparse mid-stratum, tall very sparse shrub layer and mid-dense ground cover

Trees: *Corymbia intermedia*, *Eucalyptus pilularis* and *E. racemosa*.

Midstratum: *Allocasuarina littoralis* and *Banksia integrifolia* subsp. *compar*.

Shrubs and ground layer: *Acacia aulacocarpa*, *A. complanata*, *A. flavescens*, *Daviesia umbellulata*, *Gompholobium pinnatum*, *Hakea plurinervia*, *Hibbertia stricta*, *Imperata cylindrica*, *Lepidosperma laterale*, *Leucopogon* sp., *Lomatia silaifolia*, *Paspalidium distans*, *Persoonia virgata*, *Pimelea linifolia*, *Schizaea bifida*, *Themeda triandra*, *Xanthorrhoea latifolia* and *Xylomelum salicinum*.

Estimated area of occupancy (m) (m²): 400 x 60 (24000)

Estimated population: (density 0.05, s² = 0.041, n = 40, 5 m² quadrats) 1224 ± 315 plants (95% confidence interval)

Site: 12

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 24-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 2° **Slope class:** gently inclined **Aspect:** 130°, SE **Altitude:** 60 m

Soil: texture: sandy loam **colour:** dark reddish brown, 5YR 3/4 **pH:** 5.91

Surface rock (%): 0

Geology map unit: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile.

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Vegetation description: mid-tall to tall open forest with a low sparse mid-stratum and mid-dense ground cover

Trees: *Angophora leiocarpa*, *Corymbia intermedia*, *Eucalyptus racemosa* and *E. tindaliae*.

Midstratum: *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar*, *Eucalyptus tindaliae* and *Xylomelum salicinum*.

Shrubs and ground layer: *Acacia aulacocarpa*, *Aristida* sp., *Astrotricha longifolia*, *Astrotricha longifolia*, *Cheilanthes sieberi*, *Desmodium rhytidophyllum*, *Dianella* sp., *Entolasia stricta*, *Gahnia aspera*, *Goodenia rotundifolia*, *Hakea plurinervia*, *Hibbertia stricta*, *Imperata cylindrica*, *Lepidosperma laterale*, *Lomandra laxa*, *Lomatia silaifolia*, *Monotoca scoparia*, *Paspalidium distans*, *Persoonia virgata*, *Themeda triandra*, *Xanthorrhoea latifolia* and *Xylomelum salicinum*.

Estimated area of occupancy (m) (m²): 300 x 50 (15000)

Estimated population: (density 0.13, $s^2 = 0.017$, $n = 20$, 5 m² quadrats) 1950 ± 117 plants (95% confidence interval)

Site: 13

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 24-Oct-97

Landform pattern: gently undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 20°, NNE **Altitude:** 40 m

Soil: texture: N/R **colour:** N/R **pH:** N/R

Surface rock (%): 0

Geology map unit: Td/RJd: Td: Tertiary: duricrusted old land surface: ferricrete, silcrete and indurated palaeosoils at the top of a deep weathering profile; RJd: Duckinwilla group; Undivided: Sandstone, siltstone, shale, mudstone, coal

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Vegetation description: mid-tall to tall woodland with a mid-tall sparse mid-stratum and mid-dense ground cover

Trees: *Corymbia trachyphloia*, *Eucalyptus acmenoides* and *E. racemosa*.

Midstratum: *Acacia flavescens*, *Allocasuarina littoralis*, *Banksia integrifolia* subsp. *compar* and *Pinus* sp.*.

Shrubs and ground layer: *Acacia aulacocarpa*, *Banksia oblongifolia*, *Cyathochaeta diandra*, *Daviesia umbellulata*, *Entolasia stricta*, *Hakea plurinervia*, *Imperata cylindrica*, *Lepidosperma laterale*, *Lomatia silaifolia*, *Monotoca scoparia*, *Schizaea bifida*, *Themeda triandra* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 25 x 30 (750)

Population: 42 plants

Site: 14

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 3-Oct-97

Landform pattern: undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 100°, E **Altitude:** 60 m

Soil: texture: loam **colour:** dull reddish brown, 5YR 4/3 **pH:** 5.25

Surface rock (%): 0

Geology map unit: Duckinwilla group; Tiaro Coal Measures; Jdt: Shale, mudstone, siltstone, sandstone, coal, limestone

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: last prescribed burn 1996; logged 1988

Vegetation description: tall open forest with a sparse ground cover

Trees: *Corymbia citriodora*, *Eucalyptus acmenoides* and *E. crebra*.

