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NATURAL RESOURCES ANALYSIS PROGRAM
(NRAP)

VEGETATION SURVEY AND MAPPING OF CAPE YORK PENINSULA

V.J. Neldner and J.R. Clarkson
Queensland Herbarium, Mareeba
Queensland Department of Environment and Heritage
1995

CYPLUS is a joint initiative of the Queensland and Commonwealth Governments

CAPE YORK PENINSULA LAND USE STRATEGY
(CYPLUS)

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Final report on project:

NR01 - CAPE YORK PENINSULA VEGETATION MAPPING

Recommended citation:
Neldner, V.J and Clarkson, J.R. (1995). 'Vegetation Survey and Mapping of Cape York Peninsula'. (Cape York Peninsula Land Use Strategy, Office of the Co-ordinator General of Queensland, Brisbane, Department of the Environment, Sport and Territories, Canberra, and Queensland Department of Environment and Heritage, Brisbane.)

Note:

Due to the timing of publication, reports on other CYPLUS projects may not be fully cited in the REFERENCES section. However, they should be able to be located by author, agency or subject.

ISBN 0 7242 6202 4

CAPE YORK PENINSULA LAND USE STRATEGY
STAGE I

PREFACE TO PROJECT REPORTS

Cape York Peninsula Land Use Strategy (CYPLUS) is an initiative to provide a basis for public participation in planning for the ecologically sustainable development of Cape York Peninsula. It is jointly funded by the Queensland and Commonwealth Governments and is being carried out in three stages:

- Stage I - information gathering;
- Stage II - development of principles, policies and processes; and
- Stage III - implementation and review.

The project dealt with in this report is a part of Stage I of CYPLUS. The main components of Stage I of CYPLUS consist of two data collection programs, the development of a Geographic Information System (GIS) and the establishment of processes for public participation.

The data collection and collation work was conducted within two broad programs, the Natural Resources Analysis Program (NRAP) and the Land Use Program (LUP). The project reported on here forms part of one of these programs.

The objectives of NRAP were to collect and interpret base data on the natural resources of Cape York Peninsula to provide input to:

- evaluation of the potential of those resources for a range of activities related to the use and management of land in line with economic, environmental and social values; and
- formulation of the land use policies, principles and processes of CYPLUS.

Projects examining both physical and biological resources were included in NRAP together with Geographic Information System (GIS) projects. NRAP projects are listed in the following Table.

Physical Resource/GIS Projects	Biological Resource Projects
Bedrock geological data - digitising and integration (NR05)	Vegetation mapping (NR01)
Airborne geophysical survey (NR15)	Marine plant (seagrass/mangrove) distribution (NR06)
Coastal environment geoscience survey (NR14)	Insect fauna survey (NR17)
Mineral resource inventory (NR04)	Fish fauna survey (NR10)
Water resource investigation (groundwater) (NR16)	Terrestrial vertebrate fauna survey (NR03)
Regolith terrain mapping (NR12)	Wetland fauna survey (NR09)

Physical Resource/GIS Projects	Biological Resource Projects
Land resource inventory (NR02)	Flora data and modelling (NR18)
Environmental region analysis (NR11)	Fauna distribution modelling (NR19)
CYPLUS data into NRIC database FINDAR (NR20)	Golden-shouldered parrot conservation management (NR21)
Queensland GIS development and maintenance (NR08)*	
GIS creation/maintenance (NR07)*	

* These projects are accumulating and storing all Stage I data that is submitted in GIS compatible formats.

Research priorities for the LUP were set through the public participation process with the objectives of:

- collecting information on a wide range of social, cultural, economic and environmental issues relevant to Cape York Peninsula; and
- highlighting interactions between people, land (resource use) and nature sectors.

Projects were undertaken within these sector areas and are listed in the following Table.

People Projects	Land Projects	Nature Projects
Population	Current land use	Surface water resources
Transport services and infrastructure	Land tenure	Fire
Values, needs and aspirations	Indigenous management of land and sea	Feral and pest animals
Services and infrastructure	Pastoral industry	Weeds
Economic assessment	Primary industries (non-pastoral, non-forestry)	Land degradation and soil erosion
Secondary and tertiary industries	Forest resources	Conservation and natural heritage assessment
Traditional activities	Commercial and non commercial fisheries	Conservation and National Park management
Current administrative structures	Mineral resource potential and mining industry	
	Tourism industry	

SUMMARY

The structure, floristic composition and areal extent of the present native vegetation of Cape York Peninsula defined as that area of Queensland lying north of latitude 16° south including offshore islands and the islands of Torres Strait is described and mapped from aerial photography and extensive field traverses. This report summarises information which will be presented at length in two publications due for completion by the end of 1994 (Clarkson & Neldner in press and Neldner and Clarkson in press).

Twenty-one structural formations are recognised. Woodland in its various facies is the most common and wide spread structural formation. Closed forests cover less than 5% of the area thus dispelling the widespread misconception that this formation dominates the vegetation of Cape York Peninsula.

Two hundred and one map units are recognised for the natural vegetation in the mapping component of the study. An additional six units are defined for disturbed vegetation. To simplify regional analysis an intuitive amalgamation of the 201 native vegetation map units produced 30 broad vegetation groups (BVG). Summary information obtained by intersecting the vegetation coverage on the GIS with the CYPLUS regolith, geology and soils coverage is presented for each broad vegetation group. The table below summarises the data presented as broad vegetation groups.

The vegetation of Cape York Peninsula is dominated by *Eucalyptus* spp. woodlands, open-woodlands and open-forests, which occupy 64% of the study area (see table below). This dominance of eucalypt savannas is repeated in other tropical areas of northern Australia.

Extent of amalgamated broad vegetation groups

Amalgamated Broad Vegetation Groups	Area (sq km)	%Total Area
Eucalyptus spp. dominated woodlands, open-woodlands and open-forests	85 417	64.0
Melaleuca spp. dominated low open-woodlands, low woodlands and tall shrublands	19 013	14.2
Grasslands and sparse open-woodlands	8 110	6.1
Closed-forests (excluding mangroves)	7 482	5.6
Heathlands	4 461	3.3
Miscellaneous communities (including mangroves, littoral vegetation and wetlands)	9 056	6.8
TOTAL	133 539	100.0

The messmate (*Eucalyptus tetrodonta*) dominated woodlands and tall woodlands (broad vegetation groups 16 and 17) are the most extensive, occupying 36.3% of the study area. *E. tetrodonta* dominates large areas in the Top End of the Northern Territory and significant areas in the Kimberley.

Eucalyptus hylandii and/or *E. tetrodonta* dominated woodlands occurring on sandstone, metamorphic and ironstone ranges occupy 7.3% of the study area. Other larger broad vegetation groups dominated by *Eucalyptus* spp. are group 8 (5.6%), which is dominated by the bloodwoods (*E. clarksoniana, E. novoguinensis* and *E. polycarpa*); group 7 (5.0%), dominated by the boxes (*E. chlorophylla, E. microtheca* and *E. acroleuca*); group 9 (4.0%) dominated by the ironbarks (*E. cullenii* and *E. crebra*) and box (*E. persistens* subsp. *tardecidens*); and group 11 (3.1%), dominated by Molloy box (*E. leptophleba*).

The next most extensive vegetation group is the low open-woodlands, low woodlands and tall shrublands dominated by *Melaleuca* spp. (14.2% of total area), in particular *Melaleuca viridiflora* (broad vegetation group 18) which covers 10.4% of the study area.

Grasslands (6.1%), rainforests (5.6%) and heathlands (3.3%) are the next most extensive vegetation types.

Extensive field collecting and analysis of herbarium data has produced a list of the vascular plants known to occur in the study area of 3338 species. The composition of the flora is summarised in some detail in a series of tables. Of some concern is the increase in the number of naturalised exotic species which has been shown to have occurred in less than 10 years since the last similar analysis of the flora was undertaken. While still accounting for only 7.4% of the total vascular flora, naturalised exotics have increased by almost 106% in this time. This is more than 4.5 times the corresponding increase in native species. As land use patterns change leading to more extensive clearing, increased use of exotic pasture species and the importation of materials and machinery from the south, this alarming trend is likely to continue.

Summary of the vascular flora

	Pteridophytes	Gymnosperms	Angiosperms	Total
Families	30	5	183	218
Genera	73	6	1,118	1,197
Species	157	8	3,173	3,338

Ranking of the 10 largest families based on the number of genera and their percentage of the total vascular genera

Family	No. of Genera	Percentage
Poaceae	93	7.7
Orchidaceae	62	5.1
Fabaceae	56	4.6
Euphorbiaceae	45	3.7
Asteraceae	45	3.7
Rubiaceae	35	2.9
Myrtaceae	32	2.6
Sapindaceae	26	2.1
Cyperaceae	23	1.9
Rutaceae	20	1.6

379 taxa recognised as rare or threatened by the Queensland Herbarium (1994) and known to occur on Cape York Peninsula are listed in Appendix 4. This represented 10.7% of the total flora.

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1.0 INTRODUCTION

Vegetation survey and mapping has been a function of the Queensland Herbarium since 1969. The Herbarium embarked on the Vegetation Survey of Queensland in 1977. This survey aims to map and describe the vegetation of the state in nine sections at a compilation scale of 1:250 000. Three sections have been published (Boyland, 1984; Neldner, 1984; Neldner, 1991).

The Far Northern Queensland sheet (all of Queensland north of 16°S) covers all of the CYPLUS boundary with the exception of the southern extremities of the Cook Shire (see Figure 1). This study area also includes all of the Torres Strait and Great Barrier Reef islands that are part of Queensland. The study area covers 133,500 km^2 (7.7% of Queensland), which by way of comparison is nearly twice the size of Tasmania. It is important to note that this study area encompasses an additional 351 km^2 (mainly composed of the northern islands) than the CYPLUS area (north of 16°S). Area calculations will differ slightly from those based on the CYPLUS area.

Initial flora survey work began in 1979, and intensive mapping work in 1989. A substantial amount of photointerpretation, data collection and ground truthing had occurred before the commencement of CYPLUS Stage 1 in 1992. The support of CYPLUS funds allowed the survey and mapping program to be accelerated through the provision of technical and data entry support personnel. It also allowed a more balanced sampling of the vegetation through the use of helicopters to access remote areas. As part of CYPLUS NR01 a second team of botanists commenced sampling the rainforests, and these data have greatly improved the knowledge of the Cape York rainforests.

This report briefly summarises the results of this survey. Two major Queensland Herbarium publications, *Plants of Cape York Peninsula* (Clarkson and Neldner in prep) and *Vegetation of Cape York Peninsula* (Neldner and Clarkson in prep), will comprehensively document the results of the survey. A coloured map (at approximately 1:2,000,000 scale) of the 30 broad vegetation groups recognised for the study area together with individual black and white maps for each group are included in this report. Fourteen 1:250 000 scale coloured vegetation maps depicting the distribution of the 201 map units on Cape York Peninsula will by published in the future.

1.1 Previous vegetation surveys

The location and extent of previous surveys in the study area are shown in Figure 2. The CSIRO Mitchell-Normanby land resource survey (Galloway, Gunn and Story 1970) was the first systematic natural resource survey in the study area. It covered the southern six 1:250 000 sheets, excluding the south-eastern corner of the Cooktown sheet. 1:2 000 000 maps of geology, soils, pasture lands and vegetation were derived from the 1:1 000 000 land systems map. Eight map units were recognised on the vegetation map.
The soil scientist Ray Isbell travelled extensively through Cape York Peninsula while working on the Atlas of Australian soils survey (Isbell, Webb and Murtha 1968). In June and July 1968, Les Pedley and Isbell travelled both by vehicle and helicopter to record 80

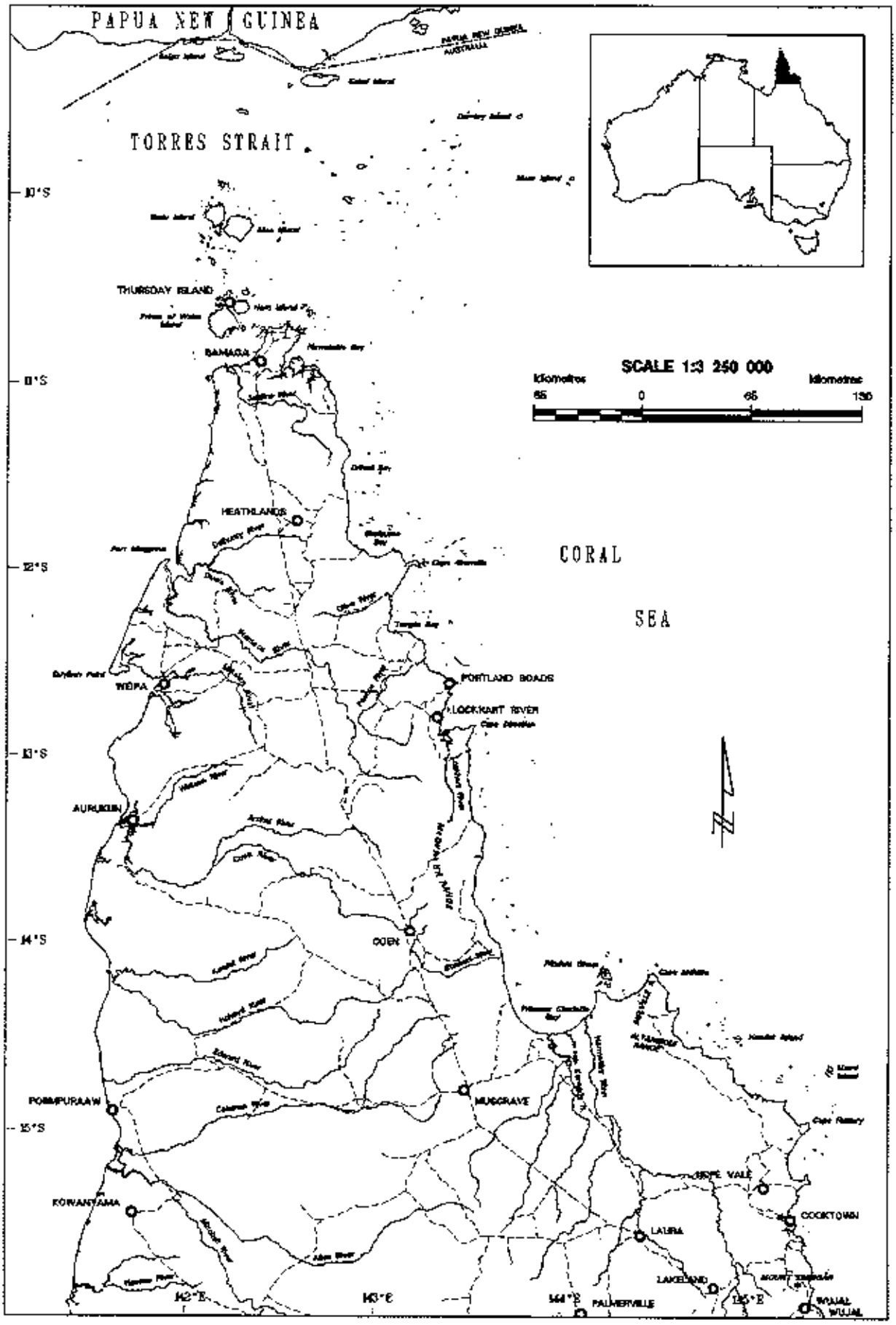

Figure 1. Extent of study area

detailed vegetation sites in the Peninsula. A 1:2 000 000 map depicting 26 vegetation map units together with descriptions was produced (Pedley and Isbell 1971). Until recently this has been the most detailed vegetation coverage over the whole study area.

A 1:500 000 map of Cape York Peninsula rainforests was produced by the Department of Forestry (1988). This map was integrated with the Pedley and Isbell map and 1:1 000 000 colour composite LANDSAT imagery to produce a 1:2 000 000 map depicting 17 plant communities by Connell Wagner (1989).

LANDSAT imagery was also used to produce 1:5 000 000 maps of the natural and present vegetation of Australia by AUSLIG (1990).

Large scale vegetation maps have been produced for less extensive area on Cape York Peninsula by Byrnes, Everist and Reynolds (1977), Clarkson (1982), Gasteen (1982), Gunness, Lawrie and Foster (1987), Hynes and Tracey (1980), Lavarack, Puniard and Fell (1988), Lavarack and Stanton (1977), Tracey and Webb (1973), Unwin and Sanderson (1988) and Neldner and Clarkson (1991). Apart from Galloway *et al.* (1970), other land system surveys in the area have been produced by Godwin (1985) and Morgan (1984). Pye and Jackes (1980) described the vegetation of the heathlands at Cape Flattery showing the location of each type within the dunefields. A small section of these dunefields was mapped as part of the ethnobotanical studies of Calvert (1993). As part of a soil survey in the Lockhart River area, Bleeker and Laut (1987) produced a map of vegetation structural formations. A number of areas have been surveyed for orchids; McIlwraith Range (Lavarack 1980), Carron Valley (Lavarack 1984), Cape York and Jardine River areas (Lavarack 1986) and northern Torres Strait Islands (Lavarack, 1989). Descriptions of the vegetation were also included in the consultants reports for the Shelburne area (MacDonald Wagner 1986), the airfield for the Royal Australian Airforce near Weipa (Gutteridge Haskins and Davey 1990), the Skardon Kaolin Project (Blandford and Associates 1994), and Saibai and Coconut Islands (Environmental Science and Services (NQ) 1994). The intertidal areas of the Endeavour, Daintree and Mulgrave Rivers were surveyed and mapped by Le Cussan (1991), while observations of the vegetation in the estuaries of the creeks between Port Stewart and Harmer Creek were recorded in Le Cussan (1993). The vegetation of the intertidal areas of the CYPLUS area has also been mapped and described to the generic level by Danaher (1994) and the occurrence of mangrove communities along various western Peninsula streams has also been documented by Messel *et al.* (1981).

A variety of large scale vegetation maps have been produced for the Great Barrier Reef islands that support large bird populations. These are published in the journal *Corella*. Stoddart and Fosberg (1991) described the vegetation communities of the reef islands.

Many of the surveys listed above have been published as internal government or consultants' reports, and may be difficult to access.

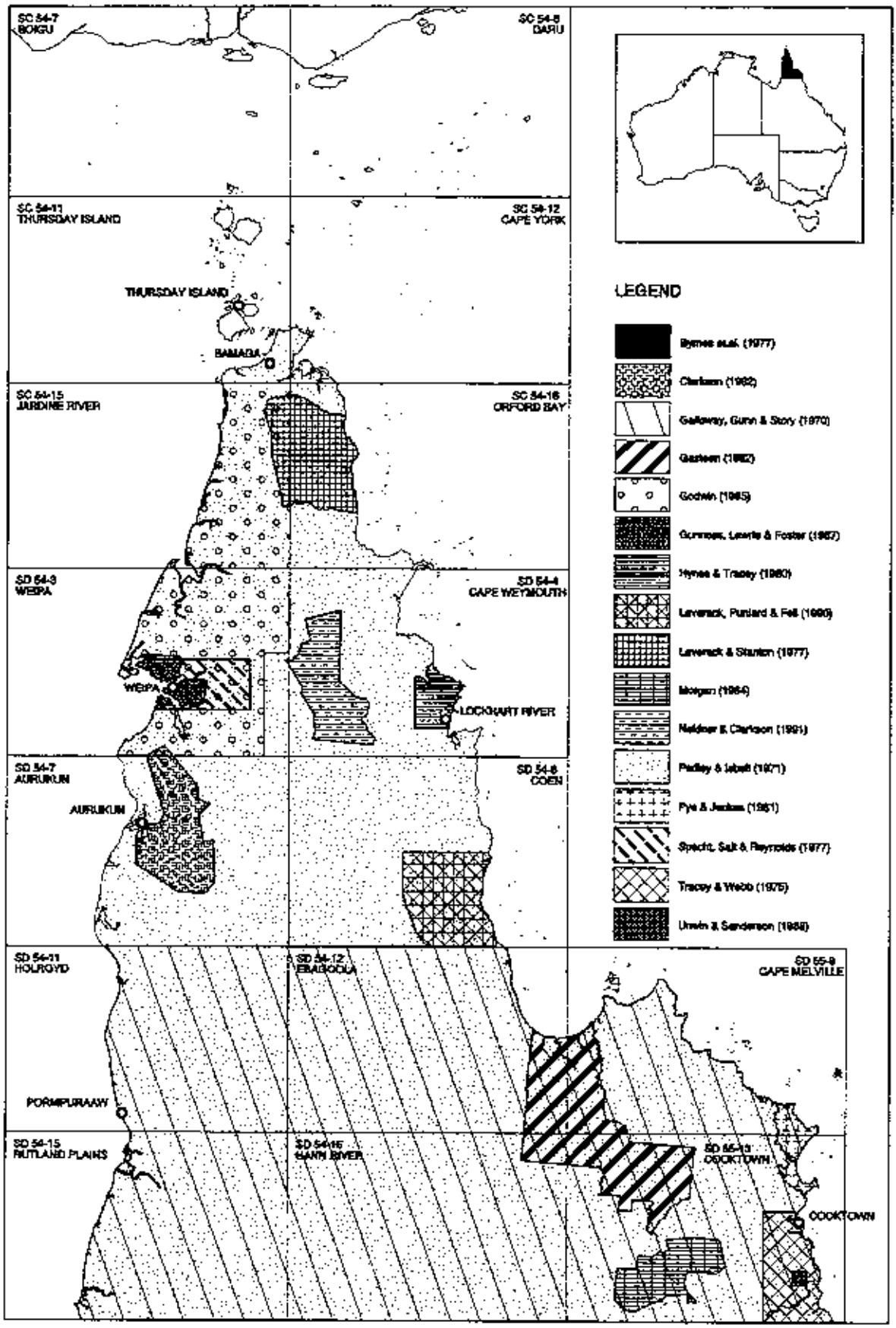

Figure 2. Previous vegetation surveys in the study area.

2.0 SURVEY METHOD

2.1 Introduction

The vegetation survey and mapping methods adopted by the Queensland Herbarium have been summarised and discussed by Neldner (1993). Boyland (1984) gives a resume to the background of the Vegetation Survey of Queensland, and describes the context in which the methods used on the project were developed. The methods used in the present study are compatible with those used in South Western Queensland (Boyland, 1984), South Central Queensland (Neldner, 1984) and Central Western Queensland (Neldner, 1991). These surveys relied extensively on data collected on previous land system surveys, and were partly constrained by the methodologies used on these integrated surveys. This survey of Far Northern Queensland was planned and developed as a single purpose vegetation survey with the majority of the data being collected by the authors between April 1989 and May 1994.

With the commencement of the Cape York Peninsula Land Use Strategy (CYPLUS) in May 1992, opportunities for integrated field work arose. Joint field work was conducted with Department of Primary Industries soil scientists resulting in 300 sites where detailed vegetation and soil information are available.

2.2 Mapping parameters

2.2.1 Map scale

The scale used for the vegetation survey was 1:250 000. This is equivalent to a reconnaissance survey with recommended uses including national and regional resource inventory, planning of large property development and management and assessment of extensive conservation areas (Reid, 1988). The 1:250 000 scale has been successfully used in other Vegetation Survey of Queensland study areas. It is a standard scale used nationally for topographic, soils, geology and vegetation. The soils, geology and regolith surveys conducted as part of CYPLUS were also produced at 1:250 000 scale.

2.2.2 Vegetation classification

Vegetation communities may vary continuously both in time and space. "Any attempt to classify a continuously varying system into several categories must necessarily be somewhat arbitrary, in so far as at some points the system must be broken into distinct groups. The selection of these critical points constitutes a controversial issue, since classification is essentially a compromise between the desire to preserve these natural groupings as continuously varying entities and the need to subdivide them for more utilitarian purposes" (Beadle and Costin 1962, p 61).

The best classification system for a project will be determined by the purpose and scale of the map. A classification based firstly on the structure, and secondly on the floristics of the vegetation is the most appropriate approach when mapping a large little-known area (Küchler 1967; Beard and Webb 1974; Boyland 1984), and has been adopted for the

Vegetation Survey of Queensland. Primary emphasis for classification was placed on the distribution of the perennial evergreen species as these are present regardless of the timing of sampling and less likely to reflect variations in seasonal conditions.

The structural formations of the vegetation are classified using a modification of the classification proposed by Specht (1970) (Table 1). Those formations occurring in this study area are indicated in boldface. Specht's scheme is based on the projective foliage cover, height and life form of the tallest layer. Map units in this survey are classified primarily on the structure of the predominant or characteristic layer, which is the layer contributing most to overall biomass and secondarily on the dominant species in that layer. The modification of Specht's classification is discussed in Boyland (1984).

Table 1. Nomenclature of structural formations (modified from Specht 1970).

Life form and height of characteristic stratum †	Projective foliage cover of characteristic stratum			
	Dense (70-100)%	Mid-dense (30-70)%	Sparse (10-30)%	Very sparse (<10)%
Trees* > 30 m	tall closed-forest	tall open-forest	**tall woodland**	
Trees* 10-30 m	**closed-forest**	**open-forest**	**woodland**	**open-woodland**
Trees* < 10 m	**low closed-forest**	**low open-forest**	**low woodland**	**low open-woodland**
Shrubs# 2-8 m	**closed-scrub**	open-scrub	**tall shrubland**	**tall open-shrubland**
Shrubs# 1-2 m	closed-heath	**open-heath**	shrubland	open-shrubland
Shrubs# < 1 m		**dwarf open-heath**	dwarf shrubland	dwarf open-shrubland
Succulent shrub			succulent shrubland	open-succulent shrubland
Hummock grasses			hummock grassland	open-hummock grassland
Tussock grasses	**closed-tussock grassland**	**tussock grassland**	open-tussock grassland	sparse-tussock grassland
Herbs	**closed-herbland°**	herbland°	open-herbland°	**sparse-herbland°**
Forbs	closed-forbland	forbland	open-forbland	**sparse-forbland**
Sedges	**closed-sedgeland**	sedgeland	**open-sedgeland**	

† Characteristic stratum is the layer which contributes most to the biomass.

* Tree is a woody plant more than 5 m tall usually with a single stem.

\# Shrub is a woody plant less than 8 m tall either multi-stemmed or branched close to ground level, infrequently with a single stem.

° Herbland refers to associations in which species composition and abundance is dependent on seasonal conditions, and at any one time grasses or forbs may predominate.

The structural classification of rainforests by Webb (1978) (Table 2) has been widely followed in descriptive and ecological studies. This classification is used to further classify the closed-forest structural formations.

The fundamental unit of description of the vegetation is the plant association. An association is a community in which the dominant layer has a qualitatively uniform floristic composition, and which exhibits a uniform structure as a whole (Beadle and Costin, 1952). Associations were erected on the basis of the frequency and abundance (based on density, basal area and cover estimates) of species, the stratification of plant forms and the spatial distribution of individuals. The structural attributes are of a continuous nature and can lead to a proliferation of associations, as structural formations grade into each other.

A map unit is that area which is readily mappable. Map units may be homogeneous, consisting of a single plant association, or they may comprise several different plant associations. Where various plant associations could not be consistently segregated by photointerpretation, they were amalgamated into one map unit.