Shrubs and ground layer: *Acacia aulacocarpa*, *A. leiocalyx*, *Aristida* sp., *Cleistochloa subjuncea*, *Cymbopogon refractus*, *Desmodium rhytidophyllum*, *Dianella revoluta*, *Geitonoplesium cymosum*, *Hardenbergia violacea*, *Imperata cylindrica*, *Themeda triandra* and *Xanthorrhoea latifolia*.

Estimated area of occupancy (m) (m²): 200 m along road and 100 m down slope (20000)

Population: 126 plants

Site: 15

Land tenure: State Forest, freehold land and road reserve **Controlling body:** Department of Primary Industries, Forestry; unknown and local council

Date surveyed: 3-Oct-97

Landform pattern: undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 3° **Slope class:** gently inclined **Aspect:** 210°, SSW **Altitude:** 60 m
Soil: texture: loam **colour:** very dark reddish brown, 5YR 2/3 **pH:** 5.52 **other comments:** stones up to 5 mm diam.
Surface rock (%): 0
Geology map unit: Duckinwilla group; Tiaro Coal Measures; Jdt: Shale, mudstone, siltstone, sandstone, coal, limestone
Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire history: last prescribed burn 1996; logged 1989

Vegetation description: tall to very tall open forest with a sparse ground cover

Trees: *Eucalyptus acmenoides*, *Corymbia citriodora*, *C. intermedia*, *E. major*, *E. crebra* and *Angophora leiocarpa*.

Shrubs and ground layer: *Acacia aulacocarpa*, *Aristida* sp., *Daviesia ulicifolia*, *Geitonoplesium cymosum*, *Imperata cylindrica* and *Jacksonia scoparia*.

Estimated area of occupancy (m) (m²): 200 m along road and 75 m down slope (15000)

Population: 20 plants

Site: 16

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 21-Oct-97

Landform pattern: undulating rises **Landform element:** hillcrest **Morphological type:** crest

Slope: 0° **Slope class:** level **Aspect:** _ **Altitude:** 20 m

Soil: texture: loam **colour:** very dark reddish brown, 2.5YR 2/2 **pH:** 4.92

Surface rock (%): 0

Geology map unit: QPa: Quaternary alluvial plains: sand, silt, clay, gravel

Geology map reference: Maryborough 1: 250, 000 SG 56-6

Fire and logging history: last prescribed burn 1994; logged 1963

Vegetation description: tall open forest with a tall sparse shrub layer and mid-dense ground cover

Trees: *Corymbia intermedia* and *Eucalyptus siderophloia*.

Shrubs and ground layer: *Acacia aulacocarpa*, *Alphitonia excelsa*, *Aristida* sp., *Austrosteenisia blackii*, *Brunoniella australis*, *Canthium coprosmoides*, *Cymbopogon refractus*, *Desmodium rhytidophyllum*, *Dianella caerulea* var. *vannata*, *Entolasia stricta*, *Fimbristylis dichotoma*,

Geitonoplesium cymosum, *Glochidion ferdinandi*, *Imperata cylindrica*, *Lantana camara**, *Lophostemon confertus*, *Panicum effusum*, *Parsonsia straminea* and *Solanum densevestitum*.

Estimated area of occupancy (m) (m²): 5 m radius (75)

Population: 15 plants

Site: 17

Land tenure: Vacant Crown Land **Controlling body:** Department of Natural Resources

Date surveyed: 31-Oct-97

Landform pattern: undulating rises **Landform element:** hillslope **Morphological type:** simple slope

Slope: 1° **Slope class:** very gently inclined **Aspect:** 140°, SE **Altitude:** 20 m

Soil: texture: sand **colour:** greyish yellow brown, 10YR 4/2 **pH:** 5.15

Surface rock (%): 5

Geology map unit: Burrum Coal Measures: Kb: Feldspatholithic labile sandstone, siltstone, mudstone, shale, coal, conglomerate, glauconitic sandstone **Geology map reference:** Maryborough 1: 250, 000 SG 56-6

Vegetation description mid-tall to tall woodland with mid-tall sparse midstratum, tall to very tall sparse shrub layer and mid-dense ground layer.

Trees: *Corymbia citriodora*, *C. intermedia* and *Eucalyptus fibrosa*.

Midstratum: *Eucalyptus exserta*, *E. fibrosa* and *Lophostemon confertus*.

Shrubs and ground layer: *Acacia leiocalyx*, *Allocasuarina littoralis*, *Aristida* sp., *Banksia oblongifolia*, *Chrysocephalum apiculatum*, *Entolasia stricta*, *Jacksonia scoparia*, *Laxmannia* sp., *Leptospermum trinervium*, *Lomandra multiflora*, *Lophostemon confertus*, *Melichrus urceolatus*, *Platysace linearifolia*, *Themeda triandra* and *Xanthorrhoea johnsonii*.

Estimated area of occupancy (m) (m²): 33 x 31 (1023)

Population: 105 plants

Appendix 2.8. *Oldenlandia* sp. (Wietalaba N. Gibson 1344)

Site: 1

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 800 m SSE of Hut.

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry
Easting: 519156 **Northing:** 7312123 **Latitude:** 24°17'36" **Longitude:** 151°13'05"
Date surveyed: 18 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillcrest **morphological type:** crest
Aspect: 170°, S **slope:** 1° **slope class:** very gently inclined **Altitude:** 200 m
Soil: texture: loam **colour:** dull reddish brown 5YR 4/3 **pH:** 6.8
Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone
Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii* emergents
Species recorded in the vicinity of *Oldenlandia* sp. (Wietalaba N.Gibson 1344): *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Araucaria cunninghamii*, *Backhousia kingii*, *Canthium odoratum*, *Canthium* sp., *Capparis arborea*, *Carissa ovata*, *Choricarpia subargentea*, *Diospyros geminata*, *Drynaria sparsisora*, *Geitonoplesium cymosum*, *Lantana camara**, *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Rhodamnia* sp. (Calliope N.Gibson 1335), *Smilax australis*, *Spartothamnella juncea*, *Sterculia quadrifida* and *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360).

Area of occupancy: c. 1 m² **Population:** 1 mature individual observed.

Site: 2

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 100 km S from Hut
Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry
Easting: **Northing:** **Latitude:** **Longitude:**
Date surveyed: 20 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope
Aspect: 170°, S **Slope:** 15° **Slope class:** moderately inclined **Altitude:** c. 400 m
Soil: texture: loam **colour:** dark reddish brown 5YR 3/3 **pH:** 6.6
Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone
Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii*, *Archidendropsis thozetiana* and *Barklya syringifolia* emergents

Species recorded in the vicinity of *Oldenlandia* sp. (Wietalaba N.Gibson 1344): *Alchornea ilicifolia*, *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Backhousia kingii*, *Breynia oblongifolia*, *Canthium odoratum*, *Capparis arborea*, *Carissa ovata*, *Cassine melanocarpa*, *Choricarpia subargentea*, *Citriobatus linearis*, *Diospyros geminata*, *Elattostachys xylocarpa*, *Geitonoplesium cymosum*, *Lantana camara**, *Melodorum leichhardtii*, *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Pleiogynium timorense*, *Pleogyne australis*, *Smilax australis*, *Spartothamnella juncea*, *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360) and *Tetrastigma nitens*.

Area of occupancy: 60000 m² (200 m down the slope and 300 m across)

Estimated population: 30,000-60,000 mature individuals.

Appendix 2.9 *Prostanthera* sp. (Mt Tinbeerwah P.R.Sharpe 4781)

Site: 1 **Location:** Lot 183, plan MCH947, Parish of Tewanin, county of March, Noosa Shire

Easting: 497035 **Northing:** 7081048 **Latitude:** 26°23'26" **Longitude:** 152°58'13"

Land tenure: Freehold **Controlling body:** _

Date surveyed: 7 Oct 1997 **Map reference:** Cooroy 9445-2

Landform pattern: hills **Landform element:** hillslope **Morphological type:** waning lower slope

Aspect: 140°, SE **Slope:** 1° **Slope class:** very gently inclined **Altitude (m):** 100

Soil: texture: clay loam **colour:** black, 2.5Y 2/1 **pH:** 4.16

Geology map unit: Myrtle Creek Sandstone; R-Jy: sandstone, shale, siltstone, conglomerate **Geology map reference:** Gympie 1: 250, 000 SG56-10

Fire management and history: unknown; field observation: not burnt for many years

Vegetation description: Very tall sclerophyll open forest with mid-tall mid-dense midstratum, tall sparse shrub layer and dense ground layer

Tree layer: *Syncarpia glomulifera* subsp. *glomulifera*, *Corymbia intermedia* and *Eucalyptus pilularis*.