Table 2. Field key to structural types of Australian rainforest vegetation (from Webb, 1978)

1. Mesophylls and notophylls most common	
2. Robust lianes, vascular epiphytes, plant buttresses, macrophylls and compound mesophylls prominent; trunk spaces generally obscured by aroids and palms; stem diameters irregular, many av. 60-120 cm; canopy level av. 21-42 m.	
3. Deciduous emergent and top canopy trees rare.	
4. Palm trees not prominent in canopy	Complex mesophyll vine forest (CMVF)
4. Feather palm trees prominent in canopy . .	Mesophyll feather-palm vine forest (MFPVF)
3. Deciduous and semi-deciduous emergent and top canopy.	
4. Mostly mesophylls	Semi-deciduous mesophyll vine forest (SDMVF)
4. Mostly notophylls	Semi-deciduous notophyll vine forest (SDNVF)
2. Robust lianes and vascular epiphytes not conspicuous in upper tree layers which are simplified; spur rather than plank buttresses prominent; trunk spaces open, stem diameters (except for evergreen emergents) generally regular, av. 60 cm; canopy level av. 24-36 m. Simplification of structural features does not, however approach that of simple notophyll evergreen types. Sclerophylls (e.g. *Acacia*) may be scattered in canopy.	
3. Deciduous emergent and top canopy trees rare or absent. Mostly mesophylls.	
4. Palm trees not prominent in canopy	Mesophyll vine forest (MVF)
4. Fan palm trees prominent in canopy	Mesophyll fan-palm vine forest (MFAPVF)
1. Notophylls and microphylls most common	
2. Robust and slender woody lianes, vascular epiphytes, plank buttresses, and compound entire leaves prominent; trunk spaces generally obscured by the Aroid *Pothos*; stem diameters irregular, many av. 60-120 cm.	
3. Canopy level uneven, av. 21-45 m, emergents mostly evergreen and umbrageous	Complex notophyll vine forest (CNVF)
3. Canopy level uneven, av. 15-36 m, occasional deciduous species with common emergent *Araucaria* or *Agathis*, reaching av. 36-51 m . . .	Araucarian notophyll vine forest (ANVF)

Table 2. (cont). **Field key to structural types of Australian rainforest vegetation (from Webb, 1978)**

2.	Robust lianes and vascular epiphytes inconspicuous in tree tops; slender woody and wiry lianes prominent in understorey; plank buttresses inconspicuous; simple toothed leaves prominent; trunk spaces open; stem diameters (except for emergents) generally regular av. 60 cm; tree crowns evergreen and generally sparse and narrow; strong tendency to single species dominance (e.g. *Ceratopetalum*) in upper tree layers; canopy level even, av. 21-33 m often with sclerophyllous emergents and co-dominants.	Simple notophyll evergreen vine forest (SNEVF)
2.	Robust lianes, vascular epiphytes and plank buttresses present, but not so prominent as in complex types; tree crowns mostly evergreen, but with a few semi-evergreen or deciduous species, ie. structural features are intermediate between simple and complex types	Notophyll vine forest (NVF)
2.	Robust and slender lianes generally present, wiry lianes (climbing ferns) generally conspicuous in understorey; vascular epiphytes and plank buttresses inconspicuous; feather palms generally conspicuous; tree crowns evergreen; canopy level av. 20-25 m	Evergreen notophyll vine forest (ENVF) ± feather palms
2.	Robust, slender and wiry lianes generally inconspicuous; fleshy vascular epiphytes may be prominent on trunks; plank buttresses inconspicuous; simple entire leaves prominent; deciduous species generally absent but many tree crowns become sparse during the dry season i.e. semi-evergreen; typically mixed with sclerophyllous emergents and co-dominants.	
3.	Canopy level av. 10-20 m	Simple semi-evergreen notophyll vine forest (SSENVF)
3.	Canopy level av. 3-9 m, generally even, and canopy trees often branched low down (shrub-like)	Simple semi-evergreen notophyll vine thicket (SSENVT)
1. Microphylls most common		
2.	Mossy and vascular epiphytes inconspicuous in top tree layers; robust lianes generally prominent; plank buttresses absent; prickly and thorny species frequent in usually dense shrub understorey; ground layer sparse; compound leaves and entire leaf margins common.	
3.	Canopy level uneven, av. 9-15 m with mixed evergreen and semi-evergreen emergent and upper tree layer species; araucarian and deciduous emergents rare or absent	Low microphyll vine forest (LMVF)
3.	Canopy level uneven, av. 9-15 m with some deciduous and semi-evergreen species; frequent araucarian (*Araucaria cunninghamii*) emergents to av. 21-36 m	Araucarian microphyll vine forest (AMVF)
3.	Canopy level uneven and discontinuous, av. 4-9 m with mixed evergreen, semi-evergreen and deciduous emergents to av. 9 - 18 m, swollen stems ('Bottle Trees' common)	Semi-evergreen vine thicket (SEVT)
3.	Canopy level uneven and discontinuous, av. 4-9 m; practically all emergents are deciduous, and many understorey species are deciduous or semi-evergreen; swollen stems ('Bottle Trees' and other species may be common)	Deciduous vine thicket (DVT)

Table 2. (cont). Field key to structural types of Australian rainforest vegetation (from Webb, 1978)

2.	Mossy and vascular epiphytes usually present in top tree layers; robust lianes inconspicuous; slender and wiry lianes generally prominent; plank buttresses absent; prickly and thorny species absent; simple leaves with toothed margins common; strong tendency to single species dominance (*Nothofagus, Eucryphia*) in tree layer; tree ferns and ground ferns prominent; sclerophyll emergents generally present in marginal situations	
	3. Canopy level tall, even except for sclerophylls, av. 20-45 m	Microphyll fern forest (MFF)
	3. Canopy level stunted, generally even and mixed with sclerophylls, av. 6-9 m	Microphyll fern thicket (MFT)
1. Nanophylls most common		
2.	Mossy epiphytes conspicuous; robust lianes and true prickles and thorns absent or rare; plank buttresses absent; simple leaves with toothed margins common; strong tendency to single species dominance (*Nothofagus*) in tree layer; tree ferns and ground prominent; floor often peaty and covered by mosses; sclerophyll emergents generally present.	
	3. Canopy level tall, except for sclerophylls, av. 18-40 m	Nanophyll fern forest (NFF) and mossy forest (NMF)
	3. Canopy level stunted, uneven, often with sclerophylls, av. 6-9 m	Nanophyll fern thicket (NFT) and mossy thicket (NMT)

2.2.3 Nature of mapped vegetation

This study aims to map and survey relatively undisturbed natural vegetation. Natural vegetation is an integration of environmental parameters, and hence a summary of the abiotic parameters of a site (soils, geology, climate) and an indication of its resource potential. While virtually all of Cape York Peninsula vegetation may have been influenced by the grazing of domestic and feral animals and altered fire regimes since European settlement, it is impossible to fully evaluate the magnitude and extent of change in the vegetation. The invasion of weeds has also occurred, causing severe degradation in localised areas, eg. *Cryptostegia grandiflora* (Rubbervine) in the frontage country of the Mitchell river. However, compared to more closely settled area of Queensland, the impacts on the vegetation have been low, resulting in only subtle changes in structure and floristics. Most of these changes have probably affected the low shrub and ground layers. There are obvious examples where change has been dramatic, either directly by human influence, e.g. clearing for mining or cropping, or indirectly through altered fire regimes and grazing, e.g. expansion of rainforest species in the Cooktown area.

The vegetation map represents the distribution of undisturbed natural vegetation in the study area at the time when the aerial photographs were taken. For all but the Cooktown sheet, the aerial photographs used were taken between 1969 and 1971. The Cooktown photography used was flown between 1960 and 1962. The details of the aerial photography used in the project are listed in Table 3.

Where field sampling showed that the vegetation has dramatically changed since when the aerial photographs were taken, both the vegetation shown on the aerial photographs and the present vegetation are recorded in the GIS coverages. By interrogating the GIS, the areas where dramatic change has been noted can be displayed. However, this evaluation of present vegetation is restricted to areas that were visited during field work.

Table 3. Aerial photography used in this study

1:250 000 map sheet	Code	Scale	Date	Type	Comment
Aurukun	D54-7	1:85 000	6/69;7/69;8/69;11/69	B&W	
Boigu	SC57-7	Various	7/73;6/75	B&W	
Cape Melville	D55-9	1:84 400	9/69;11/69;7/70;7/74	B&W	
Cape Melville	D55-9	1:138 300	6/75	B&W	Cape Melville area
Cape Weymouth	D54-4	1:84 000	11/69;9/70;11/71; 10/72;7/74;8/74	B&W	
Coen	D54-8	1:83 000	8/69;7/70;10/72;7/74 8/74	B&W	
Cooktown	D55-13	1:85 000	12/59;5/60;6/60;9/60;7/62	B&W	
Cooktown	D55-13	1:138 300	9/78	colour	SE Corner only
Daru	SC54-8	Various	5/74;6/75	B&W	
Ebagoola	D54-12	1:82 970	9/69;7/70;11/72	B&W	
Hann River	D54-16	1:83 480	3/69;4/69;5/69;7/69	B&W	
Holroyd	D54-11	1:84 680	5/69;7/69;8/69	B&W	
Jardine River	C54-9	1:85 000	11/69;6/71;7/71	B&W	
Maer	SC55-5	Various	5/74	B&W	
Orford Bay	C54-16	1:86 000	6/71;11/71;7/74;8/74	B&W	
Rutland Plains	D54-15	1:84 480	4/69	B&W	
Torres Strait	C54-12	1:85 000	6/71;8/71;11/71;7/74 8/74	B&W	
Weipa	D54-3	1:84 680	7/69;8/69;11/69;9/70	B&W	

2.2.4 Survey type

This survey was conducted using a free survey method. Road access provides the most economical means of conducting field work, but is limited in most areas. Hence the location of sites was primarily determined by the presence of trafficable roads and tracks,

and secondarily by the photopatterns delineated from the aerial photographs. Sites that were highly disturbed or perceived as atypical in the field were not sampled intensively.

Limited helicopter surveying allowed rapid access to many inaccessible areas on Cape York Peninsula, even though landing was impossible in many areas. Helicopter transects were carefully planned to maximise the sampling of areas of unreliable mapping (method 1) and for inadequately sampled vegetation communities (method 2). The methods used for assessing the reliability of mapping and adequacy of sampling are discussed fully in Neldner, Crossley and Cofinas (in press). Within a vegetation pattern, sites were selected to cover the geographic and environmental variation within the pattern. The offshore islands were sampled during Department of Environment and Heritage boat charters. Only limited sampling was possible on the Torres Strait Islands (36 detailed sites), however the mapping of these islands was checked by Quarantine botanist Barbara Waterhouse, Department of Primary Industries who has a good knowledge of the vegetation of these islands.

2.3 Sampling

2.3.1 Detailed sites

Detailed vegetation data were recorded for 1473 sites (See Fig. 3). Detailed soil profile information is available for 300 of these sites (Grundy and Heiner, 1991; Biggs and Philip, 1994). For each sampling site, the slope, aspect and position were recorded. A 50 m x 10 m plot was used as the basic sampling unit. The height, projective foliage cover (*pfc*) and density of each species in the woody strata were recorded. The heights of trees were measured using a clinometer, while the *pfc* was estimated using the formula:

$$pfc = pcc \times acc$$

pfc = *percentage crown cover* - the total length of the transect (midline of the 50 m x 10 m plot) covered by the vertical projection of crowns, assuming the crowns to be solid, expressed as a percentage of the total transect length.

acc = *average percentage canopy cover* - the proportion of the ground area covered by the vertical projection of foliage within the perimeter of the crowns of individual plants estimated by reference to photographs of representative crowns given in Walker and Hopkins (1990).

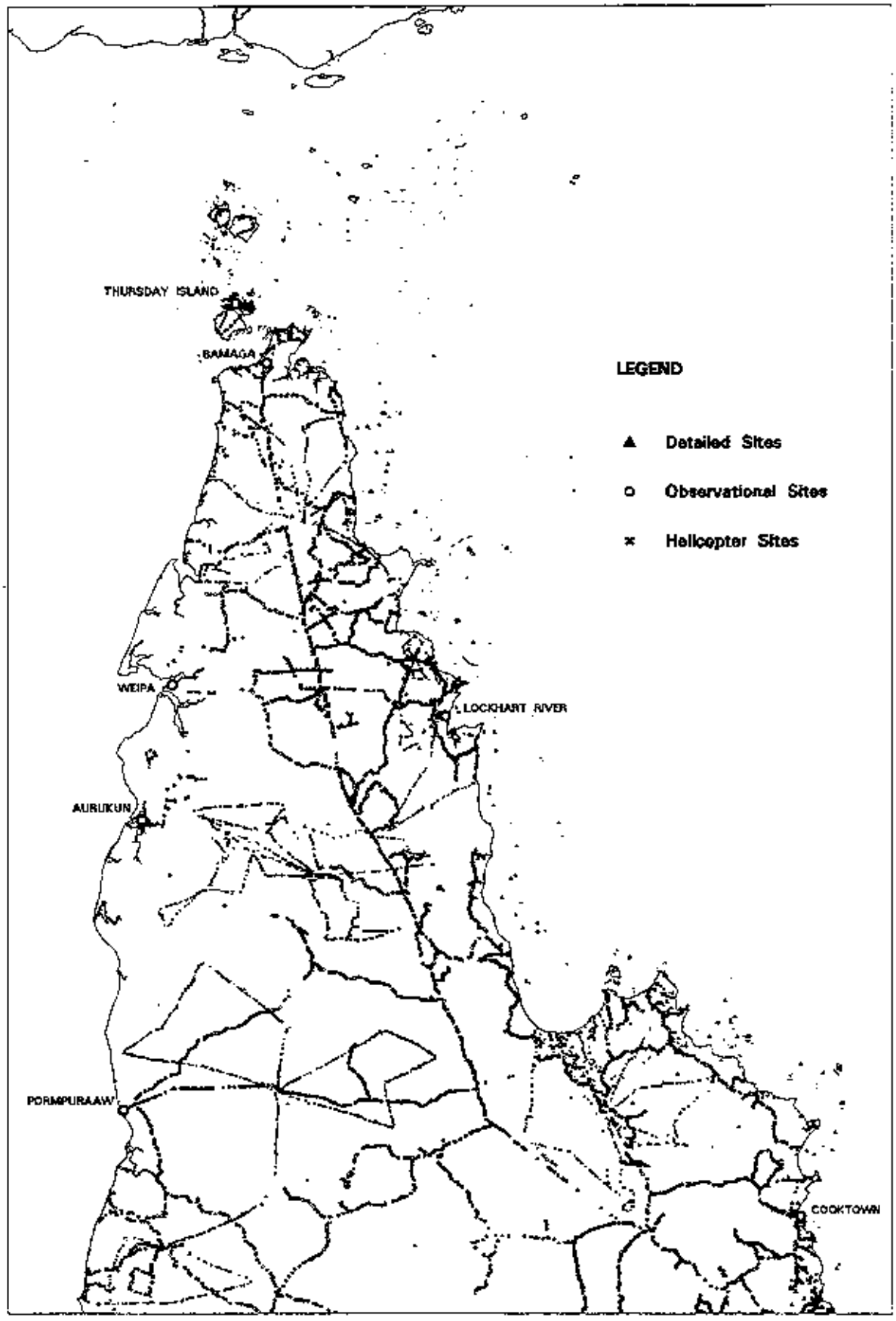

Figure 3. Location of sampling sites.

The basal area of the tree layer was estimated by using the Bitterlich method (Grosenbraugh, 1952), while the diameter breast heights (dbh) of the five closest trees to the centre point were measured using girthing tapes.

The projective foliage cover of each ground layer species occurring in five 0.5 x 1.0 m quadrats located at 10 m intervals along the plot centre line were recorded. The heights of the ground layer were measured, and additional herbaceous species occurring in the 50 x 10 m plot were recorded. A complete list of vascular plant species present was made. Plants unable to be identified in the field were collected and later determined in the laboratory. Extensive collections of fertile plant material vouch the identification of plants noted in the study area. These specimens are lodged with the Queensland Herbarium, Brisbane and duplicates distributed widely to herbaria within Australia and overseas.

The detailed site data is most comprehensive and of the highest reliability. It has been used to devise the intuitive map legend, in pattern analysis to confirm classification concepts and in ground truthing the mapping.

2.3.2 Observational sites

Observational sites made while travelling by vehicle record the dominant woody species and other conspicuous species, the vegetation structure and frequently the landform situation. The site position is determined by using a Global Positioning System (GPS). 5700 observational sites were recorded during this study. The observational sites are used primarily for ground truthing the vegetation mapping, but also provide invaluable distributional data for the dominant woody species.

2.3.3 Helicopter observations

The 2650 helicopter observations made while flying at low altitudes in the helicopter record the dominant species and structure of communities. The data was recorded initially using a tape recorder and GPS, and subsequently transcribed and recorded in the database. Because of the rapid and more remote nature of these observations, these data are generally brief and of a lower reliability than detailed or observational sites. However they are very useful in truthing the vegetation maps, particularly where no data is available because of inaccessibility (See Fig. 1).

2.3.4 Other data

Other reliable data for the study area were incorporated into the database and analyses. These sources of these data are:

1) 140 Rainforest sites collected by D.G. Fell and J.P. Stanton as part of CYPLUS. These data gave comprehensive species and structural information using the 32 nearest neighbour plotless method (Young, 1985). Reliable environmental data was also gathered. Examples of data from two of these sites are given in Appendix 5.

2) 105 rainforest sites collected by L.J. Webb and J.G. Tracey. Detailed floristic data was gathered for the canopy layer only with a structural class assigned and some environmental data recorded.

3) 110 sites on islands in the Great Barrier Reef collected by various Department of Environment and Heritage (DEH) staff. Variable floristic and structural data depending on the collector and time of year.

4) 16 sites on the Endeavour River estuary collected by Jenni Le Cussan (1991), DEH. Comprehensive floristic and some structural data were collected.

Queensland Herbarium specimen data were retrieved through HERBRECS. The description of habitat and environmental data varies greatly with the collector. These data only indicated the presence of the collected plant at a location. These records were incorporated into the species list for the study area (Clarkson and Neldner in prep.).

2.4 CORVEG database

The data is stored in the CORVEG database developed by McDonald and Dillewaard (1993) using Microsoft FoxPro software. CORVEG is being developed as the vegetation survey database for DEH and the Queensland Herbarium. A number of retrieval programs have been written to assist in the production of map unit descriptions and statistics.

2.5 Photointerpretation and mapping techniques

Initial aerial photointerpretation of the study area was undertaken in 1989 using stereopairs of vertical black and white photos. Nominal scale of the photography was approximately 1:85 000 scale for most areas (see Table 3).

Dyeline maps of photopatterns at 1:250 000 scale were produced from the interpreted photos and used for planning and conducting field work. The vegetation boundaries delineated on the aerial photographs were scanned and checked to provide a digital coverage. At the end of 1992, an intuitive map legend was devised on the basis of the detailed site data gathered and any published information available for the region. The aerial photographs were once again examined stereoscopically, and Unique Mapping Area (UMA) files produced for each map sheet. For each UMA, ie. area of land delineated on the map, the vegetation map units (up to four per UMA) and the percentage of the UMA they each occupy were determined. Any detailed or observational sites located in the UMA were noted. A reliability code (see Table 4) was assigned for each UMA. This enabled easy identification of areas of low mapping reliability and assisted in planning helicopter transects.

Table 4. Reliability ratings assigned by photointerpreter

Rating	Description
1	Very reliable, detailed site(s) recorded in UMA.
2	Very reliable, observational site(s) recorded in UMA.
3	Reliable, photointerpretation and aerial observations only.
4	Reliable, photointerpretation only but high confidence.
5	Low reliability, photointerpretation only but low confidence.
6	Unreliable, photointerpretation only but poor confidence.

Where field data indicated that the vegetation had changed since the time of photography, the present vegetation was also recorded in the UMA File. Once the UMA files were checked, they were incorporated into the GIS using ARCINFO software. The vegetation polygon and site data coverages were checked using ARCVIEW to display a variety of queries and allow thorough visual checking.

Table 5 presents the percentage of the study area covered by each reliability code. Only 10.6% of the area has a low reliability of mapping. The location of these areas is shown in Figure 4.

Table 5. Percentage of study area for each reliability rating

Rating	Unique mapping areas	% of study area
1	739	25.4
2	956	15.2
3	671	11.4
4	12,966	37.4
5	1,668	8.8
6	444	1.8
Total	17,444	100.0

On the completion of final editing, the GIS coverages were submitted to the CYPLUS GIS residing with the Department of Lands in Brisbane and NRIC in Canberra. Other copies of the coverages reside with the Environmental Resources Information Network (ERIN) in Canberra and the Queensland Herbarium in Brisbane and Mareeba.

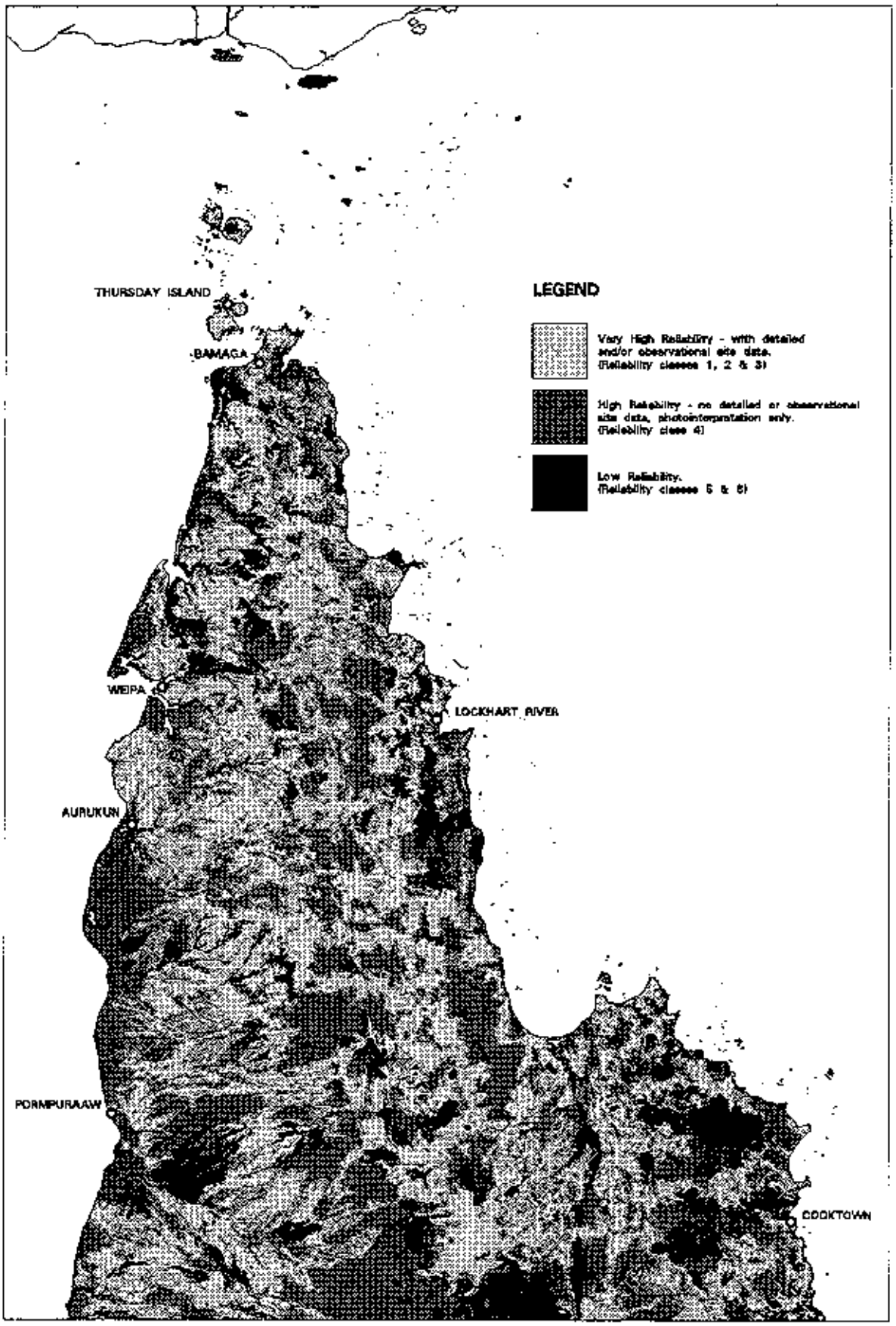

Figure 4. Spatial extent of high and low reliability mapping

As stated earlier, the scale of the vegetation mapping is 1:250 000, and the smallest unit that can be represented is approximately 2 mm x 2 mm or the equivalent of 25 ha. In order to give a balanced representation of the vegetation, certain plant communities e.g. narrow riverine communities, isolated rainforest patches, and small swamps, may have been exaggerated in their areal extent, so as to be shown on the map. In many situations, two or more mapping units were so intermingled that delineation was not practical, and these were mapped as complexes. The percentages of each vegetation type in the complex are tabulated in the UMA file. Some plant associations recognised were never of a mappable size at this scale.

2.6 Data analysis

A legend of photopattern types was constructed during initial photointerpretation. As field work progressed, a provisional map legend was constructed on the basis of the detailed site data collected and the photopattern types. At the completion of the field data collection, the detailed site data was objectively classified using the numerical classification program PATN (Belbin, 1988).

Because of the high seasonal variability in the ground layer and the dominance of woody species (in terms of biomass) in the majority of vegetation associations of Cape York Peninsula, pattern analysis was only performed on the non-herbaceous plant species. Classifications derived solely from canopy species have been found to be as informative as those based on full floristic composition for normal mapping scales (Webb, Tracey, Williams and Lance 1967; Neldner and Howitt 1991; Bedward, Keith and Pressey 1992). Analyses were performed on presence/absence data, and quantitative data including basal area, tree density and shrub density. The Bray Curtis (or its binary equivalent the Czekanowski) was used as the association measure, and association matrices generated for each data set. Each matrix was subjected to a hierarchical agglomerative polythetic clustering using FUSE, based on the Flexible Unweighted Pair Group Method Using Averages (UPGMA) with the β value set at -0.1. Research has shown this to be a robust general agglomerative hierarchical clustering strategy (Belbin, Faith and Milligan 1992).

To obtain species classifications, each data set was transposed, and the above classification repeated using the Two-Step option (Austin and Belbin 1982). Dendrograms of the resulting hierarchies were plotted. The PATN modules, GDEF (describes the groups established by the classification), GSTA (provides statistics for each group) and TWAY aided interpretation of the classifications, the latter imposing the site and species classifications of each data matrix to produce a two-way table.

Similar analyses were performed on various subsets of the detailed site database, e.g. all *Eucalyptus tetrodonta* dominated sites to assist in finalising the map legend.

On the completion of data analysis, the final legend of 201 map units was constructed, then sorted firstly on structural formation and secondly on dominant species. The dominant species were determined by comparing the basal area estimates, stem densities, cover estimates and frequencies of each species in the predominant layer. The vegetation coverage was then edited to conform to the final legend.

2.7 Limitations of the survey

1. The vegetation mapping represents the distribution of relatively undisturbed natural vegetation at the time of the aerial photography (1960 - 1974).

2. The field sampling effort was commensurate with the mapping scale of 1:250 000. Care should be taken in extrapolating the data presented beyond this scale.

3. Vegetation associations tend to merge into one another, so that a line on the vegetation map often represents an ecotone rather than a discrete boundary. Discrete boundaries do occur in some situations, e.g. closed-forest/woodland boundaries.

4. Vehicle based field work was restricted by access mainly to the dry season months (May-October), hence some ephemeral herbaceous plant species may not have been recorded at the time of sampling. Helicopters were used to allow access to remote areas in the wet season to partially compensate for this problem.

3.0 VEGETATION OF CAPE YORK PENINSULA

3.1 Structural formations

Twenty-one structural formations have been recognised as occurring in the vegetation of Cape York Peninsula. Woodlands, which by definition are dominated by trees (10 - 30 m tall) with a projective foliage cover of 10 - 30%, cover 51% of the study area. The majority of these woodlands are dominated by *Eucalyptus* spp. with only 5.7% dominated by other genera (*Acacia* spp., *Casuarina equisetifolia*, *Melaleuca* spp. and *Thryptomene oligandra*). Woodlands are the dominant structural formation on the coarse textured soils (Kandosols and Tenosols), which occupy the majority of the study area.

Eucalyptus spp. also dominate the majority of the open-woodlands (PFC < 10%) with only minor areas of this formation dominated by *Terminalia* spp. (0.7%) or *Corypha utan* (0.5%). Open-woodlands cover 6.9% of the study area, and are predominantly confined to the heavier textured soils, where the boxes *Eucalyptus chlorophylla, E. leptophleba, E. microtheca* and *E. acroleuca* are the major species.

The closed-forests (> 70% PFC with trees > 10 m tall) are predominantly confined to the wetter areas of Cape York Peninsula, particularly on the east coast ranges which as well as receiving a higher annual rainfall, are more likely to have some orographic precipitation in the dry season months. Closed-forests also occur in drier areas but in topographic positions, such as in valleys, streamlines or depressions that receive additional moisture through runon and flooding. Low closed forests occur in situations where factors such as shallowness of soil, soil infertility, moisture stress or exposure to winds limit the height of the canopy trees to less than 10 m. In moisture stressed situations, many of the trees and shrubs are deciduous in the dry season. Apart from the rainforests, the closed-forests (4.2% of the area) also include the *Rhizophora* spp. ± *Bruguiera* spp. mangrove closed-forests which occupy 0.6% of the study area. The mangrove low closed-forests dominated by *Ceriops tagal, Avicennia marina* or *Pemphis acidula* occupy 0.5% of the study area, while the low closed-forest dominated by rainforest species cover 0.8%.

The closed-tussock grasslands (2.8%) and tussock-grasslands (2.6%) are mainly confined to the areas of heavy textured soils, particularly Grey Vertosols which tend not to favour the growth of trees and shrubs. These formations, together with the closed-sedgelands (0.2%) and open-sedgelands (0.5%), occur in areas that regularly experience flooding for extended periods. Sites experiencing very frequent fires also have a poor development of woody species.

Closed-herblands (< 0.1%) are restricted to frontal dunes, sand cays and islands. The sparse-herblands (1.2%) occur on a variety of substrates that are hostile to plant colonisation, e.g. saltpans, rock pavements, sandblows, and regularly flooded islands and river beds.