Mid stratum: *Allocasuarina littoralis*, *Synoum glandulosum* and *Leptospermum polygalifolium*

Shrub layer: Common species: *Elaeocarpus reticulatus*, *Cryptocarya glaucescens*, *Banksia spinulosa* var. *collina*, *Pittosporum undulatum*, *Acrotriche aggregata*, *Eucalyptus* spp. sapling, *Livistona australis*, *Persoonia virgata* and *Phebalium woombye*. **Other species present:**

Glochidion ferdinandi, *Melastoma affine*, *Dodonaea triquetra*, *Babingtonia* sp. (Yurolo A.R. Bean 6808), *Litsea australis* and *Hovea acutifolium*.

Ground layer: Common species: *Schoenus melanostachys*, *Gahnia clarkei*, *Dianella longifolia*, *Smilax australis*, *Prostanthera* sp. (Tinbeerwah P.R.Sharpe 4781) and *Lomandra hystrix*. **Other species present:** *Austromyrtus dulcis*, *Tetrastigma nitens*, *Billardiera scandens* var. *scandens*, *Lepidosperma laterale*, *Geitonoplesium cymosum*, *Gleichenia dicarpa*, *Gonocarpus teucroides*, *Goodenia rotundifolia*, *Hibbertia aspera*, *Ottocloa nodosa*, *Podolobium formosa* and *Morinda jasminoides*.

Populations: estimated 300 individuals

Area of occupancy: c. 10000 m², c. 200 across slope, 50 m down slope

Notes and comments: Area possibly seasonally wet from water seeping from hillside

Site: 2 Location: Mt Tinbeerwah, Tewantin State Forest, SF 959 Fty 1295

Easting: 497317 **Northing:** 7081160 **Latitude:** 26°23'22" **Longitude:** 152°58'23"

Land tenure: State Forest **Controlling body:** Department of Natural Resources/ Department of Primary Industries, Forestry

Date surveyed: 7 Oct 1997 **1:50,000 map reference:** Cooroy 9445-2

Landform pattern: hills **Landform element:** rocky hillslope **Morphological type:** rock pavement

Aspect: 110°, E **Slope:** 25° **Slope class:** steep **Altitude (m):** 240

Soil: texture: sapric loam **colour:** reddish black, 7.5R 2/1 **pH:** 4.17

Geology map unit: T1: Tertiary: trachyte, comendite, trachyrhyolite, mangerite, syenite

Geology map reference: Gympie 1: 250, 000 SG56-10

Fire management and history: area has been partly burnt in last fire, seedlings appearing in the burnt area

Vegetation description: Mid-tall to tall open shrubland with isolated mallee trees

Tree species: *Eucalyptus exserta*.

Shrub and ground species present: *Leptospermum microcarpum*, *Acacia hubbardiana*, *Allocasuarina littoralis*, *Commersonia* sp. (Mt Tinbeerwah G.P.Guymer 1786), *Goodenia rotundifolia*, *Lepidosperma laterale*, *Aristida benthamii* var. *benthamii*, *Dianella caerulea* var. *vannata*, *Digitaria parviflora*, *Eriostemon difformis* subsp. *smithianus*, *Lomandra confertifolia* subsp. *pallida*, *Micrantheum ericoides*, *Tetraria capillaris*, *Themeda triandra* and *Entolasia stricta*.

Area of occupancy: 200 m across the slope and 50 m down slope (1 ha)

Populations: 52 mature individuals and 8 seedlings

Notes and Comments: A number of naturalised species were observed along the walkway from the carpark to the lookout on top of Mt Tinbeerwah. The species observed were: *Eragrostis mexicana* subsp. *mexicana*, *Conyza sumatrensis*, *Brachiaria decumbens*, *Ipomoea batatas*, *Lantana camara*, *Bidens pilosa*, *Melinis repens* and *Melinis minutiflora*.