The lakes and lagoons (0.4%) are very restricted in the study areas, with the permanent wetlands only covering < 0.1% of the study area.

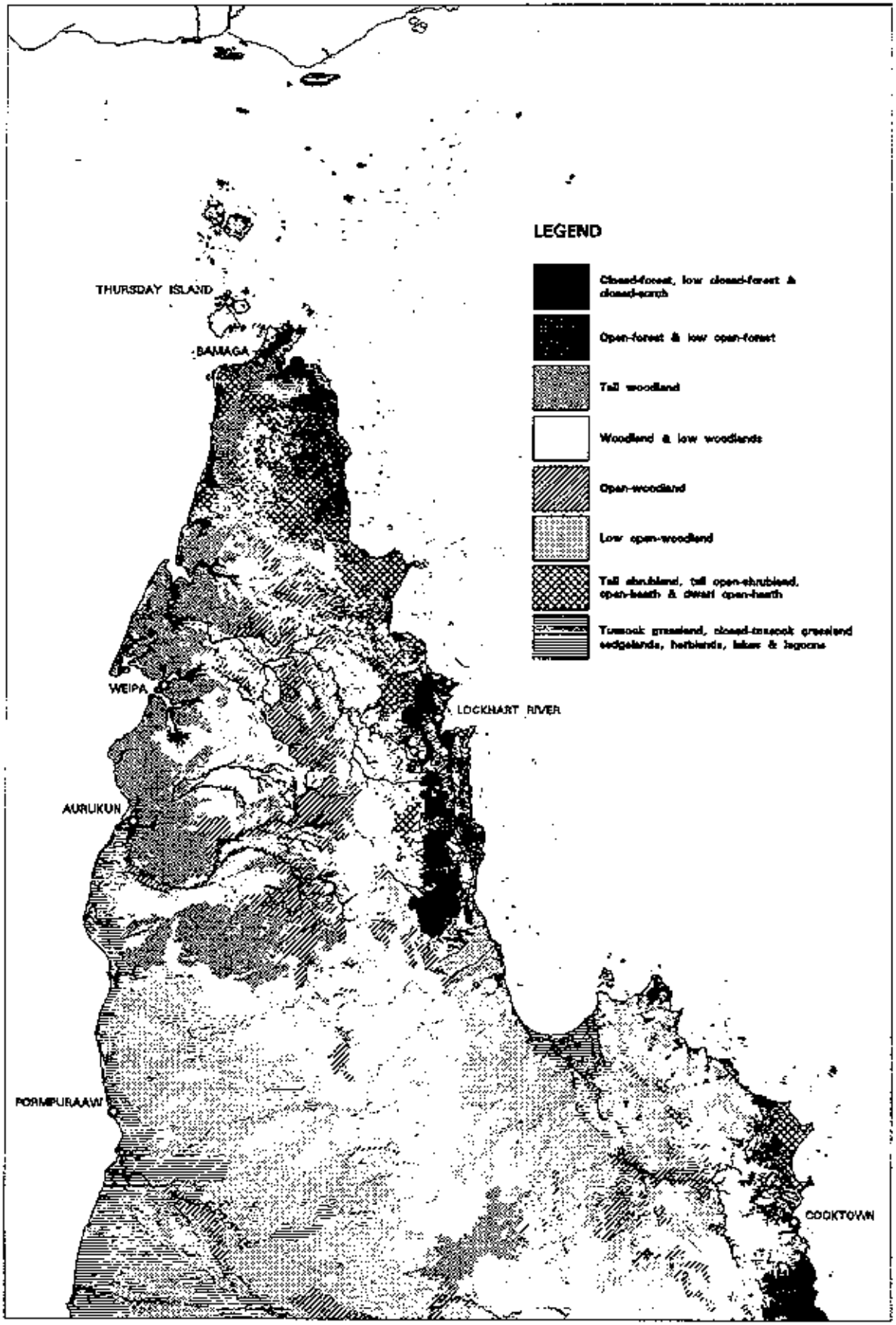

Figure 5. Distribution of dominant structural formations

Table 6 lists the percentage and area of the study area occupied by each structural formation in decreasing size, and the spatial extent of seven amalgamated structural classes is shown in Figure 5.

Table 6. Percentage and area of each structural formation

Structural Formation	Number of map units	Area	% of total area
Woodland	57	67 609	50.6
Low open-woodland	11	17 776	13.3
Tall woodland	2	9715	7.3
Open woodland	9	9146	6.9
Closed-forest	32	5581	4.2
Open-heath	9	3987	3.0
Open-forest	19	3983	3.0
Closed-tussock grassland	8	3711	2.8
Tussock grassland	2	3447	2.6
Sparse-herbland	5	1672	1.3
Low closed-forest	14	1670	1.3
Low woodland	8	1388	1.0
Low open-forest	7	1232	0.9
Open-sedgeland	1	685	0.5
Tall shrubland	3	552	0.4
Lakes and lagoons	3	462	0.4
Dwarf open-heath	3	352	0.3
Closed-sedgeland	1	212	0.2
Tall open-shrubland	2	193	0.1
Closed-scrub	3	123	0.1
Closed herbland	2	33	< 0.1

3.2 Broad vegetation groups

Two hundred and one map units are recognised for the natural vegetation of the study area. An additional six units are defined for disturbed vegetation. These map units will be fully described in Neldner and Clarkson (in prep.). Six descriptions are given in Appendix 1 as examples and brief descriptions are included in sections 3.3 to 3.32. The process of devising these map units is described in sections 2.5 and 2.6.

While the segregation to map units level is essential for 1:250 000 scale mapping and for studies at the district or property level, there is a need for produce broader groups for national and regional analyses. For this reason, each map unit was assigned to one of thirty broad vegetation groups (BVG's). These groups encompass vegetation types that are frequently dominated by a single species, e.g. *Melaleuca viridiflora* (BVG 18) or suite of species, e.g. the box eucalypts, *Eucalyptus chlorophylla, E. microtheca* or *E. acroleuca* (BVG 7). Other groups are dominated by a structural formation, e.g. open-heaths and

dwarf open-heaths (BVG 24) or a combination of a structural formation and locality, e.g. closed-forests of the Wet Tropics region. Specialised habitats such as the coral islands (BVG 28) and intertidal areas (BVG 26) form other groups. The flora of Cape York Peninsula will be analysed in relation to these 30 groups in Clarkson and Neldner (in prep.). Examples of this analysis are given in Appendix 2.

Summary information for each broad vegetation group is given in the next section. The predominant landforms are derived by intersecting the vegetation coverage with the CYPLUS regolith coverage (AGSO 1994a) on the GIS using ARC INFO. Similarly, the vegetation coverage has been intersected with the CYPLUS geology coverage (AGSO 1994b) and CYPLUS soils coverage (Biggs and Philip 1994) to provide statistics on the predominant geology and soils for each broad vegetation group. The soil classification followed is Isbell (1993). The vegetation map units making up each broad vegetation group and the proportion of the area that they cover is calculated on the GIS. Figures for areas incorporate both polygons where a map unit is dominant and all other polygons where the unit occurs, using the proportions assigned in the vegetation coverage to calculate the area.

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3.3 BVG 1. Closed-forests of the Wet Tropics region

Predominant landforms:

Mountains (55%), hills (17%), low rises (13%)

Predominant geology:

Hodgkinson Formation (D-Ch)	(57%)	Metamorphics (greywacke, slate)
Finlayson Granite (Pgf)	(17%)	Acid plutonics (porphyritic adamellite)
Kintore Adamellite (SDk)	(5%)	Acid plutonics (muscovite, adamellite)

Predominant soil map units:

Rule (Rl)	(74%)	Red Dermosols
Jeannie (Jn)	(11%)	Yellow Dermosols or Brown Kandosols

Vegetation map units:

Closed-forests

3	(22.9%)	Complex mesophyll vine forest (Lowlands, metamorphics)
4	(0.8%)	Complex mesophyll vine forest on basalt (Shiptons Flat)
5	(33.1%)	Complex notophyll vine forest ± *Agathis robusta* (Midslopes)
6	(9.1%)	Semi-deciduous mesophyll vine forest (Wet Tropics)
7	(8.0%)	Semi-deciduous mesophyll vine forest (Metamorphic slopes)
13	(6.2%)	Semi-deciduous notophyll/microphyll vine forest (Mt Webb)
17	(6.8%)	Evergreen mesophyll/notophyll vine forest (Sandstone gullies, Cooktown area)
23	(12.8%)	Simple evergreen notophyll vine forest (Upper slopes)
28	(0.1%)	Simple evergreen notophyll vine forest (High peaks)
30	(0.1%)	Simple microphyll vine fern thicket (Mt Finnigan summit)

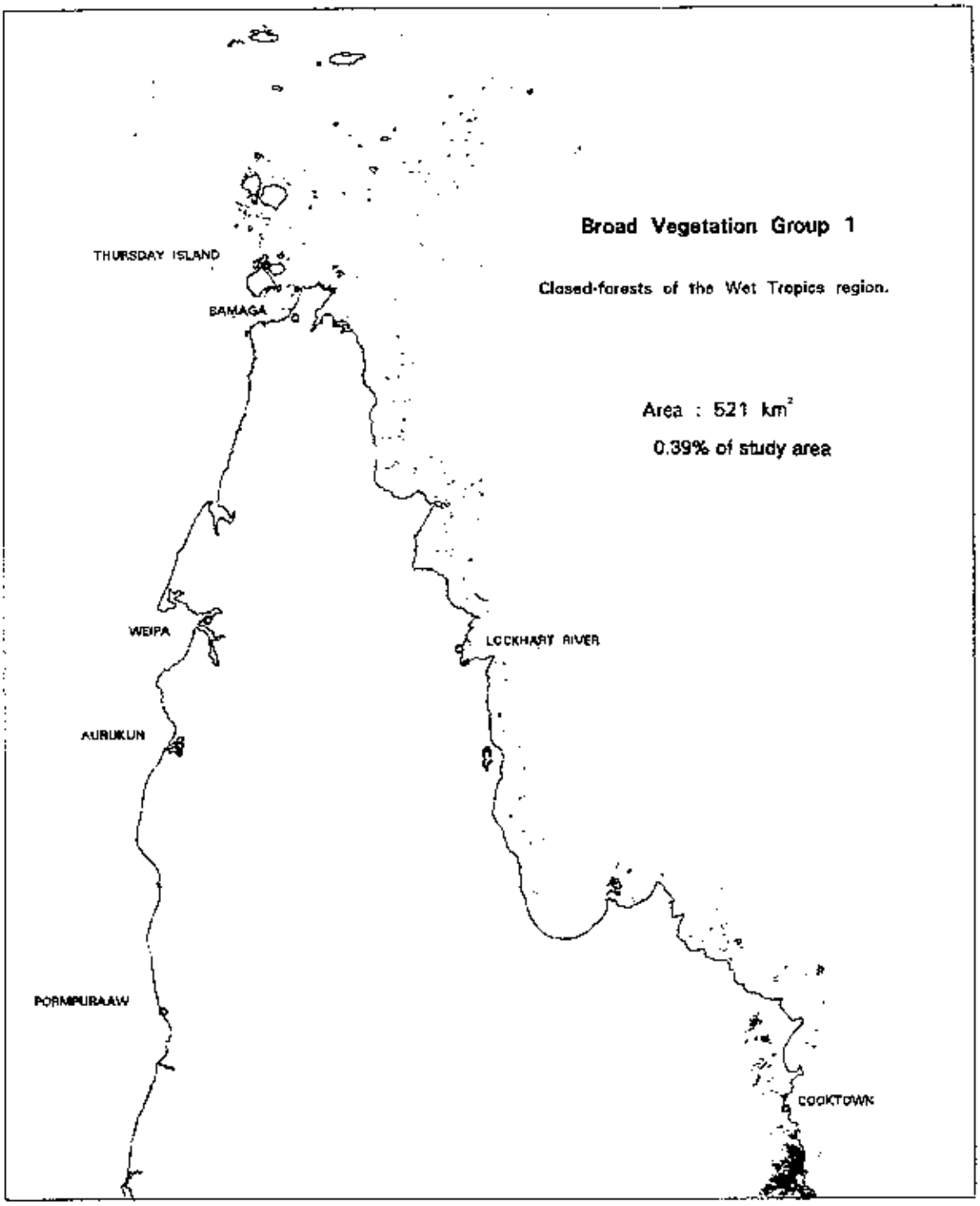


Figure 6. Spatial distribution of broad vegetation group 1.

3.4 BVG 2. Closed-forests of the McIlwraith-Iron Range region

Predominant landforms:

Low rises (45%), hills (13%), mountains (11%), escarpment (11%)

Predominant geology:

Kintore Adamellite (SDk)	(37%)	Acid plutonics (muscovite, adamellite)
Lankelly Adamellite (SDl)	(15%)	Acid plutonics (granite, adamellite)
Weymouth Granite (Plw)	(11%)	Acid plutonics (granite)
Sefton Metamorphics (Ps)	(9%)	Metamorphics (muscovite, schist, quartzite, phyllite)

Predominant soil map units:

Drop (Dr)	(54%)	Yellow Kandosols or Yellow Dermosols
Henderson (Hs)	(12%)	Red Chromosols

Vegetation map units:

Closed-forests

9	(1.8%)	Semi-deciduous mesophyll/notophyll vine forest (Granite slopes, Birthday Mountain)
15	(4.4%)	Araucarian notophyll vine forest with emergent *Araucaria cunninghamii* (Altanmoui, McIlwraith & Melville Ranges)
21	(43.1%)	Notophyll vine forest (Iron and McIlwraith Ranges)
26	(48.8%)	Simple evergreen notophyll vine forest with *Acacia aulacocarpa* ± *Eucalyptus tessellaris* ± *Blepharocarya involucrigera* emergents (Iron Range & Wet Tropics)
27	(1.5%)	Simple evergreen notophyll vine forest with *Eucalyptus pellita* emergents (Battlecamp Range)
29	(0.5%)	Simple evergreen notophyll vine forest ± *Wodyetia bifurcata* (Melville Range)

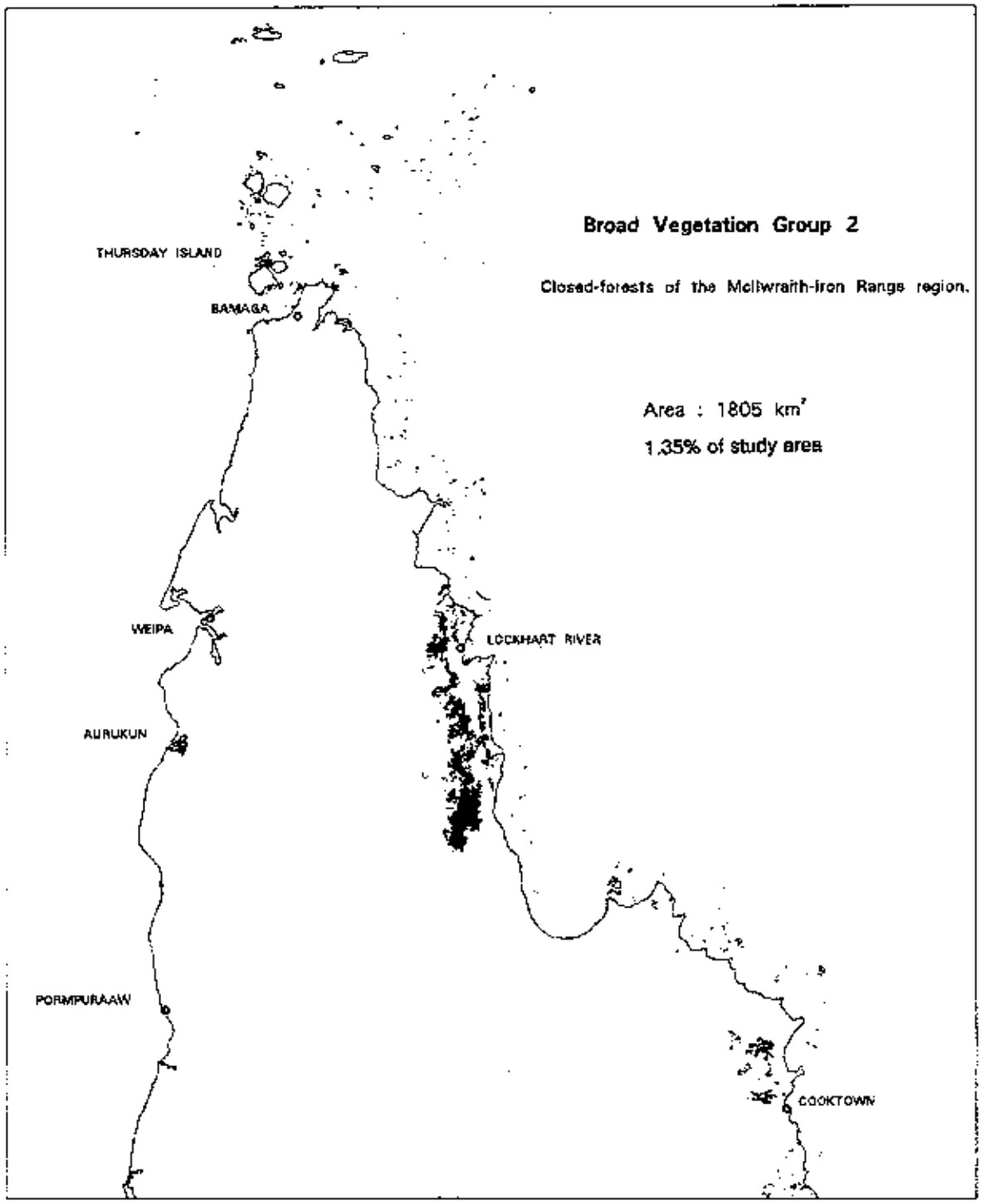


Figure 7. Spatial distribution of broad vegetation group 2.

3.5 BVG 3. Closed-forests of northern Cape York Peninsula and the Torres Strait Islands

Predominant landforms:

Low hills (85%), erosional plains (6%)

Predominant geology:

Helby Beds (JKb)	(38%)	Sedimentary (clayey quartzose sandstone)
Tertiary remnants (T&Qf)	(27%)	Weathered (ferruginous laterite, ferricrete)
Pliocene colluvium (TQs)	(8%)	Colluvial (quartzose sand)

Predominant soil map units:

Harmer (Hm)	(32%)	Yellow Kandosols
Kool (Kl)	(17%)	Red Kandosols
Emma (Em)	(12%)	Red Kandosols

Vegetation map units:

Closed-forests

11	(12.9%)	Semi-deciduous notophyll vine forest (Lockerbie)
12	(20.3%)	Semi-deciduous notophyll vine forest (Small patches on plateaus)
22	(5.4%)	Notophyll vine forest of *Welchiodendron longivalve*, *Syzygium branderhorstii*, *Ficus* spp. and palms (Torres Strait Islands)
24	(42.6%)	Simple evergreen notophyll vine forest (North-east CYP) (Sometimes emergent *Callitris intratropica*)
25	(5.1%)	Simple evergreen notophyll vine forest dominated by *Callitris intratropica* emergents

Low closed-forests

124	(13.7%)	Evergreen notophyll vine forest dominated by *Welchiodendron longivalve* ± *Acacia polystachya* ± *Canarium australianum* (Northern islands & headlands)

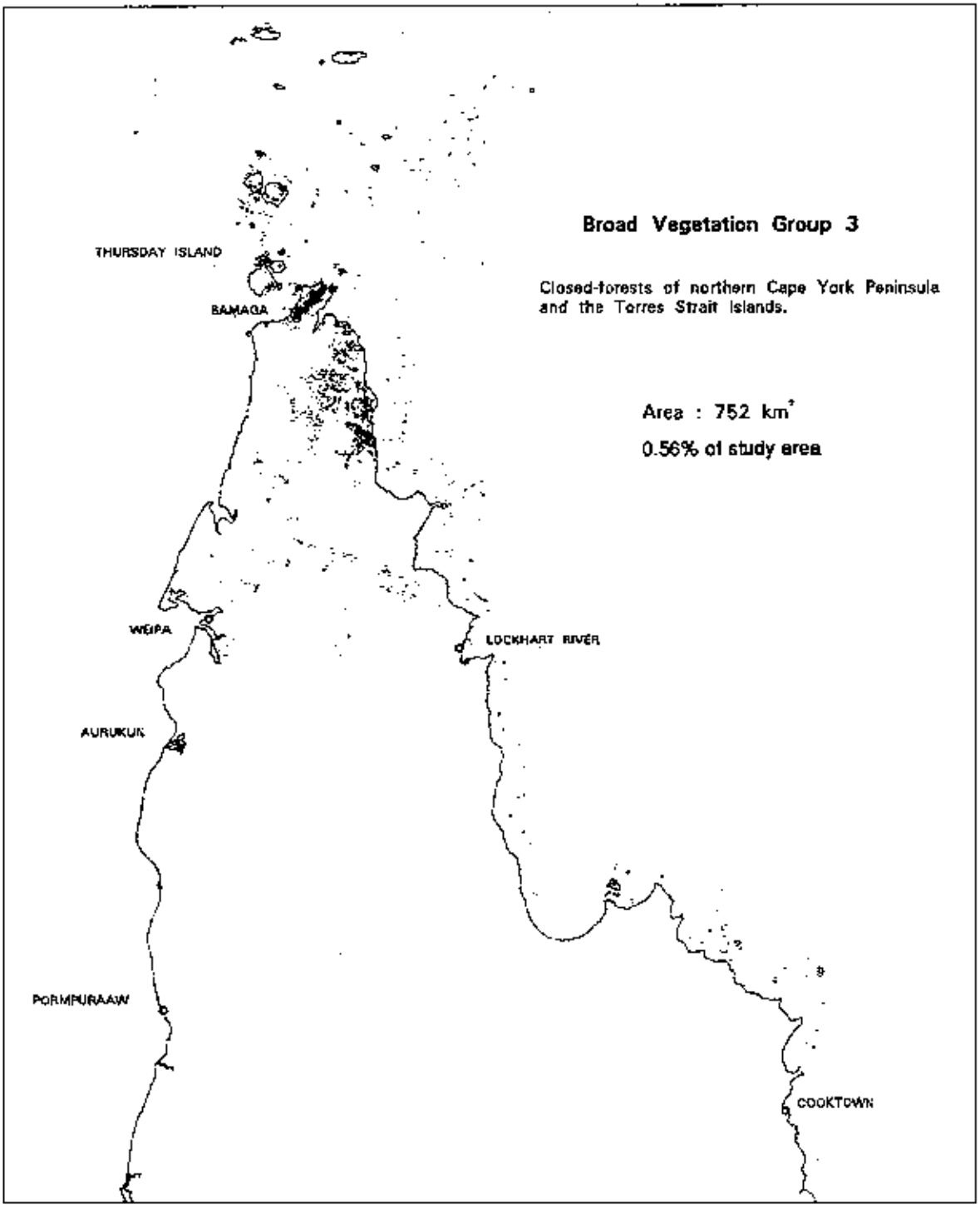


Figure 8. Spatial distribution of broad vegetation group 3.

3.6 BVG 4. Closed-forests of coastal dunes, dunefields and the Jardine River frontage

Predominant landforms:

Coastal dunes (27%), beach ridges (22%), low hills (13%), chenier plains (12%)

Predominant geology:

Holocene deposits (Qd)	(32%)	Dune deposits (white quartzose sands)
Holocene deposits (Qhm)	(27%)	Beach ridges (coloured quartzose sands)

Predominant soil map units:

Daunt (Dn)	(29%)	Aeric Podosols
Doughboy (Db)	(22%)	Semiaquic Podosols
Caravan (Cv)	(21%)	Bleached-Orthic Tenosols

Vegetation map units:

Closed-forests

20 (15.3%) Evergreen to semi-deciduous notophyll vine forest dominated by *Syzygium* spp., *Terminalia* spp. & *Xanthostemon* spp. (Beach Rainforest, east coast)

31 (29.9%) Semi-deciduous vine thicket with canopy of *Neofabricia myrtifolia, Syzygium suborbiculare* ± *Terminalia muelleri* ± *Thryptomene oligandra* (Dune Scrub, west coast)

Low closed-forests

121 (28.2%) Araucarian microphyll vine forest dominated by *Asteromyrtus angustifolia* ± *Acacia crassicarpa* ± *Syzygium* spp. ± *Araucaria cunninghamii* emergents (Coastal dunes)

123 (7.7%) Evergreen notophyll vine forest dominated by *Terminalia muelleri, Cupaniopsis anacardioides, Syzygium suborbiculare* (Coastal dunes)

Closed-scrubs

161 (18.9%) *Leucopogon yorkensis* ± *Asteromyrtus angustifolia* ± *Acacia* spp. (Sandplains)

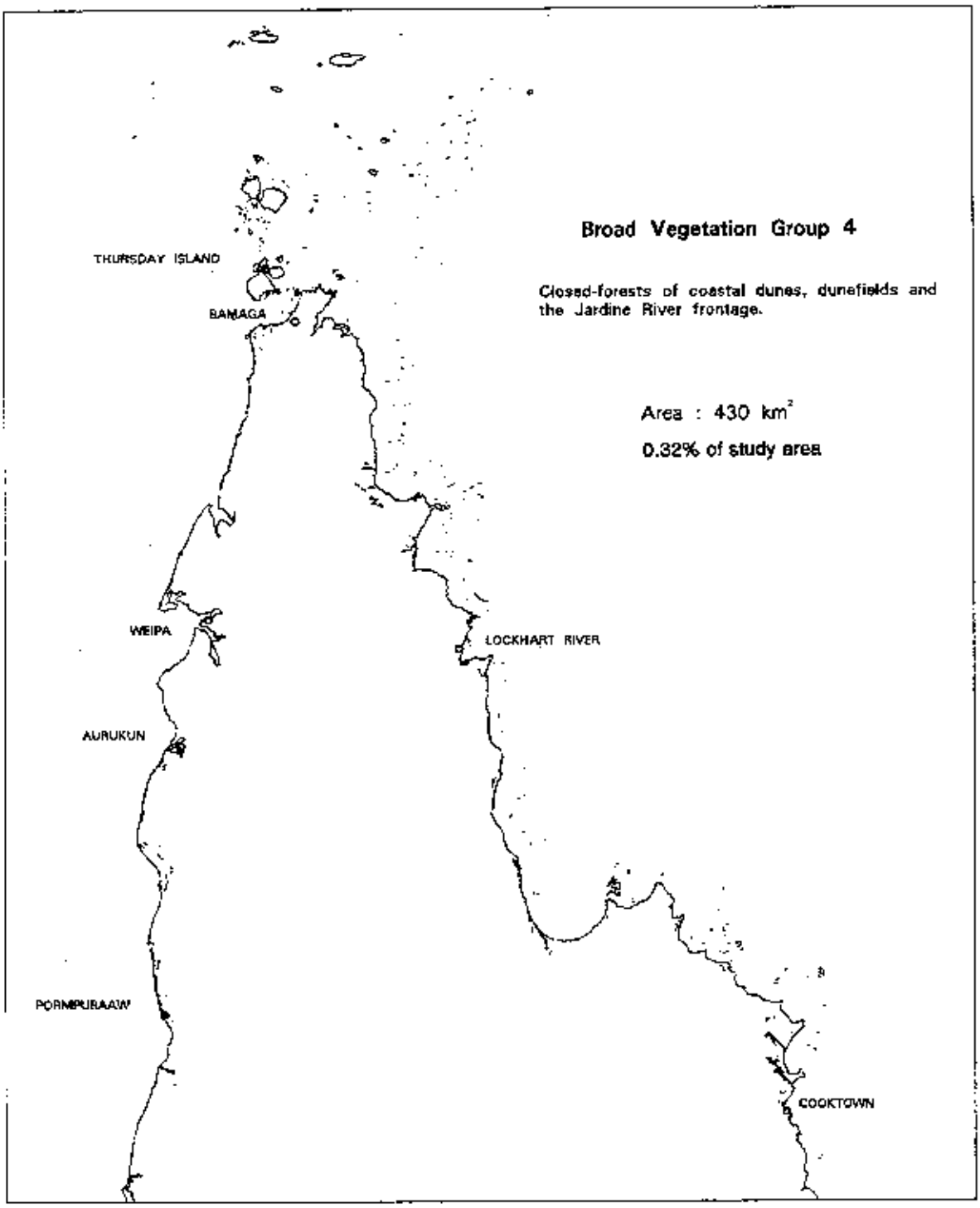


Figure 9. Spatial distribution of broad vegetation group 4.