Site: 3 Location: 105 Illoura Place, Lake Cooroibah, Lot1/RP205063, Parish of Noosa, County of March, Noosa Shire

Easting: 497851 **Northing:** 7085493 **Latitude:** 26°21'01" **Longitude:** 152°58'42"

Land tenure: Freehold **Controlling body:** _

Date surveyed: 27 Oct 1997 **Map reference:** Cooroy 9445-2

Landform pattern: gently undulating plain **Landform element:** flat **Morphological type:** flat

Aspect: _ **Slope:** 0° **Slope class:** level **Altitude (m):** 10
Soil: texture: loam **colour:** very dark reddish brown, 5YR 2/3 **pH:** 4.51
Geology map unit: Qa: Quaternary alluvium **Geology map reference:** Gympie 1: 250, 000 SG56-10

Vegetation description: tall open forest with a low very sparse mid-stratum and mid-tall to tall mid-dense shrub layer

Tree layer: *Syncarpia glomulifera* subsp. *glomulifera*, *Corymbia intermedia* and *Eucalyptus umbra*.

Mid stratum: *Acacia maidenii* and *Glochidion sumatranum*.

Shrub and ground layer: *Acacia aulacocarpa*, *Alphitonia excelsa*, *Elaeocarpus obovatus*, *Melaleuca quinquenervia*, *Petalostigma triloculare*, *Melaleuca nodosa*, *Goodenia rotundifolia*, *Dianella caerulea* var. *vannata*, *Entolasia stricta*, *Hibbertia aspera*, *Pultenaea myrtooides*, *Pultenaea retusa*, *Zieria minutiflora* and *Lomandra longifolia*.

Area of occupancy: 5 m radius

Population: Two clusters of plants: one of 19 plants and the other of 2 plants.

Notes and comments: The area has been previously partially cleared. The site is now part of a local Tree Preservation Area.

Site: 4 **Location:** Tewanin State Forest

Easting: _ **Northing:** _ **Latitude:** 26°23'06" **Longitude:** 152°59'58"

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry/Department of Natural Resources

Date surveyed: 26 Nov 1989 **Map reference:** Cooroy 9445-2

Landform pattern: gently undulating plain **Landform element:** flat **Morphological type:** flat

Aspect: _ **Slope:** 0.5° **Slope class:** level **Altitude (m):** 20

Soil: texture: sandy **colour:** - **pH:** -

Geology map unit: Qa: Quaternary alluvium **Geology map reference:** Gympie 1: 250, 000 SG56-10

Vegetation description: tall open forest with a sparse mid-stratum and mid-tall to tall shrub layer and ground layer

Tree layer: *Eucalyptus resinifera*, *Syncarpia glomulifera* subsp. *glomulifera* and *Corymbia intermedia*.

Mid stratum: *Melaleuca quinquenervia*, *Allocasuarina littoralis*, *M. sieberi* and *Leptospermum polygalifolium*

Shrub and ground layer: *Persoonia virgata*, *Dodonaea triquetra*, *Hovea acutifolia*, *Babingtonia virgata*, *Phebalium woombye*, *Acacia hubbardiana*, *Banksia spinulosa*, *Pultenaea paleacea*, *Pultenaea retusa*, *Acrotriche aggregata*, *Entolasia stricta*, *Cassytha pubescens*, *Zieria minutiflora*, *Gahnia clarkei*, *Schoenus brevifolius*, *Billardiera scandens*, *Tricoryne* sp., *eremochloa bimaculata*, *Arthraxon hispidus*, *Lepidosperma laterale* and *Pimelea linifolia*.

Area of occupancy: unknown

Population: unknown

Notes: This information is base on field notes of C. Sandercoe.

Appendix 2. 10. *Rhodamnia* sp. (Calliope N.Gibson 1335)

Site: 1

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. c. 200 m WNW of Hut.

Easting: 318688 **Northing:** 7313066 **Latitude:** 24°17'05" **Longitude:** 151°12'49"

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Date surveyed: 18 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: Mountains **Landform element:** hillcrest **Morphological type:** crest

Aspect: 130°, SE **slope:** 3° **slope class:** gently inclined **Altitude:** 460 m

Soil: texture: loam **colour:** very dark reddish brown, 5YR 2/4 **pH:** 6.39

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine forest with *Araucaria cunninghamii* emergents

Species recorded in the vicinity of *Rhodamnia* plants:

Acacia maidenii, *Alyxia ruscifolia*, *Atalaya salicifolia*, *Austrosteenisia blackii*, *Backhousia kingii*, *Barklya syringifolia*, *Carissa ovata*, *Choricarpia subargentea*, *Claoxylon tenerifolium*, *Croton acronychioides*, *Croton phebaloides*, *Drypetes deplanchei*, *Erythroxylum* sp. (Splityard Creek L.Pedley 5360), *Gymnostachys anceps*, *Lantana camara**, *Mallotus discolor*, *Melodorum leichhardtii*, *Notelaea microcarpa*, *Pellaea paradoxa*, *Phyllanthus pusillifolius*, *Pleiogynium timorense*, *Rivina humilis**, *Solanum stelligerum*, *Stephania japonica* var. *discolor*, *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360), *Gomphocarpus fruticosus**, *Asclepias curassavica**, *Abutilon oxycarpum*, *Abutilon auritum*, *Flindersia australis*, *Ficus opposita*, *Passiflora aurantia* and *Dioscorea transversa*.

Area of occupancy: c. 5 m²

Population: 1 mature individual observed during survey. Previous records indicates that another 2 juveniles in vicinity.

Notes: The observed individual is on the southern side of an old track that runs up the ridge. The track and northern slope of ridge densely covered with lantana

Site: 2

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 800 m SSE of Hut.

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Easting: 519156 **Northing:** 7312123 **Latitude:** 24°17'36" **Longitude:** 151°13'05"

Date surveyed: 18 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillcrest **morphological type:** crest

Aspect: 170°, S **slope:** 1° **slope class:** very gently inclined **Altitude:** 200 m

Soil: texture: loam **colour:** dull reddish brown 5YR 4/3 **pH:** 6.78

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii* emergents

Species recorded in the vicinity of *Rhodamnia* plants: *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Araucaria cunninghamii*, *Backhousia kingii*, *Canthium odoratum*, *Canthium* sp., *Capparis arborea*, *Carissa ovata*, *Choricarpia subargentea*, *Diospyros geminata*, *Drynaria sparsisora*, *Geitonoplesium cymosum*, *Lantana camara**, *Oldenlandia* sp. (Wietalaba N.Gibson 1344), *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Smilax australis*, *Spartothamnella juncea*, *Sterculia quadrifida* and *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360).

Area of occupancy: c. 4 m²

Population: 1 mature individual observed.

Notes: A much drier more open site than other sites observed.

Site: 3

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 400 m SW from Hut

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Easting: 318559 **Northing:** 7312668 **Latitude:** 24°17'18" **Longitude:** 151°12'44"

Date surveyed: 19 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope

Aspect: 100°, E **Slope:** 35° **Slope class:** steep to very steep **Altitude:** 400 m

Soil: texture: loam **colour:** dark reddish brown, 5YR 3/3 **pH:** 6.63

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii*, *Archidendropsis thozetiana* and *Barklya syringifolia* emergents

Species recorded in the vicinity of *Rhodamnia* plants: *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Araucaria cunninghamii*, *Backhousia kingii*, *Canthium odoratum*, *Lantana camara**, *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Spartothamnella juncea*, *Sterculia quadrifida*, *Acronychia pauciflora*, *Alectryon subdentatus*, *Alphitonia excelsa*, *Archidendropsis thozetiana*, *Atalaya salicifolia*, *Barklya syringifolia*, *Breynia oblongifolia*, *Canthium lamprophyllum*, *Croton acronychioides*, *Croton phebaliioides*, *Cryptocarya triplinervis*, *Deeringia arborescens*, *Denhamia pittosporoides*, *Jasminum didymum* subsp. *racemosum*, *Mallotus philippensis*, *Melodorum leichhardtii*, *Pleogyne australis*, *Pouteria cotinifolia*, *Pouteria myrsinoides*, *Solanum stelligerum*, *Streblus brunonianus*, *Strychnos psilosperma*, *Zanthoxylum brachyacanthum*, *Leptochloa decipiens* and *Flindersia australis*.

Area of occupancy: 3000 m² (100 m down the slope and 30 m across)

Population: 6 mature individuals and 1 individual suckering from base of dead tree.