3.7 BVG 5. Deciduous low closed-forests on slopes and alluvia

Predominant landforms:

Erosional plains (29%), mountains(18%), low hills (15%), floodplains (14%), hills(12%)

Predominant geology:

Rolling Downs Group (Klr)	(21%)	Sedimentary (mudstones, slates & siltstones)
Holocene alluvia (Qa)	(21%)	Alluvia (silts & quartzose sands)
Twin Humps Adamellite (Put)	(10%)	Acid plutonics (hornblende adamellite)
Weymouth Granite (Plw)	(6%)	Acid plutonics (biotite granite)

Predominant soil map units:

Altanmoui (Am)	(22%)	Orthic Tenosols
Batavia (Bv)	(18%)	Yellow Dermosols
Drop (Dr)	(10%)	Yellow Kandosols/Yellow Dermosols
Picanniny (Pn)	(10%)	Brown or Grey Vertosols

Vegetation map units:

Closed-forests

32	(10.4%)	Deciduous notophyll/microphyll vine thicket ± *Gyrocarpus americanus* ± *Bombax ceiba* var. *leiocarpum* emergents with semi-deciduous notophyll vine forest on associated colluvium)(Laura Basin)
33	(0.7%)	Deciduous vine forest (Lakeland area on basalt hills, eg. Mt Earl, Mt Scatterbrain)

Low closed-forests

125	(38.7%)	Deciduous microphyll vine thicket ± emergent *Lagerstroemia archeriana* (Riverine areas on heavy clays, central Cape York Peninsula)
126	(44.5%)	Deciduous vine thicket dominated by *Cochlospermum gillivraei* ± *Canarium australianum* ± *Acacia aulacocarpa* (Granite slopes)
127	(4.4%)	Deciduous vine thicket with *Wodyetia bifurcata* (Granite slopes, Cape Melville)
130	(1.3%)	*Terminalia* spp. ± low trees ± frequent scandent shrubs ± *Melaleuca citrolens* ± *Eucalyptus acroleuca* emergents (Depressions, Lakefield)

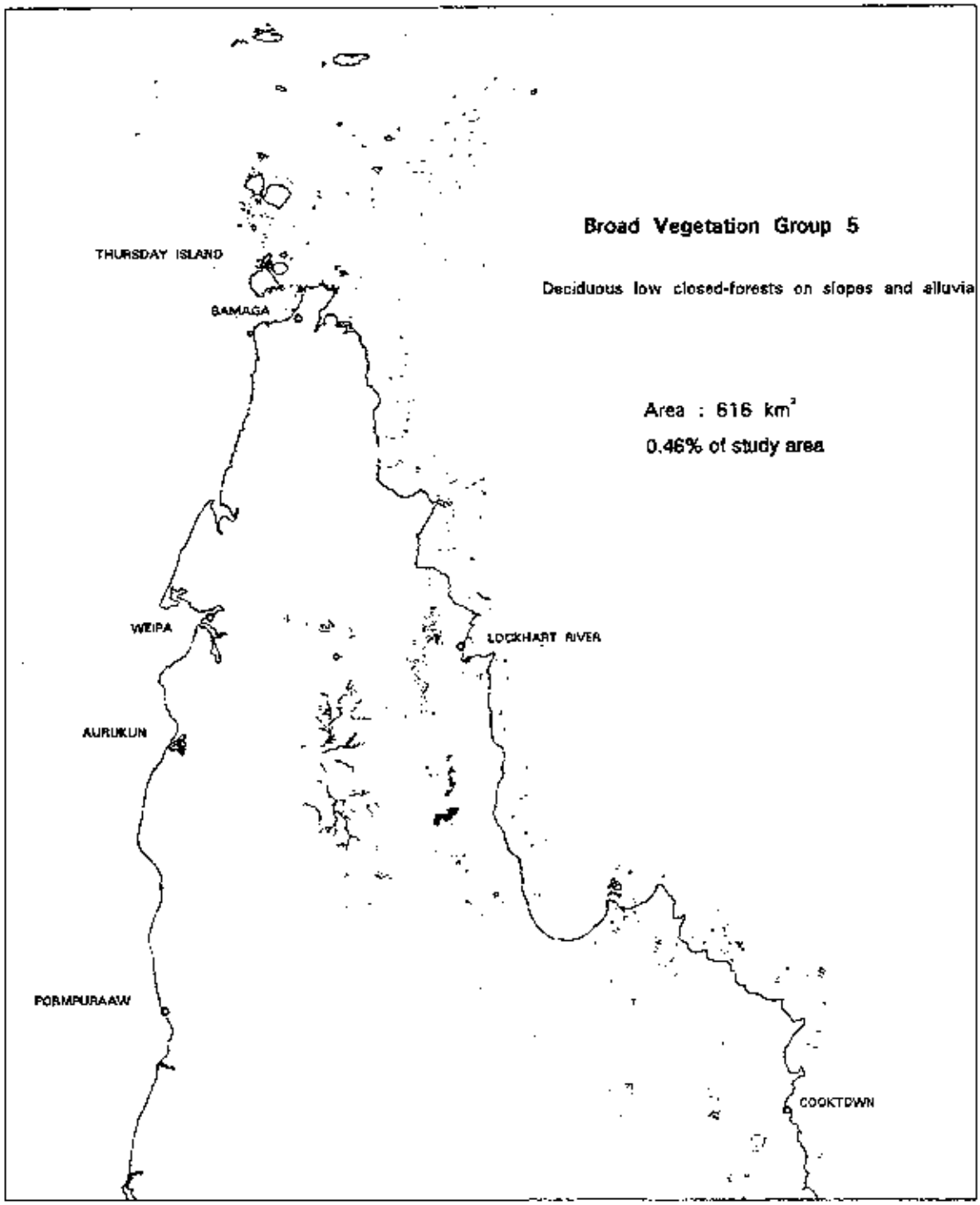


Figure 10. Spatial distribution of broad vegetation group 5.

3.8 BVG 6. Gallery closed-forests and *Melaleuca* spp. dominated open-forests on alluvia

Predominant landforms:

Stream banks, channel benches, terraces and levees on flood plains (36%), alluvial plains (16%), erosional plains (12%), rises (12%) and low hills (9%)

Predominant geology:

Holocene alluvia (Qa)	(29%)	Alluvia (silts & quartzose sands)
Pliocene colluvium (TQs)	(26%)	Colluvial (quartzose sand)

Predominant soil map units:

Leptic Tenosols - small occurrences in most map units

Vegetation map units:

Closed-forests

8	(14.9%)	Semi-deciduous mesophyll vine forest (Claudie & Normanby Rivers)
10	(3.1%)	Semi-deciduous mesophyll/notophyll vine forest (Alluvia, Cooktown)
14	(0.1%)	Semi-deciduous notophyll/microphyll vine thicket
16	(2.1%)	Evergreen mesophyll vine forest with *Archontophoenix alexandrae* (Streams)
18	(23.5%)	Evergreen notophyll vine forest (Major streams)
19	(0.8%)	Evergreen notophyll vine forest dominated by *Melaleuca leucadendra, Xanthostemon crenulatus* and *Lophostemon suaveolens* (swamps)

Open-forests

48	(53.2%)	*Melaleuca argentea* ± *M. leucadendra* ± *Acacia auriculiformis* ± *Syzygium forte* ± *Leptospermum madidum* subsp. *madidum* (Major streams) (*Melaleuca saligna* in minor streams)
50	(2.3%)	*Melaleuca leucadendra* ± *Eucalyptus tereticornis* ± *Nauclea orientalis* ± *Acacia oraria* ± *Lagerstroemia archeriana* ± *Melaleuca trichostachya* (Streams in metamorphics)

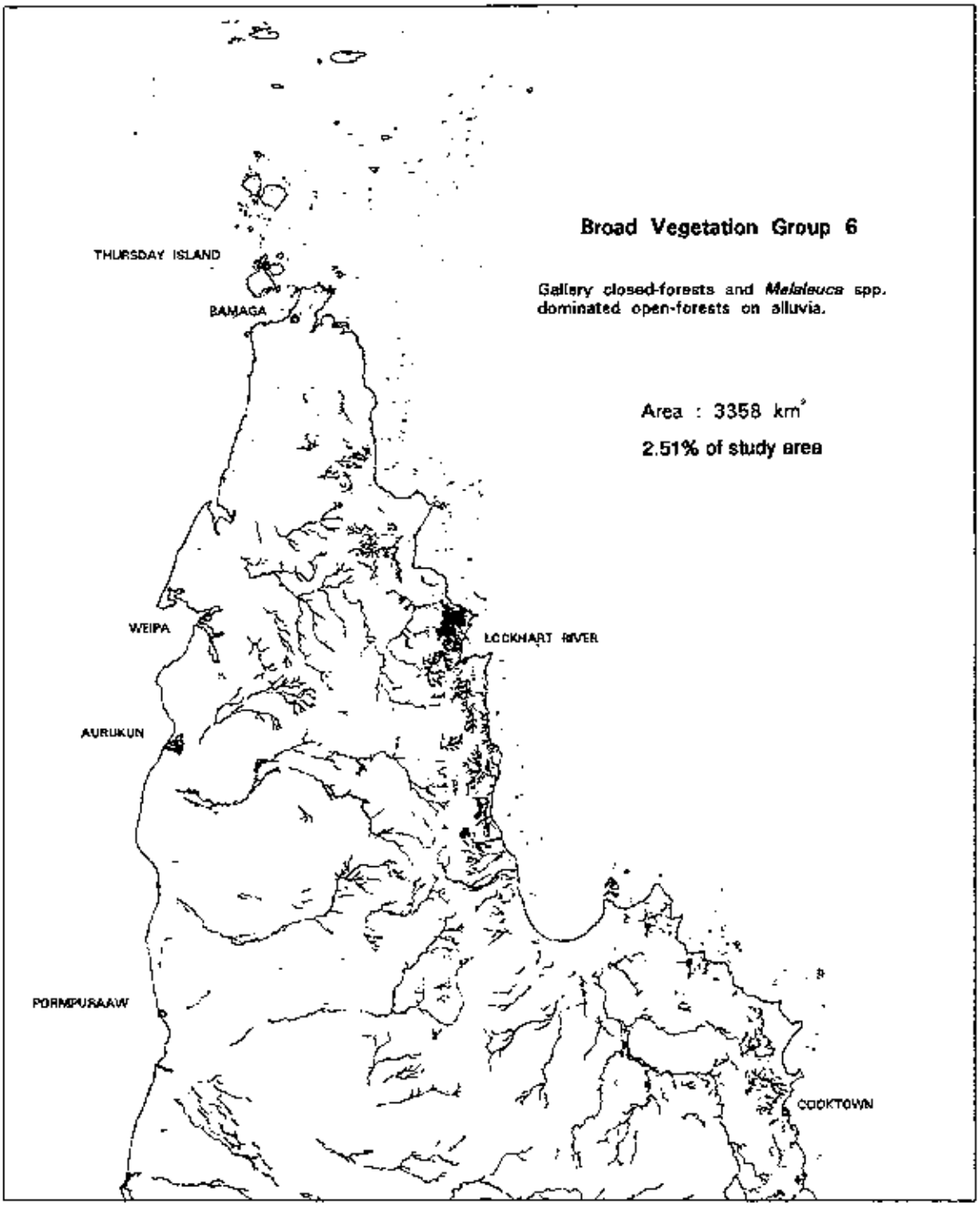


Figure 11. Spatial distribution of broad vegetation group 6.

3.9 BVG 7. Woodlands and open-woodlands dominated by *Eucalyptus chlorophylla, E. microtheca* or *E. acroleuca*

Predominant landforms:

Flood plains (49%), erosional plains (18%), rises (11%) & alluvial plains (6%)

Predominant geology:

Holocene alluvia (Qa)	(49%)	Alluvia (silts & quartzose sands)
Rolling Downs Group (Klr)	(15%)	Sedimentary (mudstones, slates & siltstones)
Pleistocene colluvia (Czx)	(8%)	Colluvia (mottley clayey sands)
Pliocene colluvium (TQs)	(6%)	Colluvia (quartzose sands)

Predominant soil map units:

Kennedy (Kd)	(23%)	Redoxic or Oxyaquic Hydrosols/ Grey or Aquic Vertosols
Antbed (Ab)	(17%)	Redoxic Hydrosols
Batavia (Bv)	(12%)	Yellow Dermosols
Myall (Ml)	(5%)	Yellow Dermosols

Vegetation map units:

Woodlands

58 (10.8%) *Eucalyptus chlorophylla* ± *E. clarksoniana* (Lakefield, SE CYP)

59 (0.5%) *Eucalyptus chlorophylla* with *Terminalia platyptera* and *Melaleuca stenostachya* subcanopy (Laura River)

Open-woodlands

112 (4.7%) *Eucalyptus acroleuca* (Lakefield, floodplains)

113 (50.5%) *Eucalyptus chlorophylla* (Southern plains)

117 (4.2%) *Eucalyptus microtheca* ± *E. papuana* (Archer River floodplains)

Low open-woodlands

150 (3.6%) *Eucalyptus chlorophylla* ± *Melaleuca viridiflora* (Hillslopes)

151 (9.3%) *Eucalyptus chlorophylla* (Flat plains, Mitchell River floodplain)

152 (16.4%) *Eucalyptus microtheca* ± *E. chlorophylla* ± *Acacia ditricha* ± *Lysiphyllum cunninghamii* (Mitchell River floodplain)

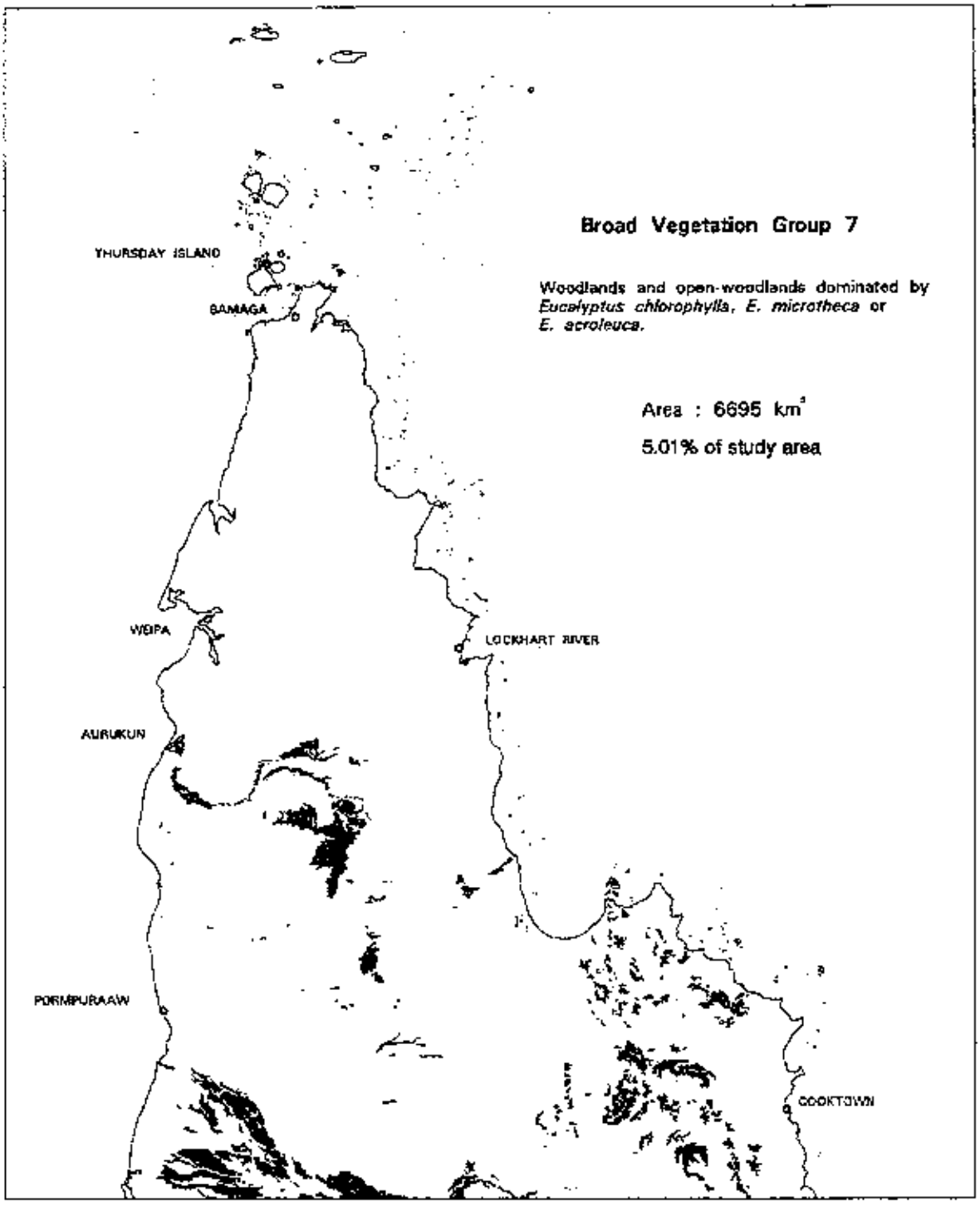


Figure 12. Spatial distribution of broad vegetation group 7.

3.10 BVG 8. Woodlands and open-woodlands dominated by *Eucalyptus clarksoniana, E. novoguinensis* or *E. polycarpa*

Predominant landforms:

Flood plains (44%), erosional plains (17%), alluvial plains (13%), & rises (10%)

Predominant geology:

Holocene alluvia (Qa)	(27%)	Alluvia (silts & quartzose sands)
Rolling Downs Group (Klr)	(21%)	Sedimentary (mudstones,slates & siltstones)
Holocene deposits (Qha)	(19%)	Alluvia (quartzose sands, silts & clays)
Pliocene colluvia (TQs)	(12%)	Colluvial (quartzose sands)

Predominant soil map units:

Batavia (Bv)	(17%)	Yellow Dermosols
Antbed (Ab)	(13%)	Redoxic Hydrosols
Mitchell (Mc)	(9%)	Brown or Red Kandosols
Bend (Bn)	(8%)	Brown or Grey Dermosols or Kandosols
Kennedy Kd)	(6%)	Redoxic or Oxyaquic Hydrosols/ Grey or Aquic Vertosols
Clark (Cr)	(6%)	Yellow Kandosols

Vegetation map units:

Woodlands

60	(2.9%)	*Eucalyptus clarksoniana, Erythrophleum chlorostachys, Eucalyptus brassiana* ± *E. tessellaris* ± *Canarium australianum, Melaleuca nervosa* (Running Creek)
61	(4.8%)	*Eucalyptus clarksoniana* ± *E. papuana* ± *Erythrophleum chlorostachys* ± *Melaleuca nervosa* (North-west Lakefield)
62	(5.7%)	*Eucalyptus clarksoniana* ± *E. papuana* ± *Melaleuca nervosa* ± *Piliostigma malabaricum* ± *Eucalyptus chlorophylla* ± *E. microtheca* (Archer River Floodplain)
63	(13.2%)	*Eucalyptus clarksoniana* ± *Melaleuca viridiflora* ± *Erythrophleum chlorostachys* ± *Eucalyptus leptophleba* (Plains)
64	(5.1%)	*Eucalyptus clarksoniana* ± *Syzygium eucalyptoides* ± *Melaleuca viridiflora* (Aurukun/Holroyd drainage)
65	(15.9%)	*Eucalyptus clarksoniana/E. novoguinensis* ± *Lophostemon suaveolens* ± *Parinari nonda* ± *Erythrophleum chlorostachys* ± *Melaleuca viridiflora* (River frontages)
67	(15.8%)	*Eucalyptus clarksoniana/E. polycarpa* ± *Erythrophleum chlorostachys* ± *Eucalyptus tetrodonta* ± *E. confertiflora* (Adjacent western streams)

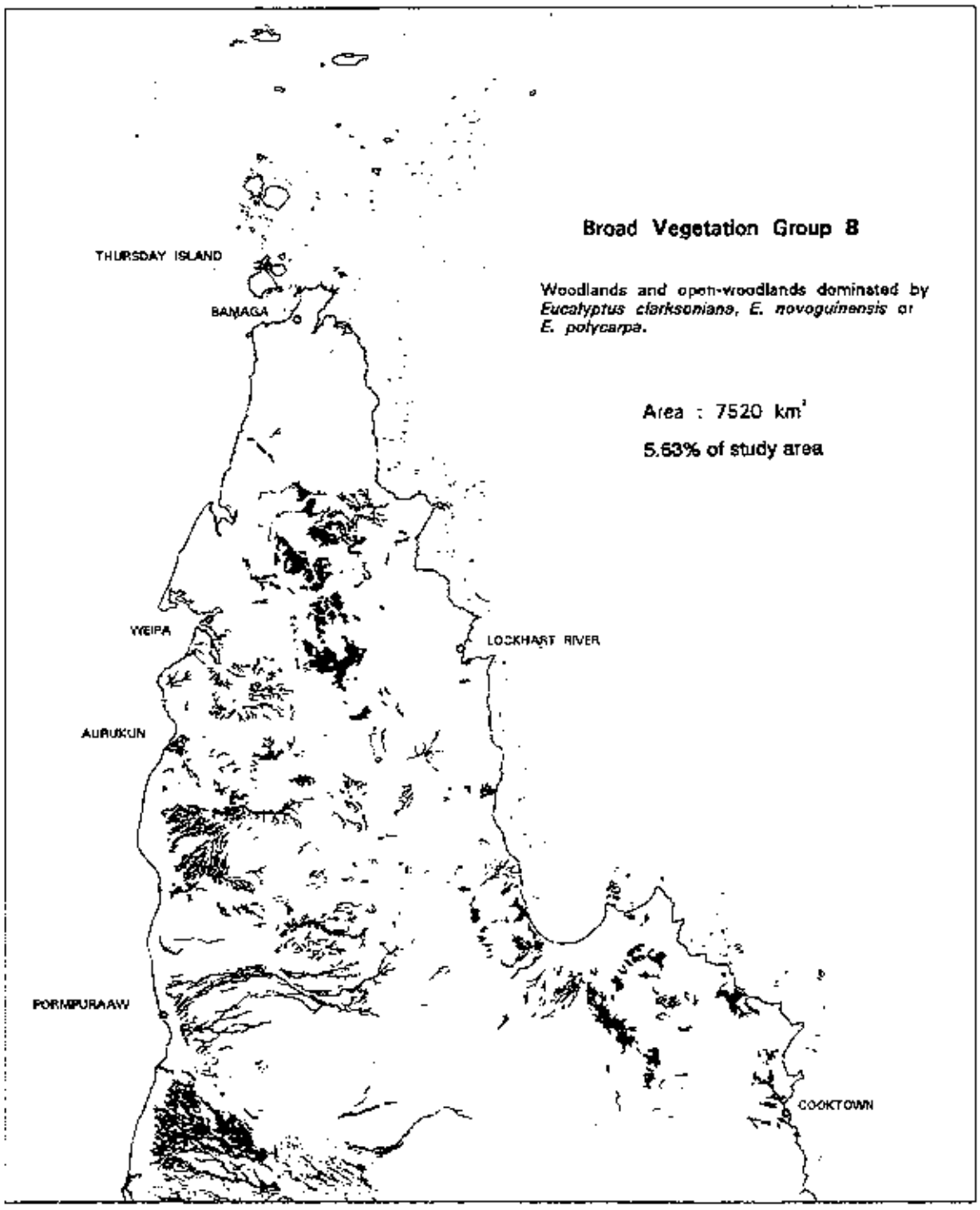


Figure 13. Spatial distribution of broad vegetation group 8.

Woodlands (cont.)

88 (17.3%) *Eucalyptus polycarpa* (or *E. clarksoniana*) ± *E. papuana* ± *E. curtipes* (*E. papuana* open-woodlands on edge) (Levees, Mitchell floodplain)

Open-woodlands

114 (19.3%) *Eucalyptus clarksoniana* ± *Melaleuca viridiflora* ± *E. platyphylla* (Plains & floodplains)

3.11 BVG 9. Woodlands and open-woodlands dominated by *Eucalyptus cullenii, E. crebra* or *E. persistens* subsp. *tardecidens*

Predominant landforms:

Rises (26%), hills (22%), mountains (18%), low hills (15%) & escarpments (9%)

Predominant geology:

Hodgkinson Formation (D-Ch)	(33%)	Metamorphics (greywacke,slate)
Kintore Adamellite (SDk)	(16%)	Acid plutonics (muscovite,adamellite)
Holroyd Metamorphics (Ph)	(6%)	Metamorphics (biotite muscovite)
Coen Metamorphics (Pc)	(5%)	Metamorphics (biotite muscovite)
Dargalong Metamorphics (Pd)	(5%)	Metamorphics (schist, gneiss)

Predominant soil map units:

Jeannie (Jn)	(27%)	Yellow Dermosols or Brown Kandosols
Drop (Dr)	(24%)	Yellow Kandosols or Yellow Dermosols
Eykin (Ek)	(6%)	Grey Sodosols
Hodge (Hg)	(5%)	Bleached-Leptic Tenosols or Brown Kandosols
Poll (Pl)	(5%)	Orthic Tenosols

Vegetation map units:

Woodlands

68	(5.2%)	*Eucalyptus crebra, E. ellipsoidea* or *E. hylandii* var. *hylandii* (Southern ranges)
69	(25.9%)	*Eucalyptus cullenii, E. clarksoniana* ± *E. chlorophylla* ± *E. confertiflora* (Granite slopes)
70	(47.9%)	*Eucalyptus cullenii* ± *E. clarksoniana* (Acid volcanic ranges)
71	(12.5%)	*Eucalyptus cullenii, E. hylandii* var. *hylandii* ± *Melaleuca stenostachya* (Ranges)
90	(3.8%)	*Eucalyptus staigeriana* (Metamorphic ranges, Maytown area)

Low open-forests

136	(1.0%)	*Eucalyptus hylandii* var. *hylandii* &/or *E. crebra* ± *E. brassiana* ± *Lophostemon suaveolens* (Southern headlands & Melville Range)
137	(0.2%)	*Lophostemon suaveolens, Eucalyptus crebra* (Altanmoui Range)

Low woodlands

142	(3.5%)	*Eucalyptus persistens* subsp. *tardecidens, Melaleuca stenostachya* (Southern metamorphic plateaus)

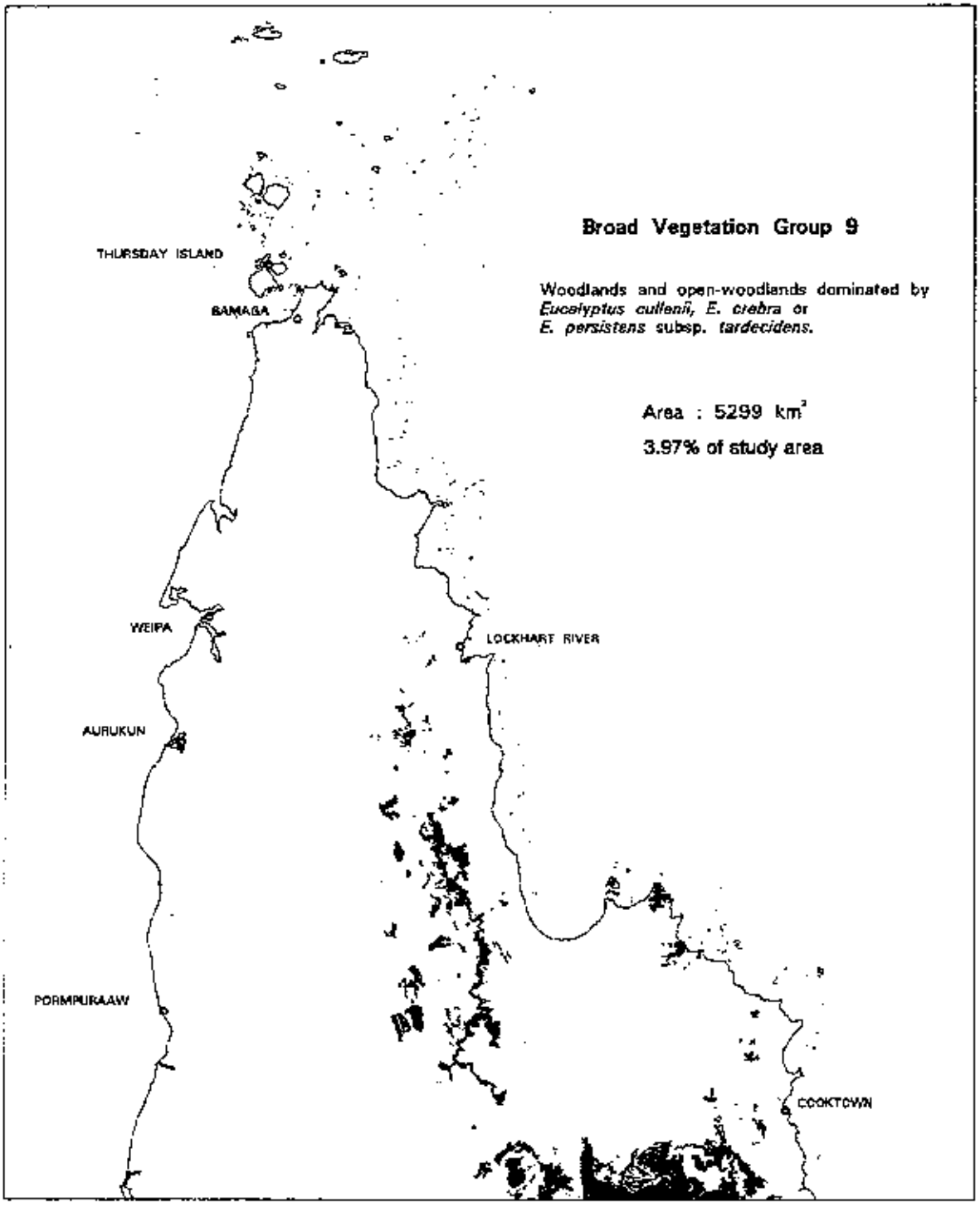


Figure 14. Spatial distribution of broad vegetation group 9.

3.12 BVG 10. Woodlands dominated by *Eucalyptus hylandii* or *E. tetrodonta* on sandstone, metamorphic and ironstone ranges

Predominant landforms:

Rises (26%), hills (21%), erosional plains (16%), low hills (8%) & mountains (8%)

Predominant geology:

Gilbert River Formation (JKg)	(27%)	Sedimentary (quartzose sandstones)
Pliocene colluvium (TQs)	(13%)	Colluvial (quartzose sand)
Holroyd Metamorphics (Ph)	(12%)	Metamorphics (biotite muscovite)

Predominant soil map units:

Camp(Cm)	(30%)	Bleached-Leptic Tenosols
Batavia (Bv)	(6%)	Yellow Dermosols
Dixie (Dx)	(5%)	Bleached-Orthic Tenosols
Haven (Hv)	(5%)	Yellow Kandosols
Clark (Cr)	(5%)	Yellow Kandosols

Vegetation map units:

Woodlands

75	(9.1%)	*Eucalyptus hylandii* var. *campestris, E. tetrodonta* (Ironstone knolls, Aurukun)
76	(32.9%)	*Eucalyptus hylandii* var. *hylandii* ± *E. tetrodonta* ± *E. cullenii* (Sandstone plateaus)
77	(39.9%)	*Eucalyptus hylandii* var. *campestris* ± *E. tetrodonta* ± *E. cullenii* ± *Melaleuca stenostachya* (Ironstone knolls and erosional surfaces)
85	(0.6%)	*Eucalyptus phoenicea* ± *E. nesophila* ± *E umbra* (Cape Bedford & wetter sandstones)
89	(0.1%)	*Eucalyptus similis* ± *E. nesophila* (Ebagoola)
96	(6.5%)	*Eucalyptus tetrodonta, E. hylandii* var. *hylandii* ± *Erythrophleum chlorostachys* (Sandstone plateaus)
100	(8.2%)	*Eucalyptus tetrodonta, E. hylandii* var. *hylandii* ± *E. nesophila* ± *E. cullenii* (or *E. crebra*) (Sandstone plateaus)
105	(2.7%)	*Eucalyptus tetrodonta* ± *E. nesophila* ± *Lophostemon suaveolens* ± *Melaleuca stenostachya* (Metamorphic and granite undulating hills)

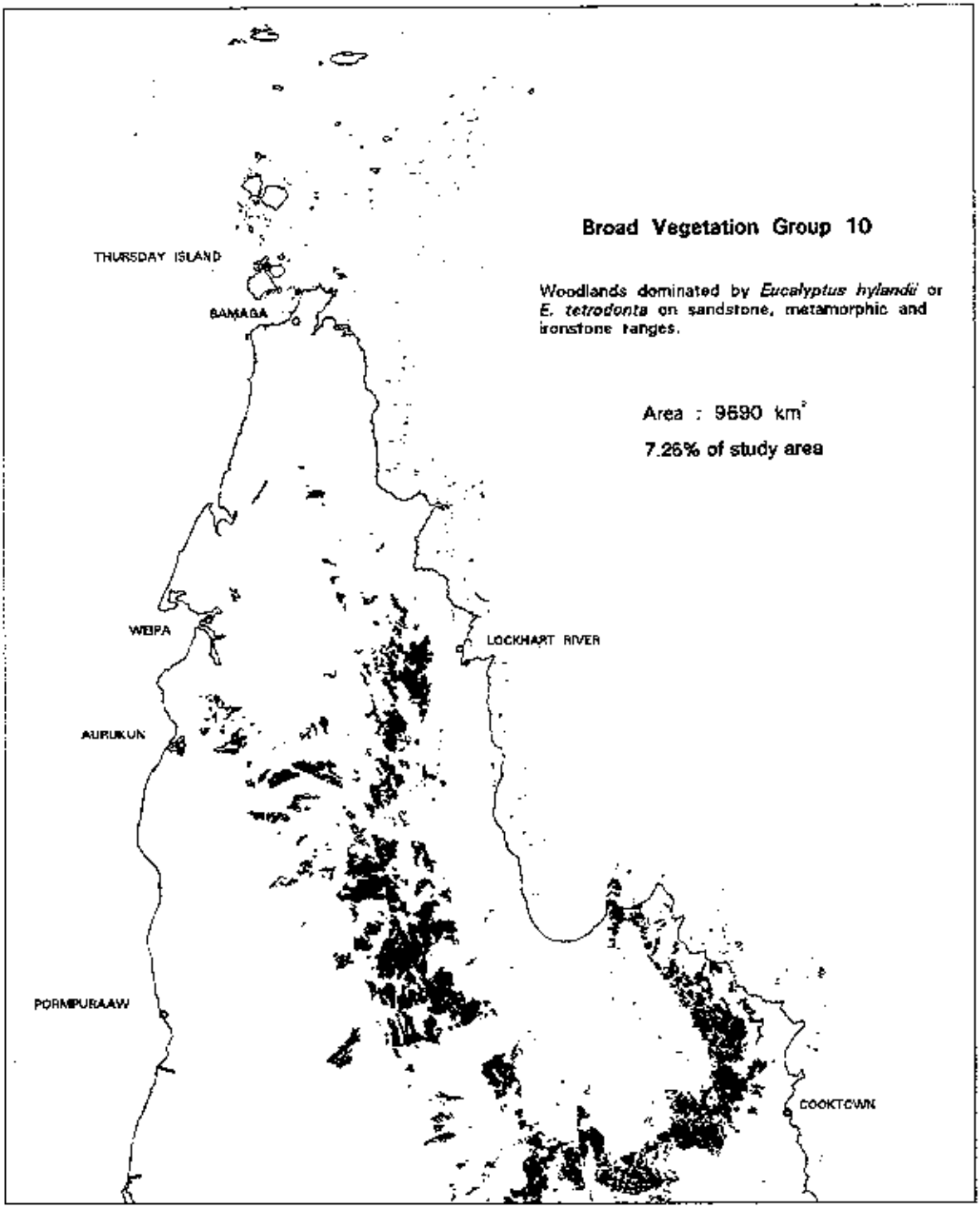


Figure 15. Spatial distribution of broad vegetation group 10.

3.13 BVG 11. Open-woodlands and woodlands dominated by *Eucalyptus leptophleba* on river frontages and northern undulating plains

Predominant landforms:

Erosional plains (50%), rises (22%), alluvial plains (7%) & flood plains (6%)

Predominant geology:

Rolling Downs Group (Klr) (63%) Sedimentary (mudstones, slates & siltstones)

Predominant soil map units:

Batavia (Bv)	(48%)	Yellow Dermosols
Myall (Ml)	(15%)	Yellow Dermosols
Drop (Dr)	(8%)	Yellow Kandosols or Yellow Dermosols

Vegetation map units:

Woodlands

78 (6.3%) *Eucalyptus leptophleba* ± *E. clarksoniana* ± *Erythrophleum chlorostachys* (Sandstone colluvium, Laura)

80 (14.3%) *Eucalyptus leptophleba, E. tessellaris* ± *E. clarksoniana* (Levees)

Open-woodlands

115 (13.0%) *Eucalyptus leptophleba* (± *E. chlorophylla*) ± *E. papuana* ± *Erythrophleum chlorostachys* ± *Eucalyptus cullenii* (Erosional slopes)

116 (66.4%) *Eucalyptus leptophleba* ± *E. papuana* ± *E. clarksoniana* (Rolling plains, northern Cape York Peninsula)

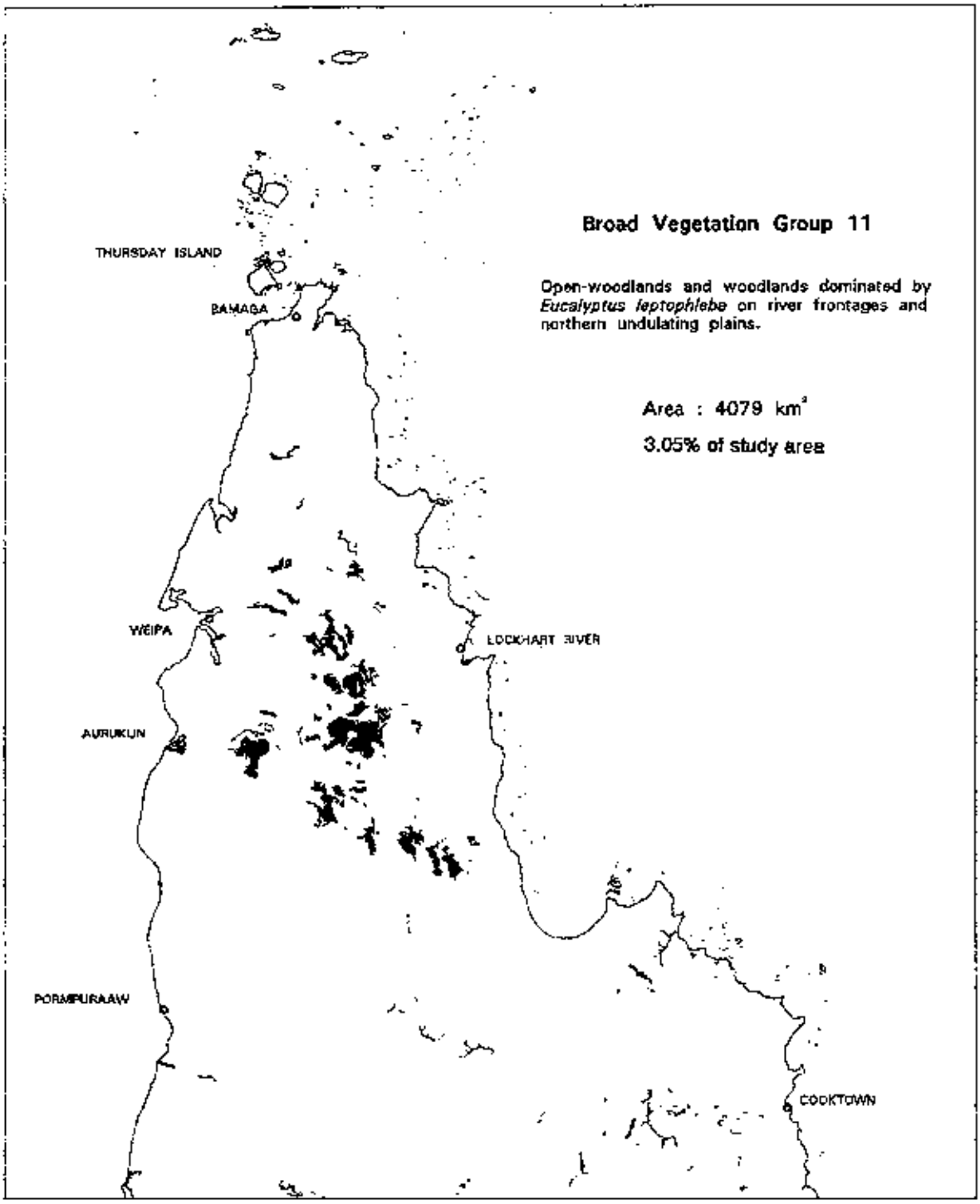


Figure 16. Spatial distribution of broad vegetation group 11.

3.14 BVG 12. Woodlands dominated by *Eucalyptus leptophleba, E. platyphylla or E. erythrophloia* on undulating hills and plains in the south-east

Predominant landforms:

Erosional plains (20%), rises (18%), low hills (13%), alluvial terraces (12%), flood plains (11%) & pediments (9%)

Predominant geology:

Pleistocene colluvia (Czx)	(38%)	Colluvia (mottley clayey sands)
Hodgkinson Formation (D-Ch)	(26%)	Metamorphics (greywacke,slate)
McLean Basalt (Cze)	(23%)	Basic volcanics (olivine basalt)

Predominant soil map units:

Jeannie (Jn)	(29%)	Yellow Dermosols or Brown Kandosols
Burn (Br)	(19%)	Red Ferrosols
Kingjack (Kj)	(12%)	Yellow Dermosols
Gibson (Gs)	(11%)	Yellow Sodosols or Redoxic Hydrosols
Greenant (Ga)	(8%)	Yellow, Grey or Brown Sodosols or Redoxic Hydrosols

Vegetation map units:

Open-forests

43	(3.5%)	*Eucalyptus platyphylla, E. leptophleba, Erythrophleum chlorostachys* ± other *Eucalyptus* spp. (Ranges & flats, Wet Tropics)

Woodlands

73	(4.0%)	*Eucalyptus erythrophloia* (Basalt flows, Lakeland)
79	(24.9%)	*Eucalyptus leptophleba* ± *E. papuana* ± *E. clarksoniana* ± *E. erythrophloia* ± *E. cullenii* (Basalt areas, Lakeland)
81	(44.6%)	*Eucalyptus leptophleba, E. platyphylla* ± *E. tessellaris* ± *E. clarksoniana* (Rolling hills, Cooktown)

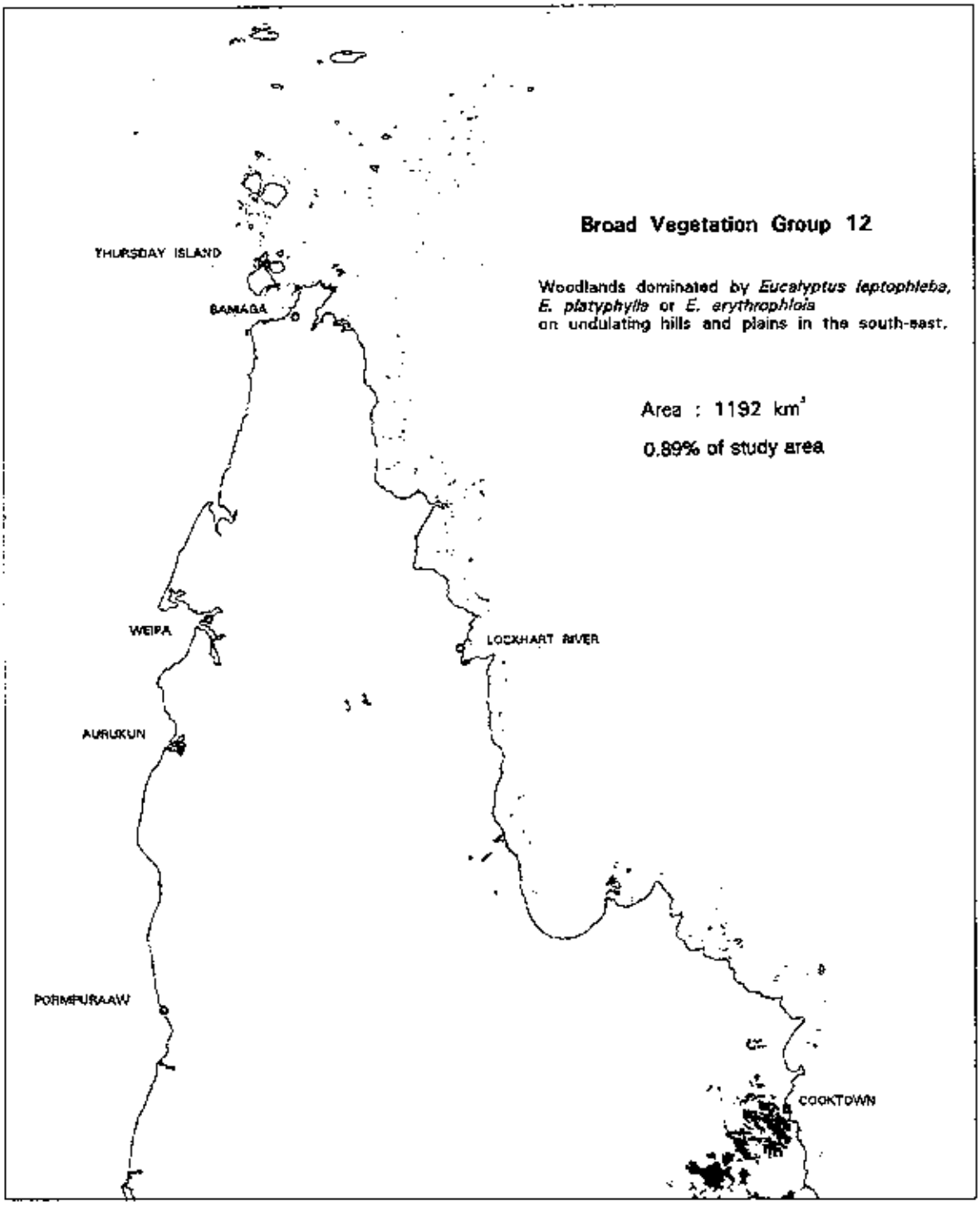


Figure 17. Spatial distribution of broad vegetation group 12.

3.15 BVG 13. Open-forests and woodlands dominated by *Eucalyptus nesophila* or *E. hylandii* var. *campestris*

Predominant landforms:

Hills (51%), mountains (11%), pediments (9%), low hills (8%) & flood plains (6%)

Predominant geology:

Hodgkinson Formation (D-Ch)	(45%)	Metamorphics (greywacke, slate)
Quaternary fans (Czt)	(11%)	Colluvia (piedmont fans, earthy breccia)
Pleistocene colluvia (Czx)	(8%)	Colluvia (mottled clayey sands)
Muralug Ignimbrite (Cm)	(7%)	Acid plutonics (rhyolite, welded tuff)

Predominant soil map units:

Jeannie (Jn)	(56%)	Yellow Dermosols or Brown Kandosols
Galloway (Gw)	(11%)	Red Kandosols
Rule (Rl)	(6%)	Red Dermosols

Vegetation map units:

Open-forests

41	(18.9%)	*Eucalyptus nesophila* ± *Eucalyptus* spp. open-forest (Wet Tropics)

Woodlands

74	(19.4%)	*Eucalyptus hylandii* var. *campestris* ± *E. nesophila* ± *Welchiodendron longivalve* ± mid-dense shrub layer (Slopes & undulating plains, northern Cape York Peninsula & Torres Strait Islands)
82	(58.7%)	*Eucalyptus nesophila* ± *E. brassiana* (Metamorphic hills)
83	(3.0%)	*Eucalyptus nesophila* ± *E. novoguinensis* ± *E. hylandii* var. *campestris* ± *E. tetrodonta* (Old stabilised dunes & sandy colluvium)
87	(23.0%)	*Eucalyptus platyphylla* ± *E. clarksoniana* (Flat wet plains)

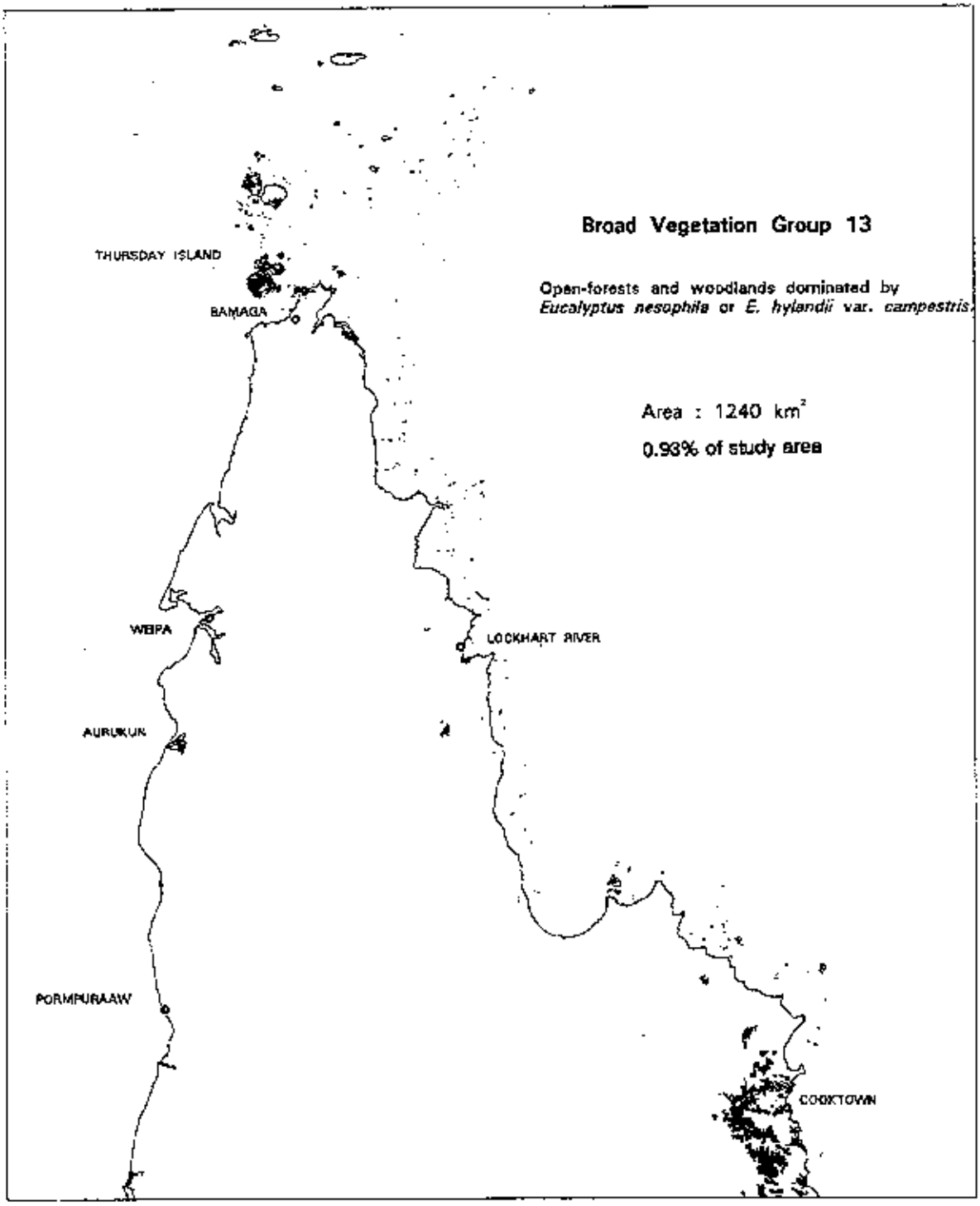


Figure 18. Spatial distribution of broad vegetation group 13.

3.16 BVG 14. *Eucalyptus* spp. open-forests of the Wet Tropics region

Predominant landforms:

Hills (36%), low hills (28%), mountains (17%) & plateaus (9%)

Predominant geology:

Hodgkinson Formation (D-Ch)	(60%)	Metamorphics (greywacke, slate)
Finlayson Granite (Pgf)	(28%)	Acid plutonics (porphyritic adamellite)

Predominant soil map units:

Rule (Rl)	(62%)	Red Dermosols
Jeannie (Jn)	(34%)	Yellow Dermosols or Brown Kandosols

Vegetation map units:

Open-forests

38	(3.4%)	*Eucalyptus cloeziana* (Ranges, Rossville)
39	(12.7%)	*Eucalyptus crebra* ± *E. intermedia* ± *Lophostemon suaveolens* ± *Allocasuarina littoralis* (Ranges, Rossville)
40	(10.3%)	*Eucalyptus intermedia, E. leptophleba, Erythrophleum chlorostachys* ± *Eucalyptus tereticornis* (Hills, Wujal Wujal)
42	(26.4%)	*Eucalyptus pellita* ± *E. intermedia* ± *Allocasuarina torulosa* ± *Acacia flavescens* (Rossville)
45	(4.1%)	*Eucalyptus reducta* (Mt Poverty)
46	(24.9%)	*Eucalyptus* sp. (Mt Mulligan J.R. Clarkson 5889) (CREB track)

Woodlands

56	(18.2%)	*Eucalyptus* sp. (Mt Mulligan J.R. Clarkson 5889), *E. citriodora, E. crebra* (Sandstone capping, Mt Janet)

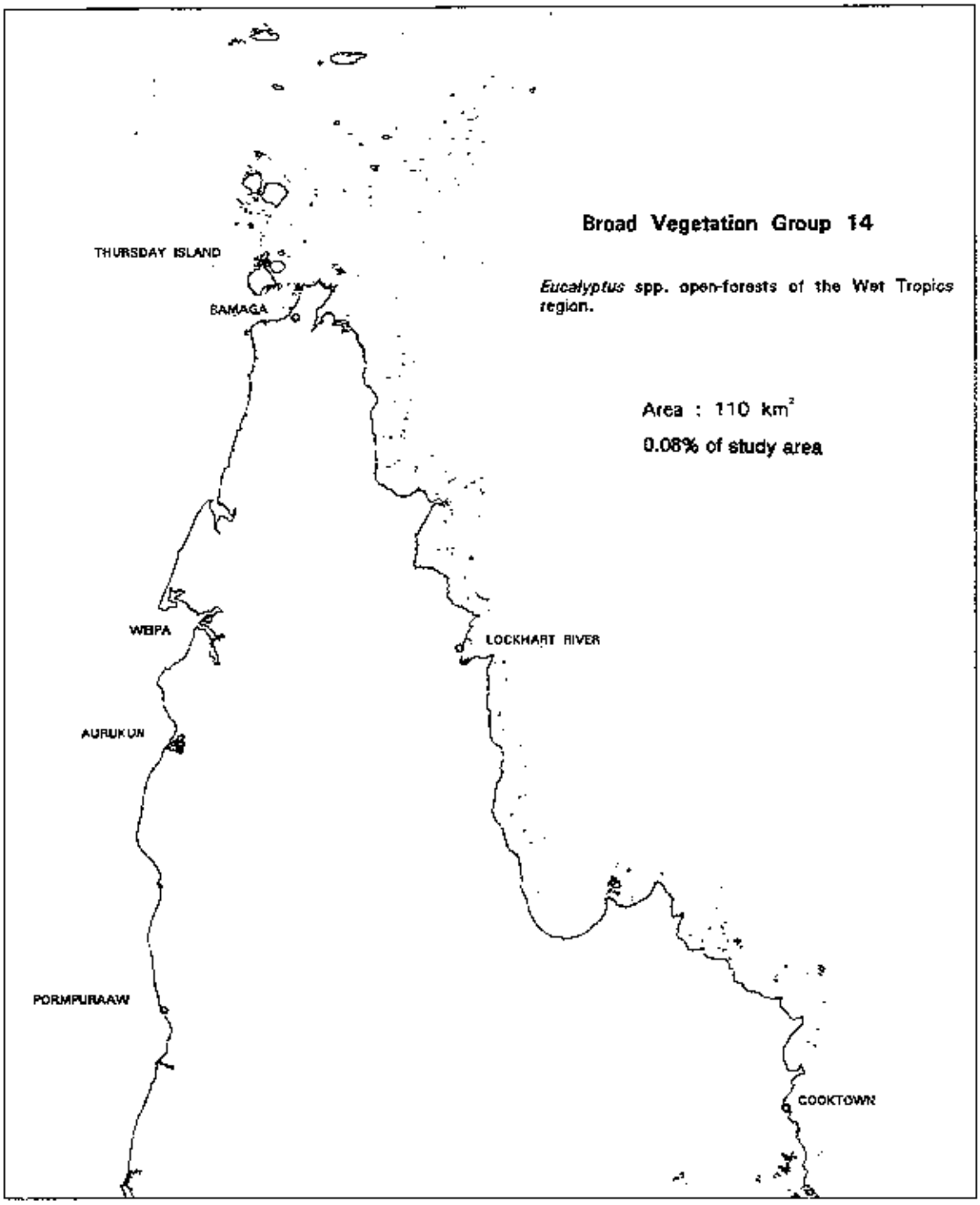


Figure 19. Spatial distribution of broad vegetation group 14.