Site: 4

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 200 m SSW from Hut

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Easting: 318771 **Northing:** 7312845 **Latitude:** 24°17'12" **Longitude:** 151°12'51"

Date surveyed: 19 Nov 1997

Map reference: Calliope 9149

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope

Aspect: 200°, S **Slope:** 20° **Slope class:** steep **Altitude:** 340 m

Soil: texture: loam **colour:** dark brown 7.5YR 3/3 **pH:** 6.51

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii*, *Archidendropsis thozetiana* and *Barklya syringifolia* emergents

Species recorded in the vicinity of *Rhodamnia* plants: *Alectryon subdentatus*, *Alphitonia excelsa*, *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Araucaria cunninghamii*, *Atalaya salicifolia*, *Backhousia kingii*, *Canthium odoratum*, *Carissa ovata*, *Cassine melanocarpa*, *Choricarpia subargentea*, *Croton acronychioides*, *Croton phebalioides*, *Diospyros geminata*, *Geitonoplesium cymosum*, *Gymnostachys anceps*, *Lantana camara**, *Melodorum leichhardtii*, *Notelaea microcarpa*, *Phyllanthus pusillifolius*, *Smilax australis*, *Solanum stelligerum*, *Spartothamnella juncea*, *Sterculia quadrifida*, *Streblus brunonianus* and *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360).

Area of occupancy: 100 m² (10 m down the slope and 10 m across)

Population: 3 mature individuals. **Notes:** Individuals growing on the side of old forestry snig track running down ridge.

Site: 5

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site, c. 100 km S from Hut

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Easting: 318800 **Northing:** 7312800 **Latitude:** N/R **Longitude:** N/R

Date surveyed: 20 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillslope **Morphological type:** simple slope

Aspect: 170°, S **Slope:** 15° **Slope class:** moderately inclined **Altitude:** c. 400 m

Soil: texture: loam **colour:** very dark reddish brown 5YR 2/3 **pH:** 6.5

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: simple microphyll/notophyll vine thicket with *Araucaria cunninghamii*, *Archidendropsis thozetiana* and *Barklya syringifolia* emergents

Species recorded in the vicinity of *Rhodamnia* plants: *Alangium villosum* subsp. *tomentosum*, *Alchornea ilicifolia*, *Alyxia ruscifolia*, *Ancistrachne uncinulata*, *Backhousia kingii*, *Barklya syringifolia*, *Bouchardatia neurococca*, *Breynia oblongifolia*, *Carissa ovata*, *Cassine melanocarpa*, *Choricarpia subargentea*, *Citriobatus linearis*, *Cleistanthus cunninghamii*, *Croton acronychioides*, *Diospyros geminata*, *Elattostachys xylocarpa*, *Gymnostachys anceps*, *Lantana camara**, *Lastreopsis microsora*, *Melodorum leichhardtii*, *Oldenlandia* sp. (Wietalaba N.Gibson 1344), *Pellaea falcata* var. *nana*, *Phyllanthus pusillifolius*, *Pleiogynium timorense*, *Pleogyne australis*, *Secamone elliptica*, *Tarenna* sp. (Ka Ka Mundi N.P. W.J.McDonald+ 5360) and *Tetrastigma nitens*.

Area of occupancy: 100 m² (10 m down the slope and 10 m across)

Population: 4 mature individuals.

Site: 6

Location: SF 583, Fty 1595, Wietalaba, 40 km S of Calliope by road, access via Marble Creek road, 9.8 km to Hut site

Land tenure: State Forest **Controlling body:** Department of Primary Industries, Forestry

Easting: 318802 **Northing:** 7312950 **Latitude:** 24°17'09" **Longitude:** 151°12'53"

Date surveyed: 20 Nov 1997 **Map reference:** Calliope 9149

Landform pattern: mountains **Landform element:** hillcrest **Morphological type:** crest

Aspect: _ **Slope:** 0° **Slope class:** level **Altitude:** 420 m

Soil: texture: loam **colour:** dark reddish brown 5YR 3/2 **pH:** 6.15

Geology map unit: Muncon Volcanics; Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate, mudstone

Geology map reference: Monto 1: 250 000, SG56-1

Vegetation description: Original vegetation has been removed. Highly disturbed habitat.

Species present in the vicinity of the *Rhodamnia*:

Carissa ovata, *Lantana camara**, *Abutilon auritum*, *Abutilon oxycarpum*, *Acacia maidenii*, *Alphitonia excelsa*, *Asclepias curassavica**,
Geitonoplesium cymosum, *Gomphocarpus fruticosus**, *Jasminum didymum* subsp. *racemosum*, *Solanum stelligerum*, *Panicum* sp. and *Paspalidium* sp..

Area of occupancy: 4 m² (2 x 2 m)

Population: 1 mature individual.

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