3.17 BVG 15. Open-forests and woodlands dominated by *Eucalyptus tessellaris*, *E. clarksoniana* or *E. brassiana* on coastal plains and ranges

Predominant landforms:

Low hills (33%), alluvial plains (16%), rises (7%), pediments (7%), hills (6%) & flood plains (6%)

Predominant geology:

Kintore Adamellite (SDk)	(21%)	Acid plutonics (muscovite, adamellite)
Holocene alluvia (Qa)	(18%)	Alluvia (silt & quartzose sand)
Pliocene colluvia (TQs)	(14%)	Colluvial (quartzose sand)
Lilyvale Beds (Tmpv)	(7%)	Colluvial (clayey quartzose sand)
Lankelly Adamellite (SDl)	(6%)	Acid plutonics (muscovite, adamellite)

Predominant soil map units:

Drop (Dr)	(31%)	Yellow Kandosols or Yellow Dermosols
Quarantine (Qt)	(7%)	Grey Sodosols
Gail (Gl)	(6%)	Yellow Kandosols
Kennedy (Kd)	(4%)	Redoxic or Oxyaquic Hydrosols or Grey or Aquic Vertosols

Vegetation map units:

Open-forests

36	(8.5%)	*Eucalyptus brassiana, E. clarksoniana, Allocasuarina littoralis* (Western McIlwraith Range & wet coastal areas)
37	(31.4%)	*Eucalyptus clarksoniana* (or *E. novoguinensis*), *E. tessellaris* ± *Acacia polystachya* ± rainforest species (McIlwraith & coastal ranges)
44	(23.3%)	*Eucalyptus tessellaris, E. clarksoniana* ± *Lophostemon suaveolens* ± *Acacia crassicarpa* (Coastal areas)

Woodlands

57	(0.3%)	*Eucalyptus brassiana* (Drainage areas, Bathurst Head)
66	(9.8%)	*Eucalyptus clarksoniana/E. novoguinensis* with mid-dense shrub layer ± *E. platyphylla* (Coastal wet areas)
84	(10.2%)	*Eucalyptus novoguinensis* ± *E. tessellaris* ± *E. nesophila* (Northern Cape York Peninsula)
91	(16.5%)	*Eucalyptus tessellaris* ± *E. clarksoniana* ± *E. acroleuca* ± *E. leptophleba* (Levees, Lakefield)

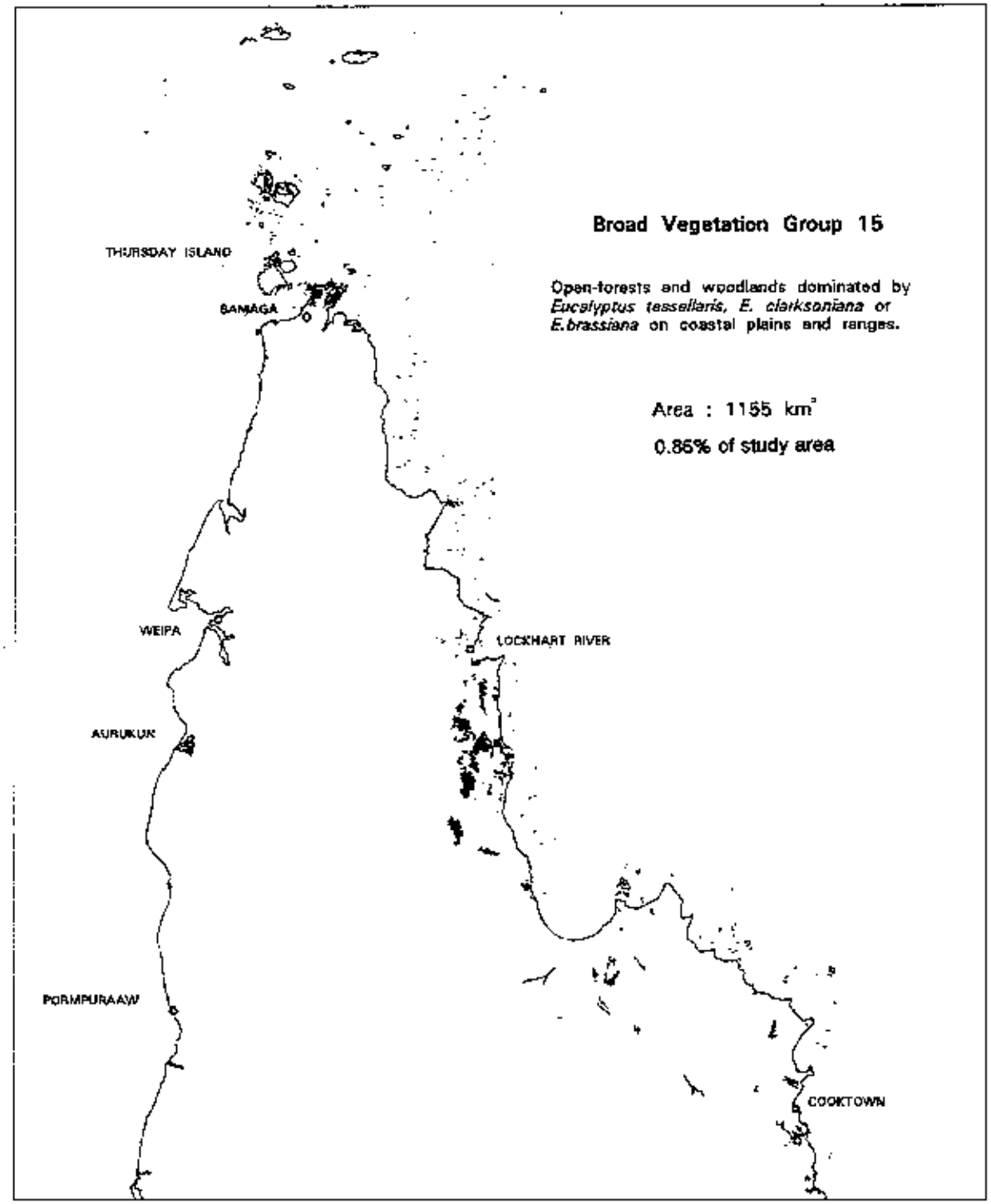


Figure 20. Spatial distribution of broad vegetation group 15

3.18 BVG 16. Woodlands and tall woodlands dominated by *Eucalyptus tetrodonta* on deeply weathered plateaus and remnants

Predominant landforms:

Erosional plains (26%), rises (21%), low hills (16%), plateaus (15%) & alluvial plains (9%)

Predominant geology:

Pliocene colluvium (TQs)	(31%)	Colluvial (quartzose sands)
Tertiary surfaces (T&Qa)	(25%)	Weathered (bauxite, ferricrete)
Rolling Downs Group (Klr)	(7%)	Sedimentary (mudstones, slates & siltstones)
Helby Beds (JKb)	(7%)	Sedimentary (clayey quartzose sandstones)
Bulimba Formation (KTi)	(6%)	Sedimentary (clayey quartzose sandstones)

Predominant soil map units:

Weipa (Wp)	(20%)	Red Kandosols
Kimba (Kb)	(19%)	Red Kandosols
Harmer (Hm)	(9%)	Yellow Kandosols
Clark (Cr)	(9%)	Yellow Kandosols
Emma (Em)	(8%)	Red Kandosols
Kool (Kl)	(6%)	Red Kandosols

Vegetation map units:

Tall woodlands

1	(4.8%)	*Eucalyptus tetrodonta* ± *E. hylandii* var. *campestris* ± *Erythrophleum chlorostachys* (The Desert, west of Laura)
2	(32.6%)	*Eucalyptus tetrodonta, E. nesophila* ± *Erythrophleum chlorostachys* (Bauxite plateaus, northern Cape York Peninsula)

Woodlands

101	(33.5%)	*Eucalyptus tetrodonta, E. nesophila* (Plateaus)
102	(9.3%)	*Eucalyptus tetrodonta* ± *E. nesophila* ± *Asteromyrtus brassii* ± heath understorey (Sandplains over sandstone)
103	(8.2%)	*Eucalyptus tetrodonta* ± *E. nesophila* (&/or *E. hylandii* var. *campestris*) ± *Erythrophleum chlorostachys* ± *Eucalyptus leptophleba* ± *E. confertiflora* (Lower slopes)
104	(11.6%)	*Eucalyptus tetrodonta* ± *E. clarksoniana* ± *E. nesophila* (Rises in south)

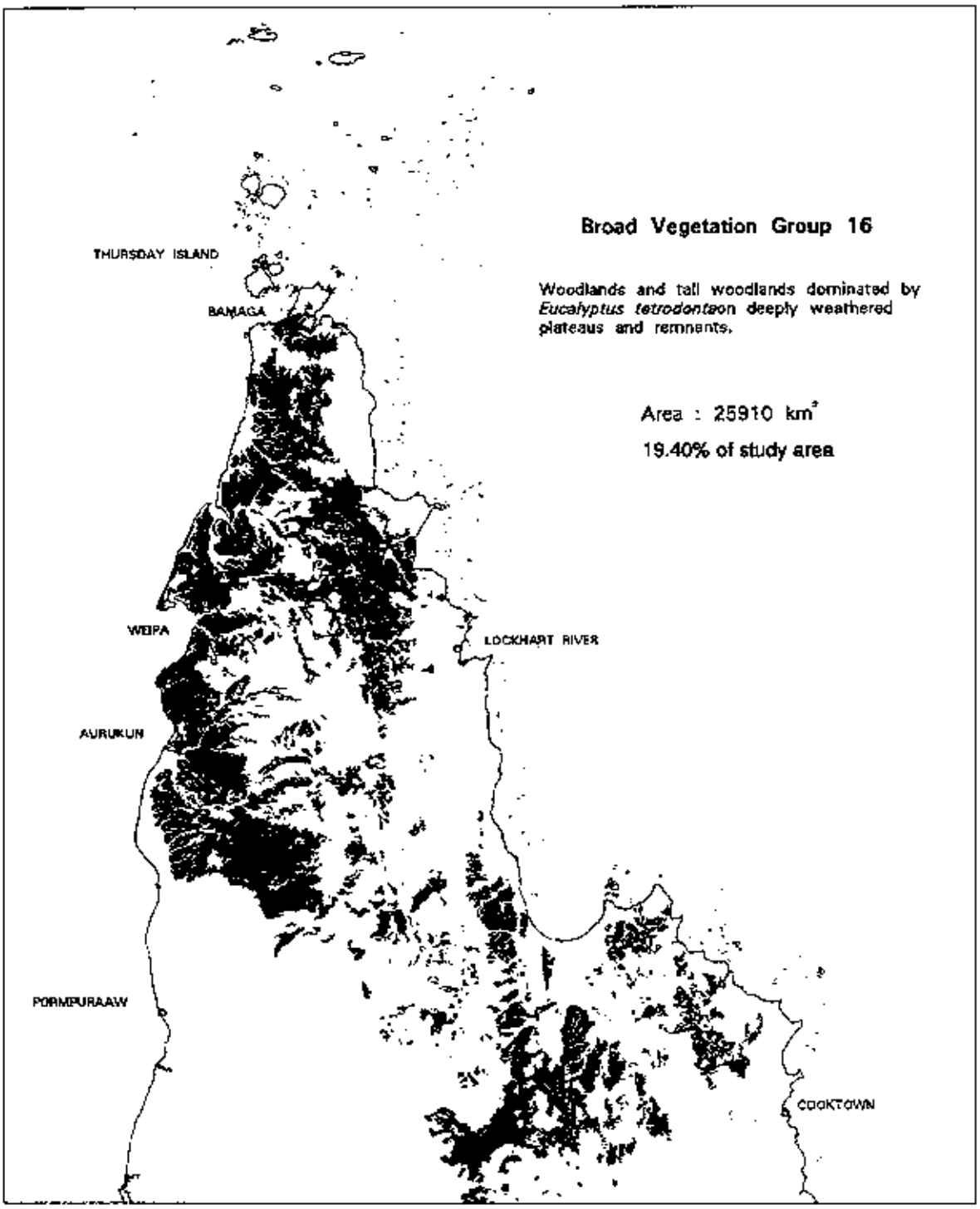


Figure 21. Spatial distribution of broad vegetation group 16.

3.19 BVG 17. Woodlands dominated by *Eucalyptus tetrodonta* on erosional surfaces and residual sands

Predominant landforms:

Rises (27%), erosional plains (26%), alluvial fans (14%), alluvial plains (12%) & flood plains (9%)

Predominant geology:

Pliocene colluvium (TQs)	(50%)	Colluvial (quartzose sands)
Rolling Downs Group (Klr)	(14%)	Sedimentary (mudstones, slates & siltstones)
Holocene alluvia (Qa)	(8%)	Alluvia (silts & quartzose sands)

Predominant soil map units:

Clark (Cr)	(37%)	Yellow Kandosols
Batavia (Bv)	(15%)	Yellow Dermosols
Dixie (Dx)	(6%)	Bleached-Orthic Tenosols
Harmer (Hm)	(5%)	Yellow Kandosols

Vegetation map units:

Woodlands

72	(3.1%)	*Eucalyptus cullenii* ± *E. tetrodonta* ± *Erythrophleum chlorostachys* ± *Eucalyptus confertiflora* ± *E. clarksoniana* (Erosional surfaces off bauxite plateaus)
86	(2.9%)	*Eucalyptus phoenicea* ± *E. tetrodonta* ± *E. hylandii var. campestris* ± *Erythrophleum chlorostachys* ± *Eucalyptus clarksoniana* (Sandy colluvia, Laura Basin)
92	(27.4%)	*Eucalyptus tetrodonta* ± *E. clarksoniana* ± *Erythrophleum chlorostachys* (Low lying sandy areas)
93	(0.4%)	*Eucalyptus tetrodonta, E. clarksoniana* ± *E. brassiana* (Stabilised dunes, Archer Point & Barrow Point)
94	(2.5%)	*Eucalyptus tetrodonta* ± *E. clarksoniana* ± *E. tessellaris* (Coastal lowlands)
95	(15.1)	*Eucalyptus tetrodonta* ± *E. confertiflora* ± *E. hylandii* var. *campestris* ± *Erythrophleum chlorostachys* ± *Eucalyptus clarksoniana* ± *E. leptophleba* (Rolling Downs erosional area)
97	(9.3%)	*Eucalyptus tetrodonta* (or *E. nesophila*), *E. hylandii* var. *campestris* ± *Erythrophleum chlorostachys* ± *Xanthorrhoea johnsonii* ± *Eucalyptus cullenii* (Granite valleys)

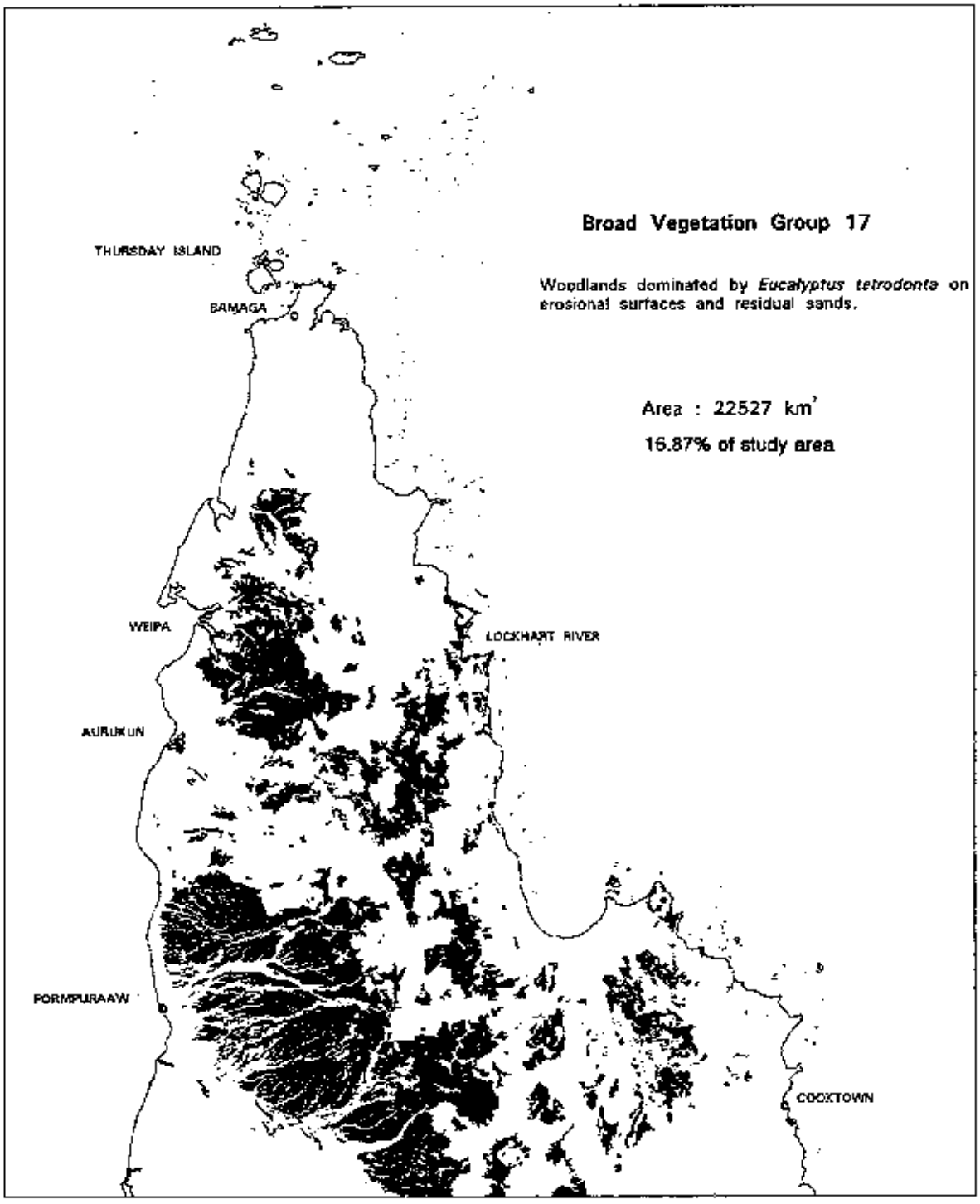


Figure 22. Spatial distribution of broad vegetation group 17.

Woodlands (Cont.)

98 (38.3%) *Eucalyptus tetrodonta, E. hylandii* var. *campestris, Erythrophleum chlorostachys* ± *Eucalyptus setosa* (Sand ridges, west of Dividing Range)

99 (1.0%) *Eucalyptus tetrodonta, E. hylandii* var. *campestris* ± *E. cullenii*

3.20 BVG 18. Low open-woodlands and low woodlands dominated by *Melaleuca viridiflora* on depositional plains

Predominant landforms:

Flood plains (52%), erosional plains (12%) & alluvial plains (10%)

Predominant geology:

Holocene alluvia (Qa)	(53%)	Alluvia (silts & quartzose sands)
Pliocene colluvium (TQs)	(22%)	Colluvial (quartzose sands)

Predominant soil map units:

Antbed (Ab)	(28%)	Redoxic Hydrosols
Silver (Sv)	(12%)	Redoxic Hydrosols
Clark (Cr)	(12%)	Yellow Kandosols
Hann (Hn)	(11%)	Redoxic Hydrosols

Vegetation map units:

Low woodlands

144 (3.9%) *Melaleuca viridiflora* ± low trees (Drainage areas)

145 (0.8%) *Melaleuca viridiflora, Asteromyrtus symphyocarpa* ± *Eucalyptus novoguinensis* ± *M. stenostachya* (Torres Strait Islands, north of Jeannie River)

147 (1.0%) *Melaleuca viridiflora* ± *Xanthorrhoea johnsonii* ± *Acacia brassii* (Coen plains)

Low open-woodlands

158 (14.3%) *Melaleuca viridiflora* ± *Petalostigma banksii* (Plains)

159 (80.0%) *Melaleuca viridiflora* ± *Petalostigma pubescens* ± emergent *Eucalyptus clarksoniana* (Low lying plains)

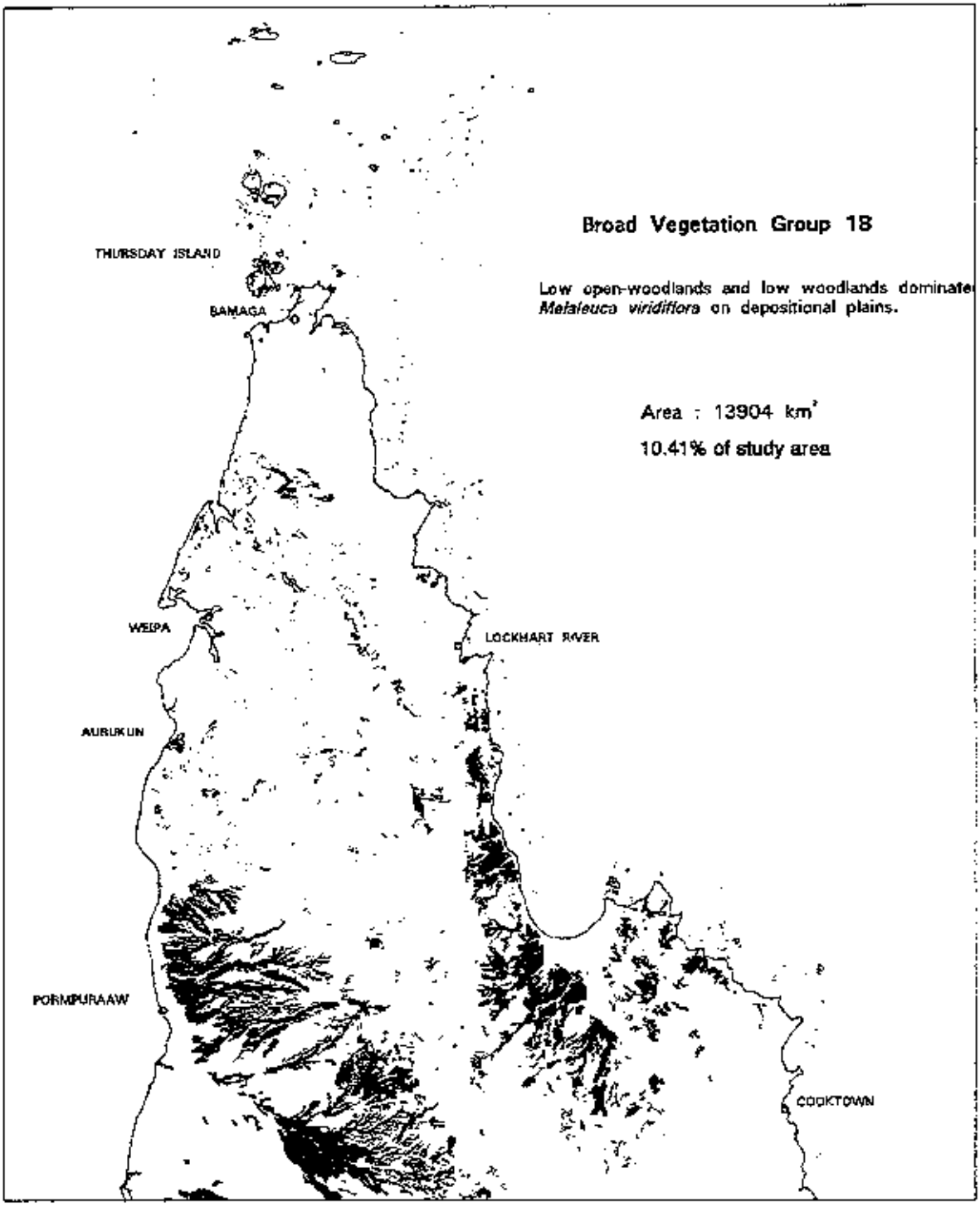


Figure 23. Spatial distribution of broad vegetation group 18.

3.21 BVG 19. Open-forests and low open-forests dominated by *Melaleuca* spp. in seasonally inundated swamps

Predominant landforms:

Swamps, sinkholes, drainage depressions and streamlines on alluvial plains (29%), drainage depressions (18%), erosional plains (17%), flood plains (10%) and alluvial swamps (7%)

Predominant geology:

Pliocene colluvium (TQs)	(34%)	Colluvial (quartzose sand)
Bulimba Formation (KTi)	(18%)	Sedimentary (clayey quartzose sandstones)
Tertiary surfaces (T&Qa)	(17%)	Weathered (bauxite, ferricrete)
Holocene alluvia (Qa)	(11%)	Alluvia (silts & quartzose sands)

Predominant soil map units:

Mapoon (Mp)	(8%)	Redoxic Hydrosols
Hann (Hn)	(6%)	Redoxic Hydrosols

Vegetation map units:

Open-forests

47	(26.0%)	*Lophostemon suaveolens* ± *Dillenia alata* ± *Xanthostemon crenulatus* ± *Melaleuca leucadendra* (Alluvial and swampy areas)
51	(1.7%)	*Melaleuca quinquenervia* open-forest (Coastal swamps)
53	(16.7%)	*Melaleuca saligna* ± *M. leucadendra* ± *M. viridiflora*, *Lophostemon suaveolens* ± *Asteromyrtus symphyocarpa* &/or *Melaleuca* sp. (Emu Lagoon J.R. Clarkson+ 9582) (Sinkholes & swamps)

Woodlands

109	(41.5)	*Melaleuca viridiflora* ± *M. saligna* ± *Asteromyrtus symphyocarpa* ± *Lophostemon suaveolens* ± *Melaleuca* spp. (Sinkholes & drainage depressions)

Low closed-forests

129	(1.1%)	Semi-deciduous microphyll species ± emergent *Melaleuca* spp. (Sinkholes, Batavia Downs)

Low open-forests

138	(2.0%)	*Melaleuca arcana* (Dune swamps)
139	(11.0)	*Melaleuca* sp. (Emu Lagoon J.R. Clarkson+ 9582) (Western swamps)

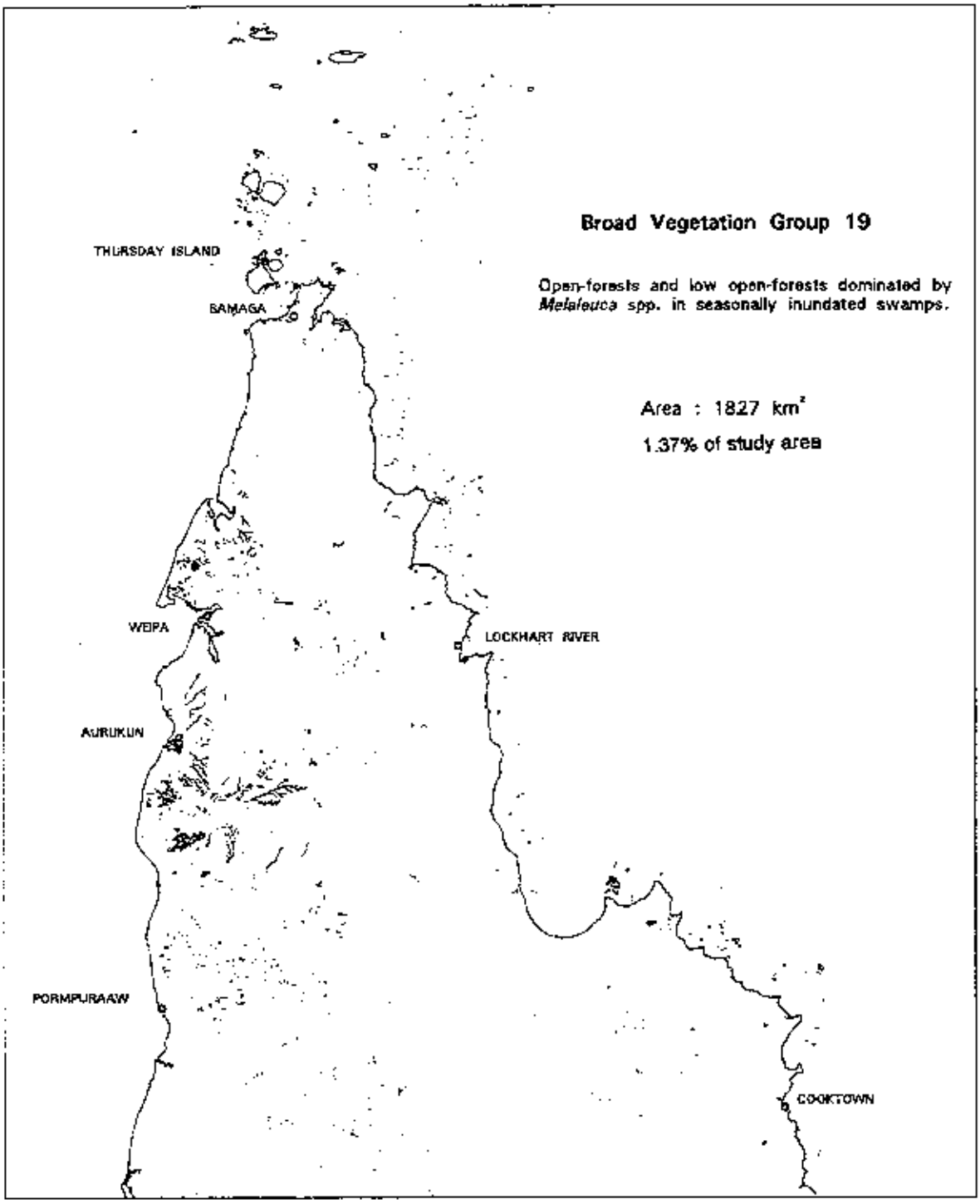


Figure 24. Spatial distribution of broad vegetation group 19.

3.22 BVG 20. Low open-woodlands and tall shrublands dominated by *Melaleuca stenostachya, M. citrolens* or other *Melaleuca* spp.

Predominant landforms:

Flood plains(36%), erosional plains (15%), rises (11%), drainage depressions (10%), hills (6%) & alluvial fans (6%)

Predominant geology:

Pliocene colluvium (TQs)	(38%)	Colluvia (quartzose sands)
Holocene alluvia (Qa)	(29%)	Alluvia (silts & quartzose sands)
Tertiary colluvia (TQs)	(9%)	Colluvia (motley clayey sands)

Predominant soil map units:

Antbed (Ab)	(20%)	Redoxic Hydrosols
Hann (Hn)	(18%)	Redoxic Hydrosols
Clark (Cr)	(16%)	Yellow Kandosols
Welcome (Wp)	(7%)	Bleached-Leptic Tenosols
Eykin (Ek)	(5%)	Grey Sodosols

Vegetation map units:

Open-forests

52 (0.4%) *Melaleuca saligna* ± *Hakea pedunculata* ± *M. acacioides* (Edge of salt pans, Bathurst Heads)

Woodlands

106 (12.2%) *Melaleuca stenostachya, Acacia leptostachya* (Erosional slopes)

Low open-woodlands

153 (23.6%) *Melaleuca citrolens* ± *M. foliolosa* ± *M. viridiflora* ± *M. acacioides* (Longitudinal drainage depressions)

155 (28.3%) *Melaleuca stenostachya* ± *M. foliolosa* ± shrub layer (Sandstone scarps)

156 (2.2%) *Melaleuca stenostachya* ± *M. viridiflora* (Plains)

157 (18.6%) *Melaleuca viridiflora, M. stenostachya* ± *Xanthorrhoea johnsonii* (Flat plains, Lakefield)

Tall shrublands

164 (0.7%) *Melaleuca acacioides* ± *Hakea pedunculata* with emergent *M. citrolens* and *M. viridiflora* (Behind mangrove areas)

165 (14.0%) *Melaleuca citrolens* ± *M. foliolosa* and/or *Antidesma parvifolium* (Western drainage lines)

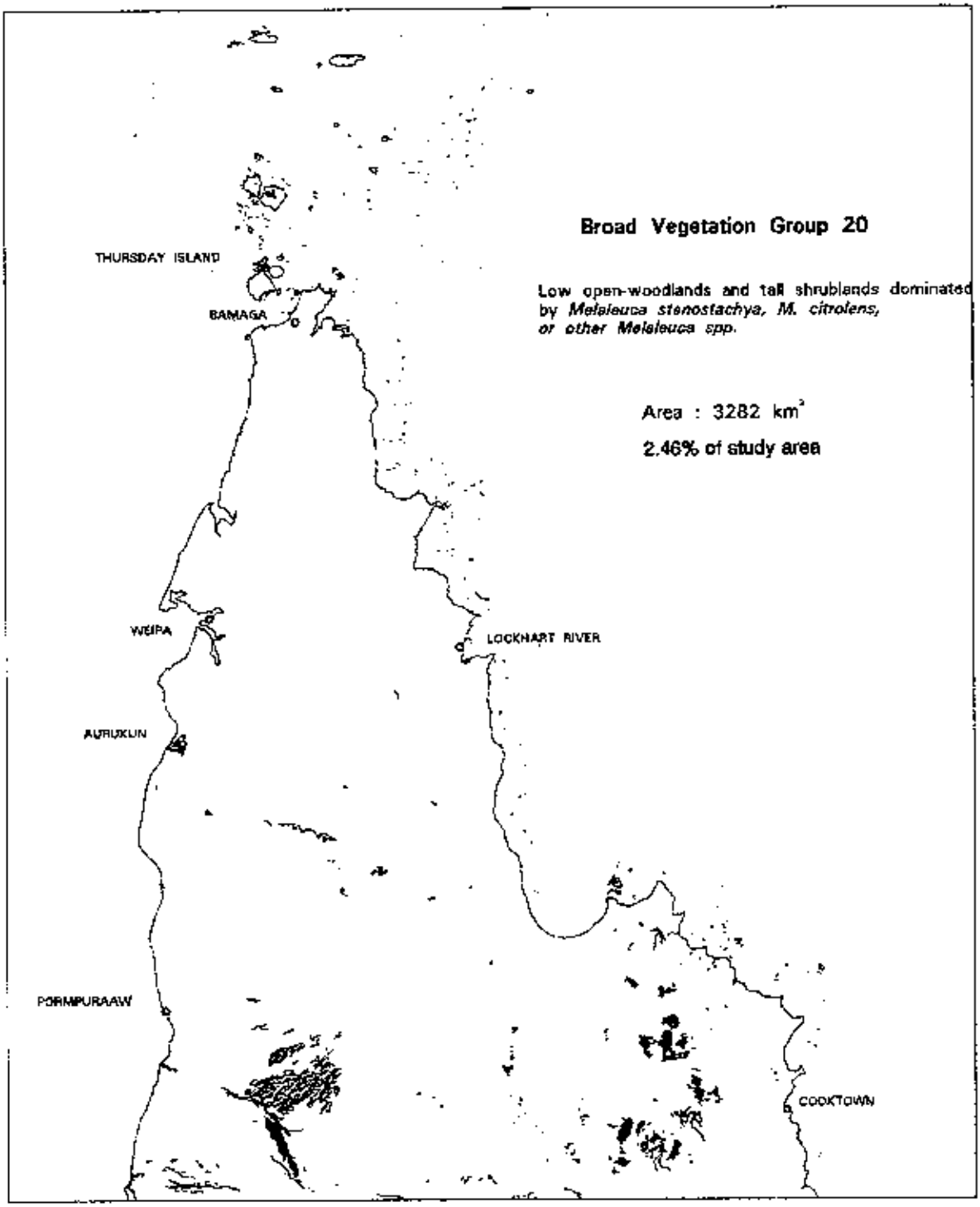


Figure 25. Spatial distribution of broad vegetation group 20.

3.23 BVG 21. Tussock grasslands on marine and alluvial plains

Predominant landforms:

Flood plains (51%), alluvial plains (27%) & tidal flats (8%)

Predominant geology:

Holocene alluvia (Qa)	(44%)	Silt and quartzose sands
Holocene alluvia (Qac)	(23%)	Coastal alluvia
Holocene alluvia (Qha)	(10%)	Modern alluvia & levee deposits

Predominant soil map units:

Marina (Mn)	(40%)	Aquic or Grey Vertosols
Kennedy (Kd)	(21%)	Oxyaquic Hydrosols or Grey Vertosols
Hann (Hn)	(12%)	Redoxic Hydrosols
Antbed (Ab)	(10%)	Redoxic Hydrosols

Vegetation map units:

Open-woodlands

111 (0.8%) *Corypha utan* (Northern Lakefield)

Closed-tussock grasslands

183 (16.4%) *Oryza* spp. ± *Eleocharis* spp. ± *Panicum trachyrhachis* ± *Fimbristylis* spp. (Seasonally inundated marine plains)

185 (5.0%) *Sporobolus virginicus* (Western coastal plains)

186 (14.0%) *Themeda arguens* ± *Dichanthium sericeum* ± *Capillipedium parviflorum* ± *Fimbristylis* spp. ± *Sorghum* spp. (Marine plains)

187 (0.3%) Grasslands/sedgelands with emergent *Pandanus* spp.(northern Torres Strait Islands)

Tussock grasslands

188 (63.5%) *Panicum* spp., *Fimbristylis* spp. ± *Oryza australiensis* ± *Sporobolus virginicus* ± *Eriachne* spp. (Western coastal plains)

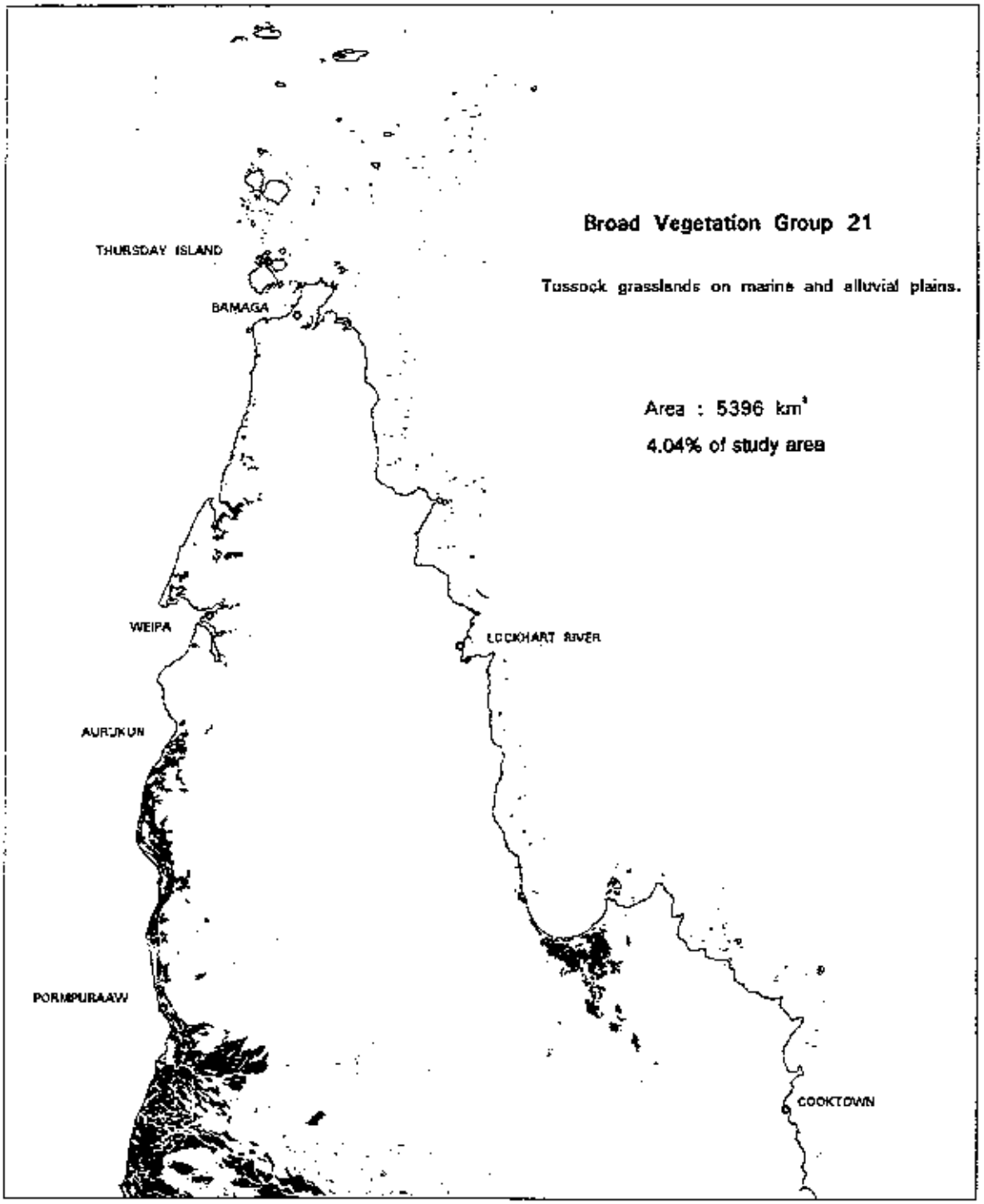


Figure 26. Spatial distribution of broad vegetation group 21.

3.24 BVG 22. Closed-tussock grasslands and open-woodlands on undulating clay plains

Predominant landforms:

Erosional plains (58%), rises (19%) & flood plains (6%)

Predominant geology:

Rolling Downs Group (Klr)	(51%)	Mudstones, slates & siltstones
Holocene alluvia (Qa)	(33%)	Silts & quartzose sands
Pliocene colluvia (TQs)	(6%)	Colluvial quartzose sands & minor silts

Predominant soil map units:

Myall (Ml)	(23%)	Yellow Dermosols
Picanninny (Pn)	(21%)	Brown or Grey Dermosols
Batavia (Bv)	(12%)	Yellow Dermosols
Wakooka (Wk)	(11%)	Yellow Dermosols
Greenant (Ga)	(6%)	Yellow Sodosols or Redoxic Hydrosols

Vegetation map units:

Open-woodlands

118 (36.9%) *Eucalyptus papuana* ± *E. leptophleba* (Rolling to flat plains, Batavia Downs)

119 (6.6%) *Terminalia aridicola* var. *chillagoensis*, *T. platyphylla* (Heavy clays, Olive Vale)

Low open-woodlands

149 (8.4%) *Acacia ditricha*, *Albizia procera* (Rokeby)

Tall open-shrublands

167 (15.3%) *Piliostigma malabaricum* (Rokeby)

Closed-tussock grasslands

181 (3.3%) *Heteropogon triticeus*, *Themeda arguens*, *Sorghum plumosum* ± *Piliostigma malabaricum* (Picanninny Plains)

182 (12.6%) *Imperata cylindrica* ± *Mnesithea rottboellioides* ± *Arundinella setosa* (Coastal plains, hillslopes & islands, Lockhart River)

184 (16.8%) *Sorghum* spp., *Themeda arguens* (Southern Lakefield & Olive Vale)

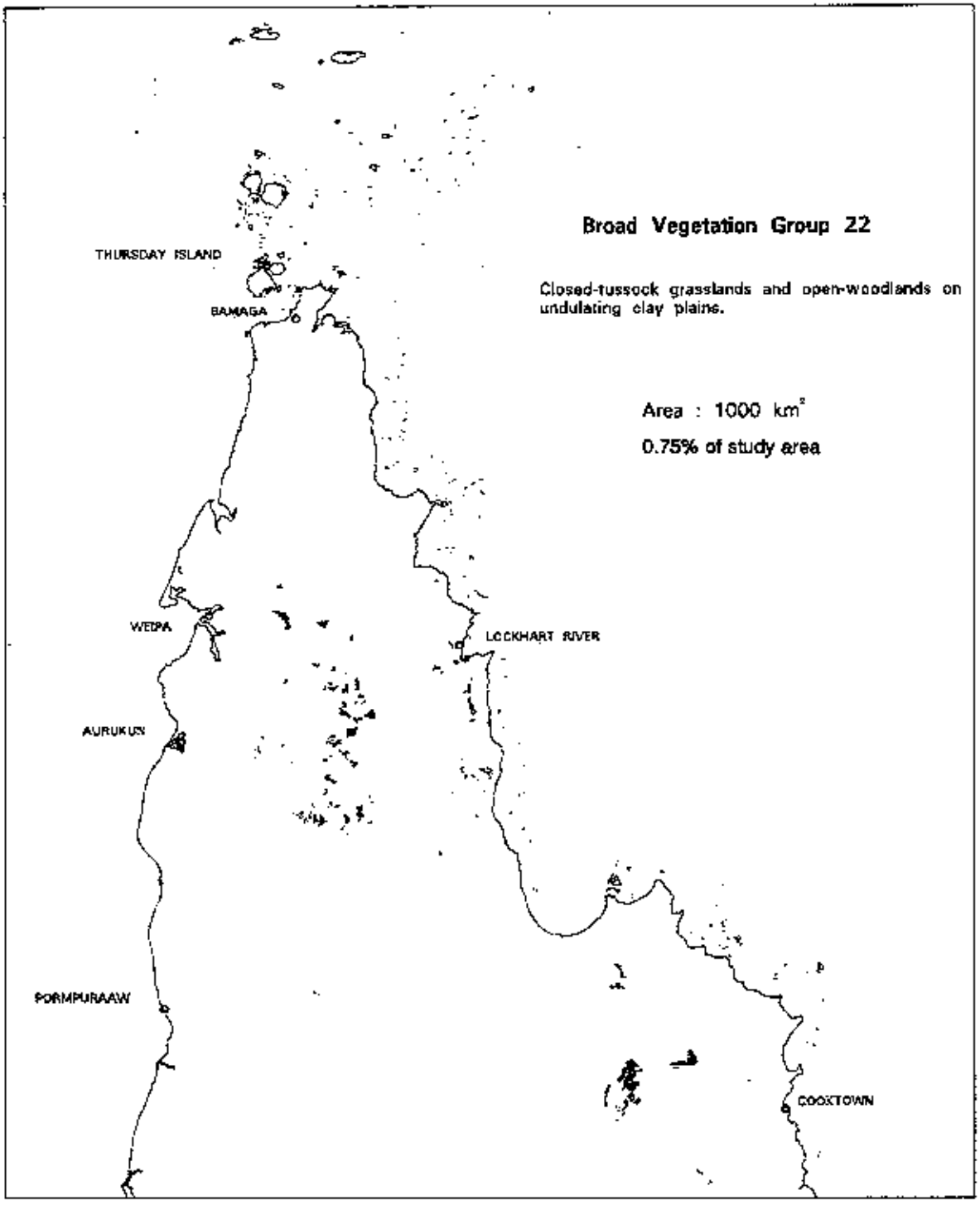


Figure 27. Spatial distribution of broad vegetation group 22.

3.25 BVG 23. Tussock grasslands on longitudinal drainage depressions, headlands or continental islands

Predominant landforms:

Flood plains (53%), drainage depressions (12%), erosional plains (8%) & islands

Predominant geology:

Holocene alluvia (Qa)	(51%)	Silts & quartzose sands
Pliocene colluvium (TQs)	(32%)	Colluvial quartzose sands & minor silts

Predominant soil map units:

Hann (Hn)	(31%)	Redoxic Hydrosols
Clark (Cr)	(19%)	Yellow Kandosols
Antbed (Ab)	(16%)	Redoxic Hydrosols
Kimba (Kb)	(7%)	Red Kandosols
Citri (Ct)	(6%)	Redoxic or Oxyaquic Hydrosols

Vegetation map units:

Low open-woodlands

154 (13.6%) *Melaleuca saligna* ± *M. viridiflora* ± *M. citrolens* (Longitudinal drainage depressions)

Closed-tussock grasslands

180 (85.2%) *Eriachne* spp. ± *Aristida* spp. ± *Eragrostis* spp. ± *Fimbristylis* spp. (Holroyd drainage lines)

Tussock grasslands

189 (1.2%) *Themeda triandra* or *Schizachyrium* spp. ± *Eriachne* spp.(Headlands and islands)

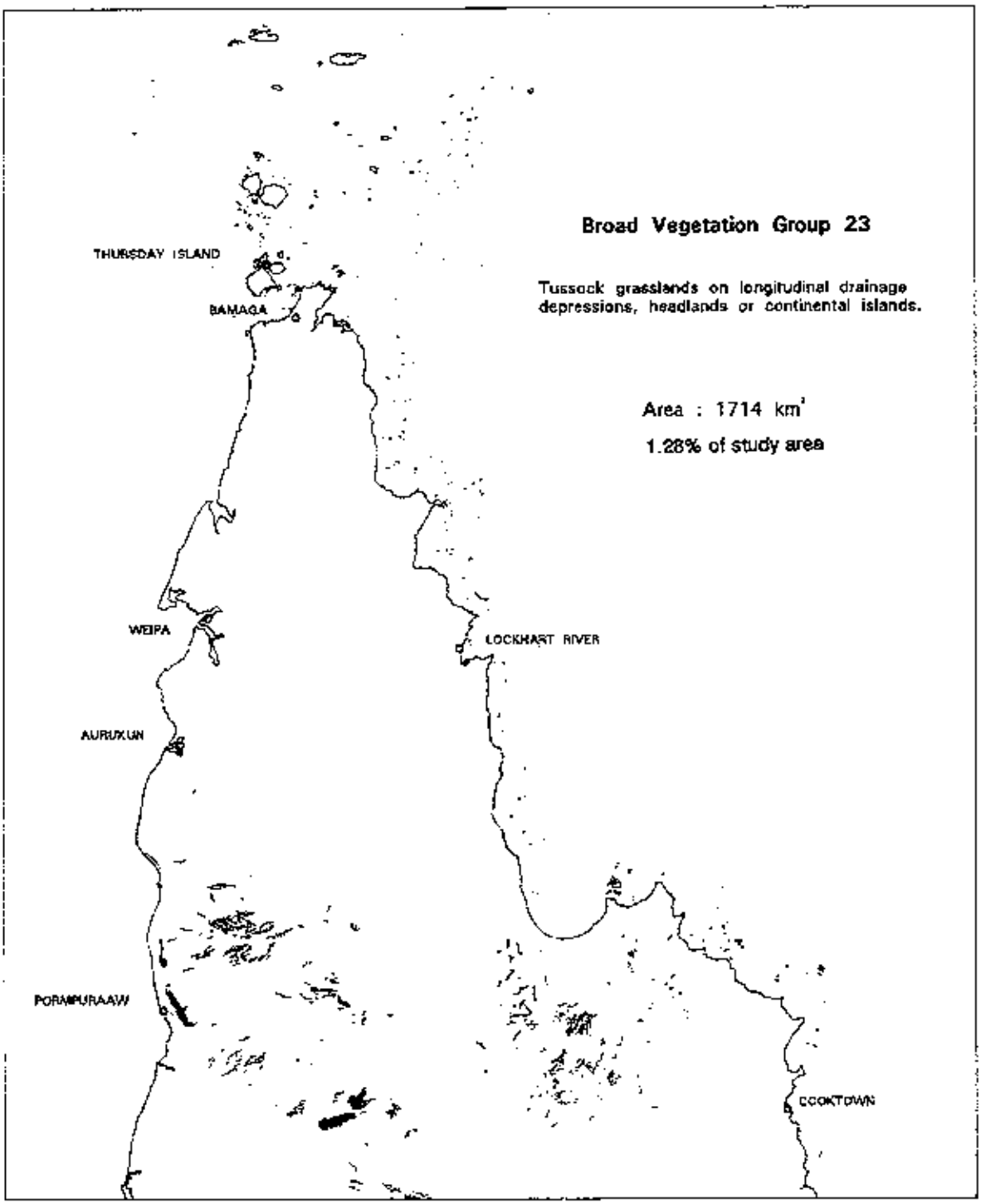


Figure 28. Spatial distribution of broad vegetation group 23.

3.26 BVG 24. Open-heaths and dwarf open-heaths on dunefields, sandplains and headlands

Predominant landforms:

Low hills (47%), coastal dunes (13%), alluvial plains (9%), erosional plains (6%) & dunefields (5%)

Predominant geology:

Helby Beds (JKb)	(27%)	Sedimentary (Clayey quartzose sandstones)
Holocene dunes (Qd)	(21%)	Coastal deposits (quartzose sands)
Pliocene colluvium (TQs)	(13%)	Colluvial (quartzose sands)
Holocene alluvia (Qa)	(13%)	Coastal deposits (silts & quartzose sands)

Predominant soil map units:

Harmer (Hm)	(34%)	Yellow Kandosols
Daunt (Dn)	(20%)	Aeric Podosols
Grevil (Gv)	(14%)	Semiaquic Podosols

Vegetation map units:

Low closed-forests

120 (2.8%) Low microphyll vine forest dominated by *Acacia crassicarpa, Syzygium banksii* ± *Neofabricia myrtifolia* ± *Leucopogon yorkensis* subcanopy (Coastal dunes)

Open-heaths

168 (8.4%) *Asteromyrtus lysicephala* ± *Baeckea frutescens* ± emergent *Thryptomene oligandra, Neofabricia myrtifolia* (Sandplains adjacent Jardine River)

169 (6.6%) *Asteromyrtus lysicephala, Choriceras tricorne, Xanthorrhoea johnsonii, Banksia dentata* (Sand sheets, north-east of Coen)

170 (2.0%) *Asteromyrtus lysicephala* ± *Jacksonia thesioides* ± *Choriceras tricorne* ± *Banksia dentata* (Adjacent streams, central Peninsula)

171 (41.4%) *Asteromyrtus lysicephala* ± *Jacksonia thesioides* ± *Choriceras tricorne* ± *Neofabricia myrtifolia* ± emergent *Melaleuca stenostachya* (Heaths over sandstone plateau)

172 (11.2%) *Asteromyrtus lysicephala* ± *Neofabricia myrtifolia* ± *Thryptomene oligandra* ± *Hibbertia banksii* ± low trees (Sandplains)

173 (3.7%) *Asteromyrtus lysicephala, Thryptomene oligandra, Neofabricia myrtifolia* ± *emergent Melaleuca arcana* (Jack River headwaters)

174 (0.01%) *Leucopogon yorkensis* ± *Asteromyrtus brassii* ± *Pouteria sericea* (Torres Strait Islands)

175 (3.7%) *Melaleuca arcana, Thryptomene oligandra, Asteromyrtus lysicephala* ± *Baeckea frutescens* (Swamp sandplains)

176 (12.3%) *Neofabricia myrtifolia* ± *Jacksonia thesioides* ± *Thryptomene oligandra* ± *Leucopogon* spp. (Quaternary dunefields)

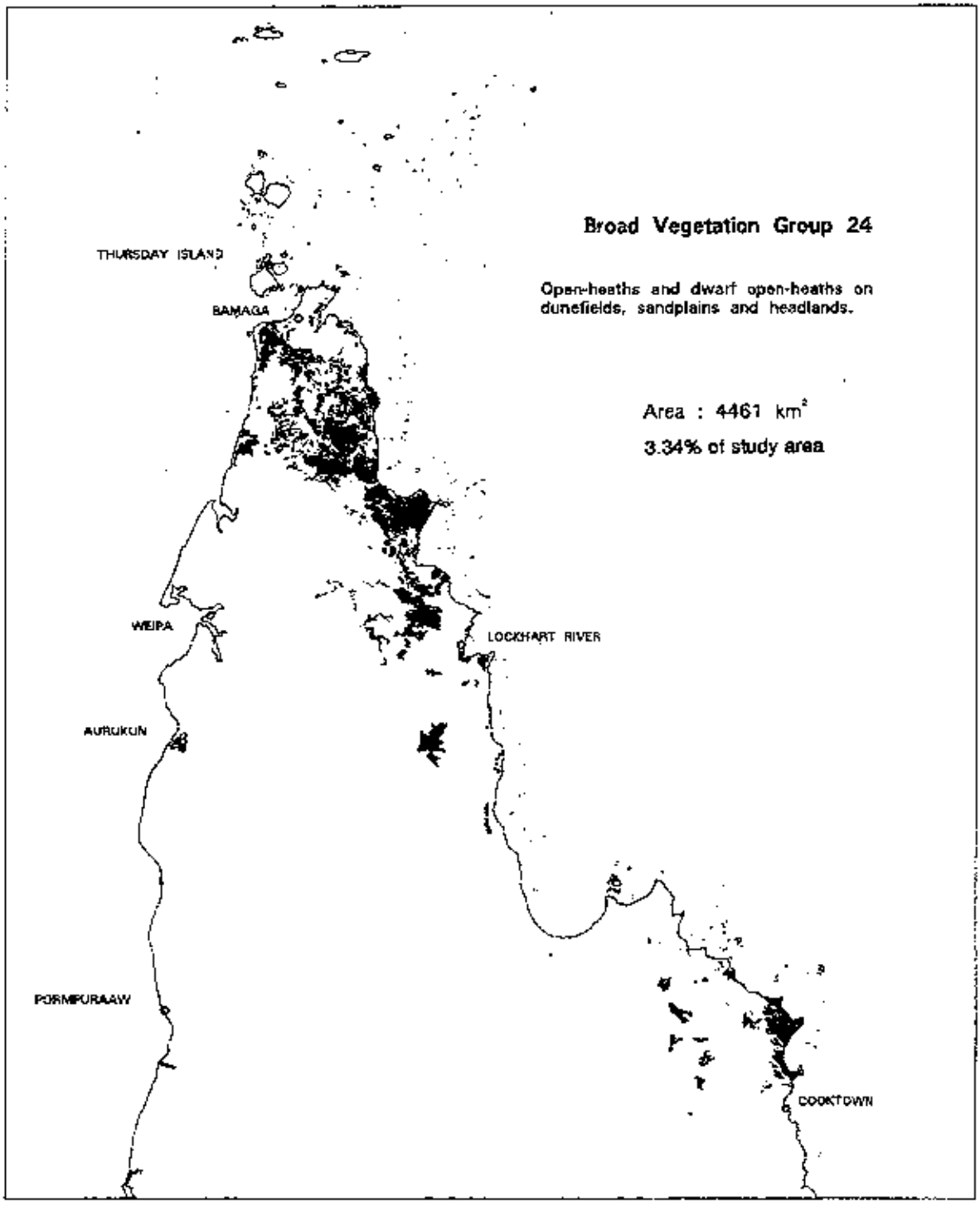


Figure 29. Spatial distribution of broad vegetation group 24.

Dwarf open-heaths

177 (1.0%) *Acacia humifusa* ± *Myrtella obtusa* ± *Grevillea pteridifolia* ± *Petalostigma pubescens* (Coastal dunes and headlands)

178 (5.0%) *Asteromyrtus lysicephala, Neofabricia myrtifolia, Grevillea pteridifolia* ± *Melaleuca viridiflora* &/or *Schizachyrium* spp. tussock grasslands (Sandstone plateaus)

179 (1.8%) *Neofabricia myrtifolia* ± *Labichea buettneriana* ± *Leucopogon ruscifolius* (Exposed sandplains, Cape Flattery)

3.27 BVG 25. Woodlands and herblands on beach ridges and the littoral margin

Predominant landforms:

Chenier plains (50%), beach ridges (32%) & tidal flats (6%)

Predominant geology:

Holocene beach ridges (Qhm)	(60%)	Marine deposits (quartzose sands, calcarenite)
Pleistocene beach ridges (Qpm)	(13%)	Older beach ridges (quartzose sands)
Quaternary deposits (Qac)	(9%)	Marine deposits (silty clays & sands)

Predominant soil map units:

Caravan (Cv)	(80%)	Bleached-Orthic Tenosols
Marina (Mn)	(6%)	Aquic or Grey Vertosols

Vegetation map units:

Open-forests

49 (11.6%) *Melaleuca dealbata* ± *Acacia crassicarpa* (Dune swales)

Woodlands

54 (70.5%) *Acacia crassicarpa* ± *Syzygium suborbiculare* ± *Parinari nonda* ± *Acacia* spp. (Dunes on west coast)

55 (2.2%) *Casuarina equisetifolia* (Foredunes)

Low woodlands

143 (2.1%) *Melaleuca foliolosa, Grevillea striata, Hakea persiehana, Melaleuca viridiflora* (Old beach ridge, Marina Plains)

Closed-herblands

193 (3.0%) Mixed graminoids and forbs (Beach Foredunes)

Sparse-herblands

196 (10.6%) Mixed herb species ± emergent low trees (Coast dunes, west coast)

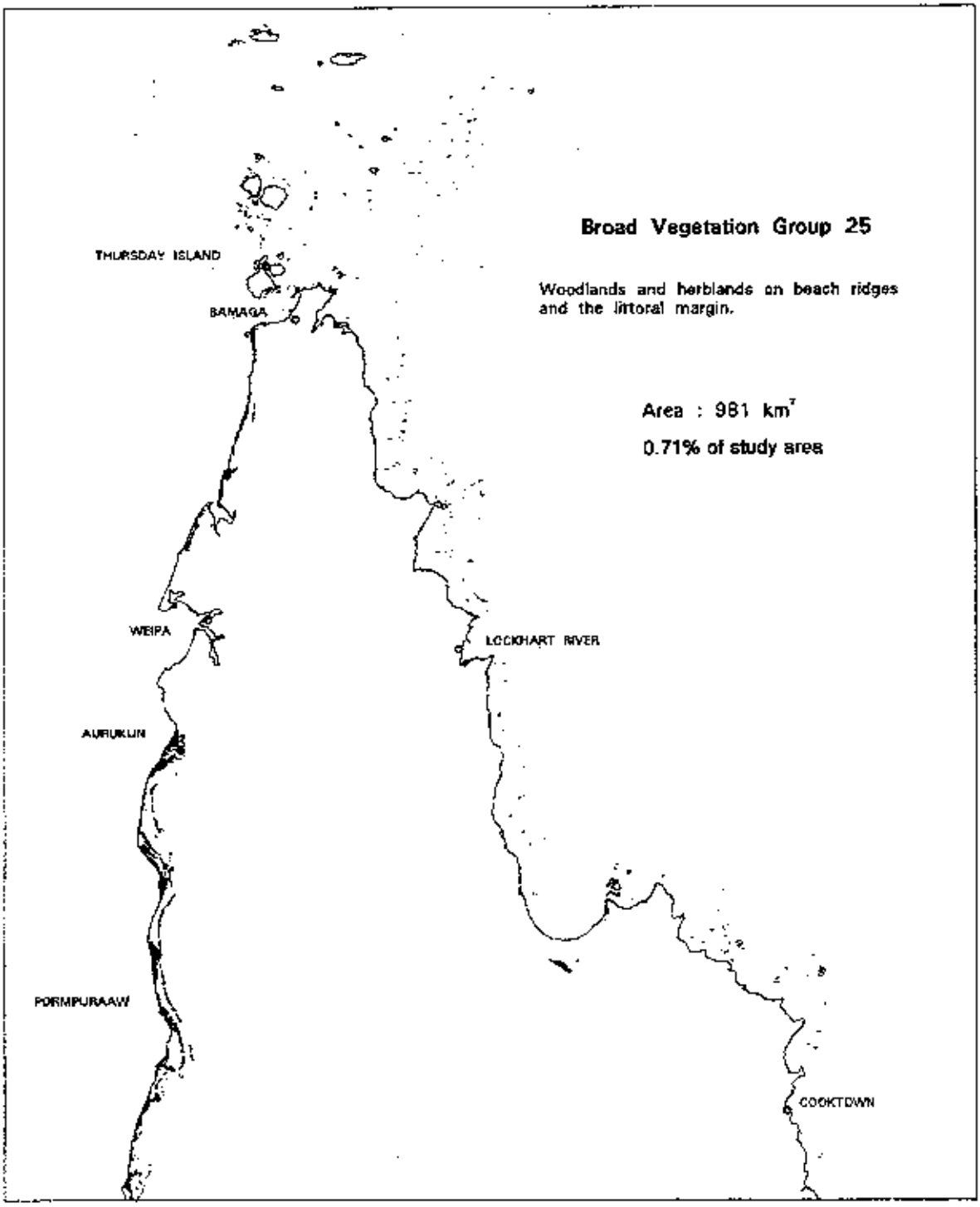


Figure 30. Spatial distribution of broad vegetation group 25.

3.28 BVG 26. Closed-forests and low closed-forests dominated by mangroves

Predominant landforms:

Tidal flats (82%)

Predominant geology:

Quaternary deposits (Qac)	(54%)	Marine deposits (silty clays & sands)
Quaternary deposits (Qm)	(14%)	Marine deposits (saltwater swamps)

Predominant soil map units:

Skardon (Sd)	(71%)	Intertidal Hydrosols
George (Go)	(9%)	Supratidal Hydrosols

Vegetation map units:

Closed-forests

34 (53.4%) *Rhizophora stylosa* ± *Bruguiera gymnorhiza* ± *Avicennia marina* (Low intertidal areas)

Low closed-forests

131 (7.0%) *Avicennia marina* var. *eucalyptifolia* ± *Ceriops tagal* (Landward intertidal areas)

132 (37.2%) *Ceriops tagal* ± *Avicennia marina* var. *eucalyptifolia* (Landward intertidal areas)

133 (0.04%) *Pemphis acidula* ± *Avicennia marina* var. *eucalyptifolia* ± *Rhizophora stylosa* (Islands)

Closed-scrubs

160 (2.4%) *Excoecaria agallocha* ± *Aegiceras corniculatum* ± *Lumnitzera* spp. with emergent *Avicennia marina* var. *eucalyptifolia* (Tidal rivers & intertidal areas)

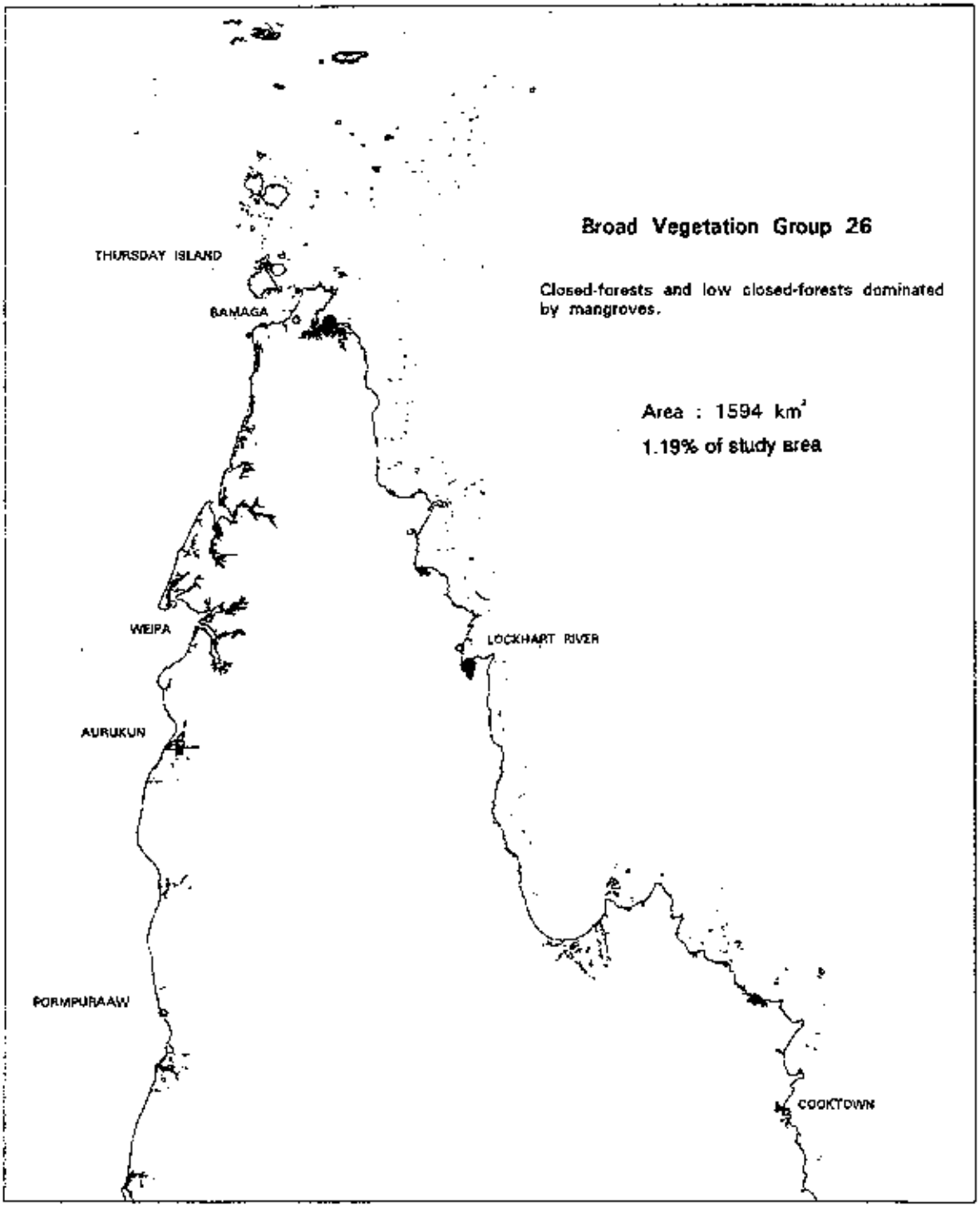


Figure 31. Spatial distribution of broad vegetation group 26.

3.29 BVG 27. Sedgelands, lakes and lagoons

Predominant landforms:

Drainage swamps, ephemeral and permanent lakes or alluvial plains (39%), low hills (15%), flood plains (8%), erosional plains (8%) & tidal flats (7%)

Predominant geology:

Holocene alluvia (Qa)	(39%)	Alluvia (silts & quartzose sands)
Pliocene colluvium (TQs)	(9%)	Colluvial (quartzose sands)
Helby Beds (JKb)	(8%)	Sedimentary (clayey quartzose sandstones)
Tertiary remnants(T&Qf)	(7%)	Weathered (ferruginous laterite, ferricrete)
Holocene dunes (Qd)	(7%)	Coastal deposits (quartzose sands)

Predominant soil map units:

Grevil (Gv)	(37%)	Semiaquic Podosols
Daunt (Dn)	(6%)	Aeric Podosols
Emma (Em)	(6%)	Red Kandosols
Marina (Mn)	(5%)	Aquic or Grey Vertosols

Vegetation map units:

Closed-sedgelands

190 (15.6%) *Eleocharis dulcis* (Marine plains)

Open-sedgelands

191 (50.4%) *Restio tetraphyllus* subsp. *meiostachyus* ± *Leptocarpus spathaceus* ± *Nepenthes mirabilis* ± *Gahnia sieberiana* (Drainage swamps)

Lakes and lagoons

199 (26.6%) Ephemeral lakes (Seasonally dry)

200 (3.9%) Perennial lakes with sedgelands on the margins (Lakes in dunefields)

201 (3.5%) Permanent lakes and lagoons frequently with fringing woodlands (Lakefield National Park)

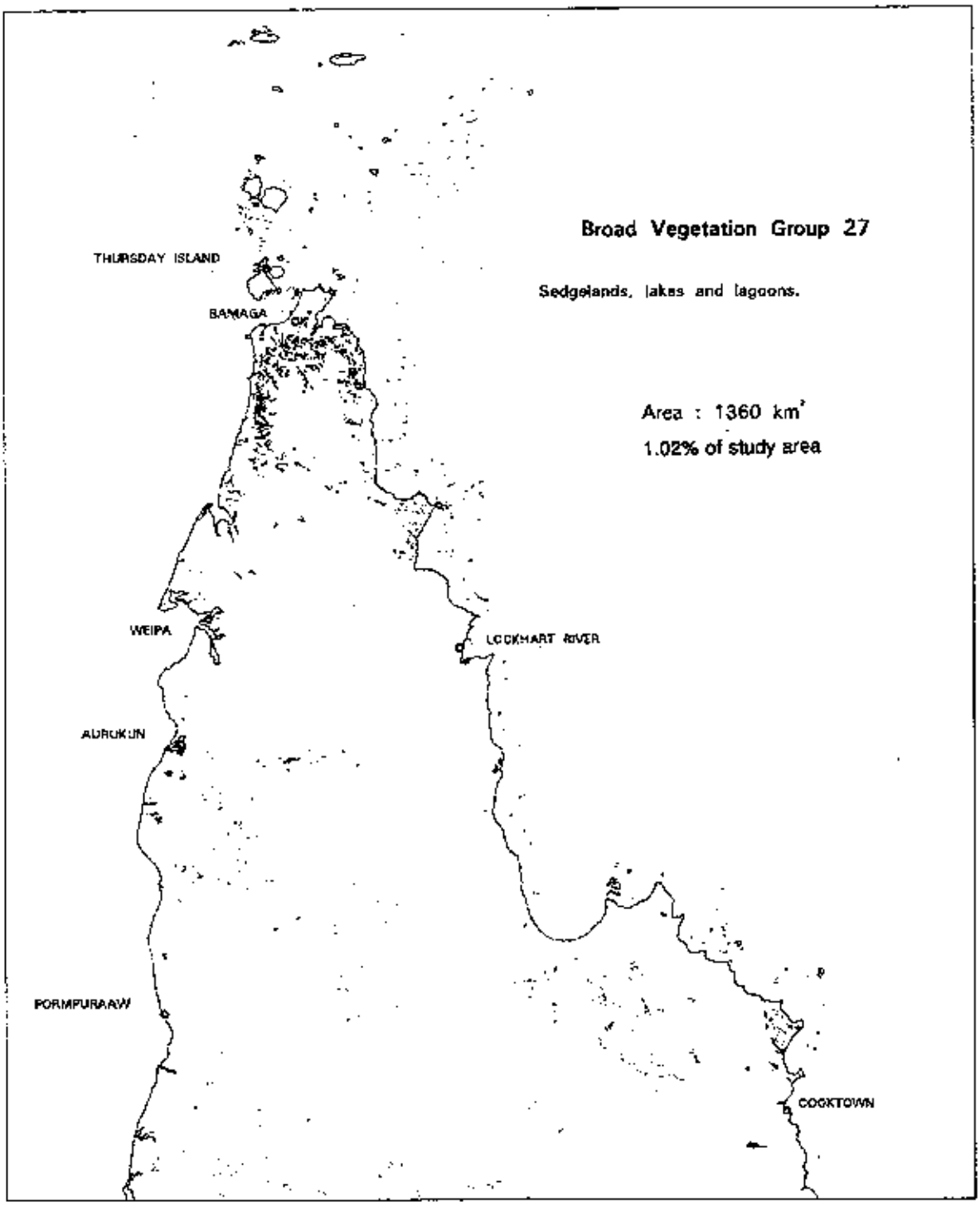


Figure 32. Spatial distribution of broad vegetation group 27.

3.30 BVG 28. Vegetation of the coral atolls, shingle cays and sand cays

Predominant landforms:

Coral atolls, shingle platforms and sand cays

Predominant geology:

Not surveyed Coral rubble

Predominant soil map units:

Not surveyed Arenic Rudosols

Vegetation map units:

Low closed-forests

122 (69.7%) Evergreen notophyll vine forest dominated by *Manilkara kauki* ± *Mimusops elengi* ± *Terminalia* spp. (Sand cays)

128 (0.7%) *Pisonia grandis* (Sand cays)

Closed-scrubs

162 (14.2%) *Premna serratifolia* ± mixed shrub spp. (Sand cays)

Closed-herblands

192 (15.5%) *Lepturus repens* ± *Ipomoea pescaprae* ± *Tribulus cistoides* (sand cays and shingle cays)

Associations from other broad vegetation groups that are also present on the islands

34 *Rhizophora stylosa* ± *Bruguiera gymnorhiza* ± *Avicennia marina var. eucalyptifolia* closed-forests
55 *Casuarina equisetifolia* low open-forests
131 *Avicennia marina* var. *eucalyptifolia* ± *Ceriops tagal* low closed-forests
132 *Ceriops tagal* ± *Avicennia marina* var. *eucalyptifolia*low closed-forests
133 *Pemphis acidula* ± *Avicennia marina* var. *eucalyptifolia* ± *Rhizophora stylosa* low closed-forests
185 *Sporobolus virginicus* closed-tussock grasslands
194 Bare saltpans with areas of *Halosarcia* spp. sparse-forblands &/or *Xerochloa imberbis* tussock grasslands &/or *Suriana maritima* woody forblands or *Sesuvium portulacastrum* open-herblands

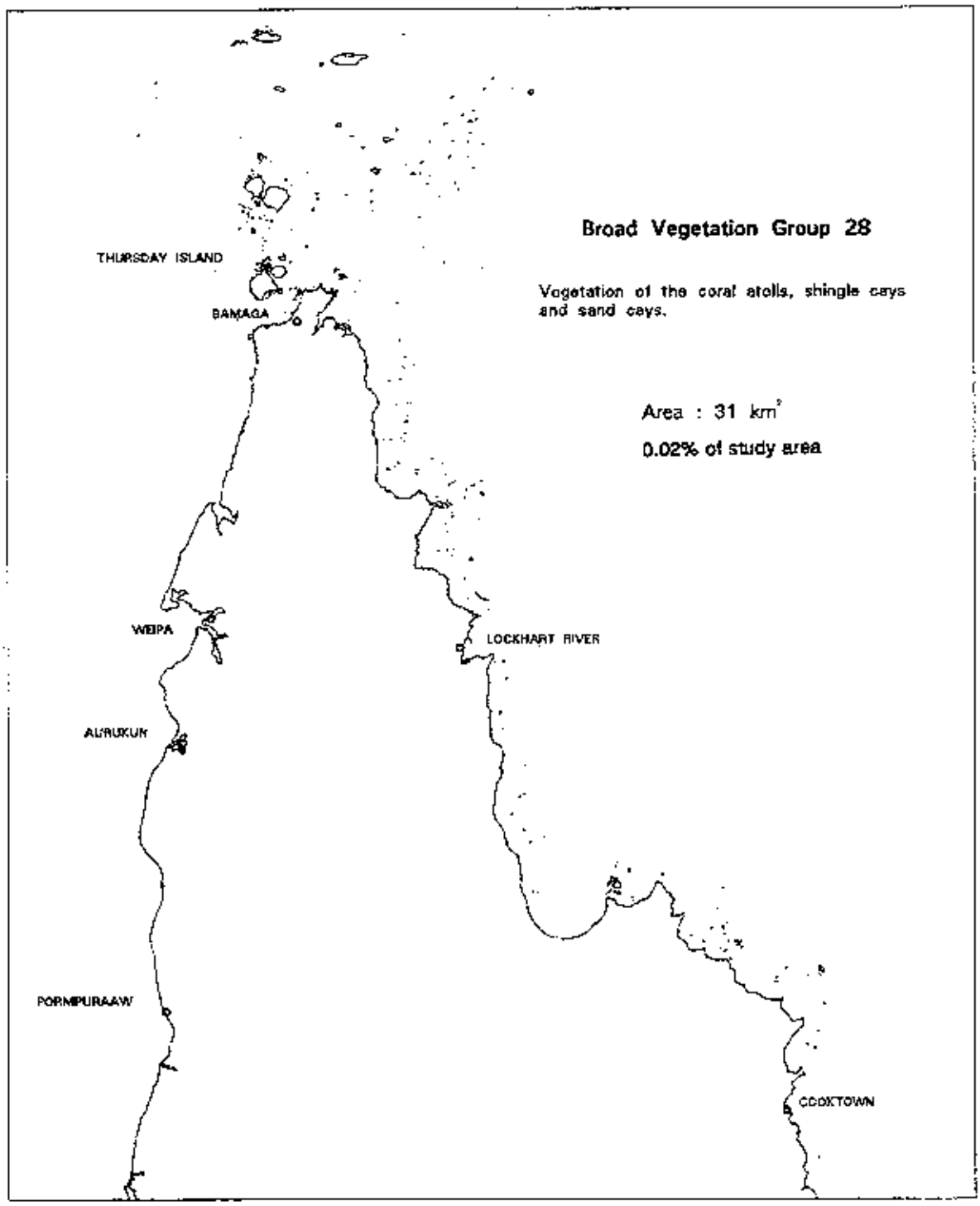


Figure 33. Spatial distribution of broad vegetation group 28.

3.31 BVG 29. Rocky and bare sandy areas, e.g. saltpans, sand blows and rock pavements

Predominant landforms:

Tidal flats (71%), flood plains (9%) and dunefields (7%)

Predominant geology:

Holocene deposits (Qac)	(34%)	Marine deposits (Silty clays & sands)
Holocene deposits (Qhp)	(31%)	Tidal flat deposits (Silty clays)
Holocene deposits (Qhm)	(6%)	Beach ridge deposits (quartzose sands)

Predominant soil map units:

George (Go)	(56%)	Supratidal Hydrosols
Skardon (Sd)	(13%)	Intertidal Hydrosols
Marina (Mn)	(11%)	Aquic or Grey Vertosols

Vegetation map units:

194	(80.1%)	Bare saltpans ± areas of *Halosarcia* spp. sparse-forbland &/or *Xerochloa imberbis* tussock grassland &/or *Suriana maritima* woody forbland or *Sesuvium portulacastrum* open-herblands (Saltpans & saline flats)
195	(2.0%)	Granite boulders covered with Blue Green Algae ± scattered trees (Black Mountain, Cape Melville)
197	(3.8%)	Rock pavements on mountains, in river beds, or on islands ± sparse-herblands
198	(14.1%)	Sand blows, or bare sand areas (Dunefields, sand cays & river beds) ± sparse scattered shrubs sparse-herblands

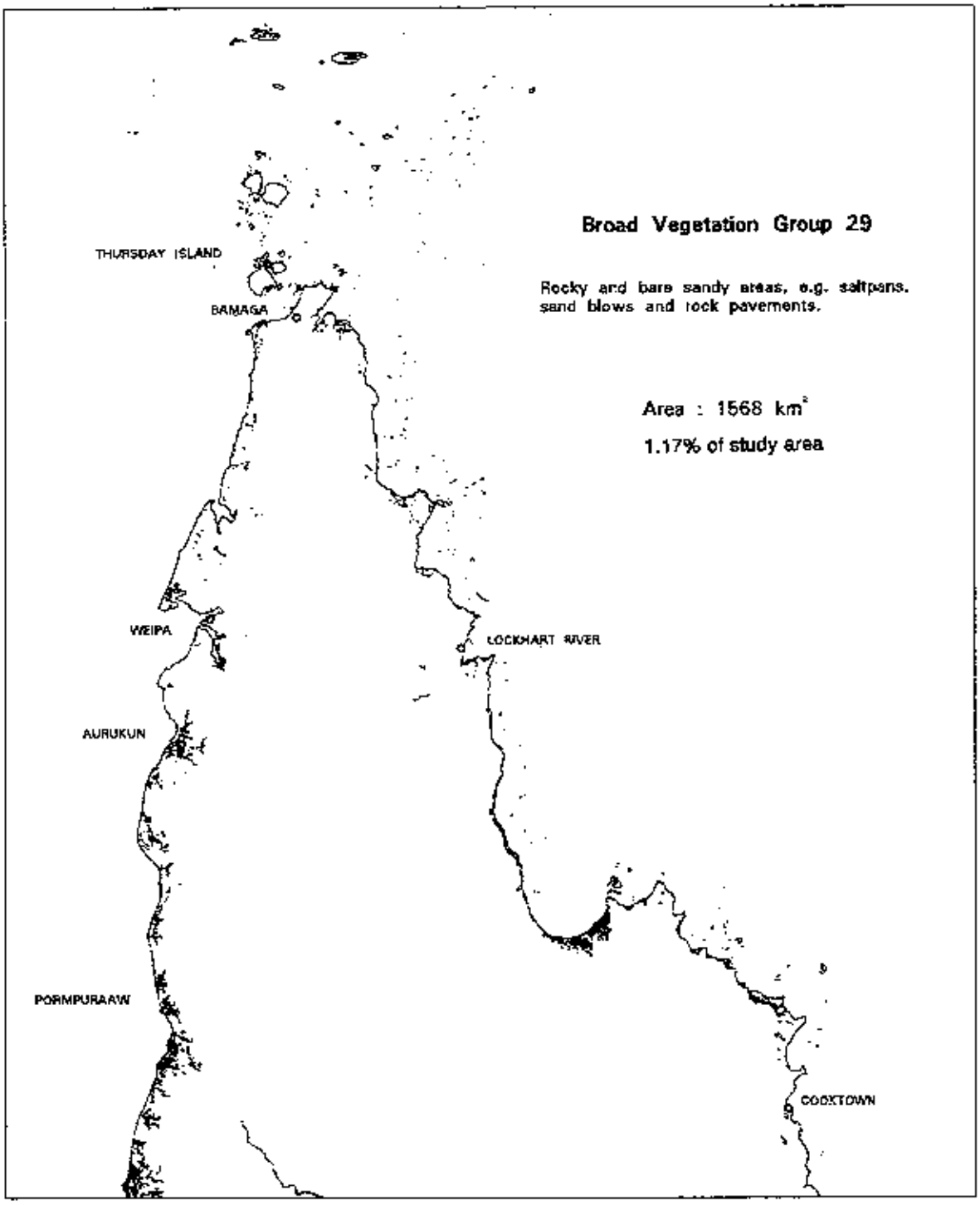


Figure 34. Spatial distribution of broad vegetation group 29.

3.32 BVG 30. Miscellaneous vegetation group dominated by *Acacia* spp. or members of the Myrtaceae family occurring on a variety of landforms

Predominant landforms:

Low hills (37%), erosional plains (13%), flood plains (11%), rises (7%), hills (7%) & alluvial plains (6%)

Predominant geology:

Holocene sand (TQs)	(27%)	Colluvia (quartzose sands)
Helby Beds (JKb)	(16%)	Sedimentary (clayey quartzose sandstones)
Quaternary sand (Qa)	(13%)	Alluvia (quartzose sands)
Tertiary laterite (T&Qf)	(13%)	Tertiary remnants (ferricrete)

Predominant soil map units:

Harmer (Hm)	(13%)	Yellow Kandosols
Emma (Em)	(10%)	Red Kandosols
Dixie (Dx)	(9%)	Bleached-Orthic Tenosols
Clark (Cr)	(8%)	Yellow Kandosols
Grevil (Gv)	(7%)	Semiaquic Podosols
Witchura (Wu)	(6%)	Red Kandosols

Vegetation map units:

Open-forests

35 (2.4%) *Acacia shirleyi* (Rocky rises, southern CYP)

Woodlands

107 (3.8%) *Melaleuca viridiflora, Asteromyrtus brassii* ± *Meleleuca stenostachya* (Metamorphic hills, Wattle Hills)

108 (2.5%) *Melaleuca viridiflora, Asteromyrtus brassii* ± *Melaleuca stenostachya* (Flat sandplains, south of Lockhart River)

110 (50.8%) *Thryptomene oligandra* ± *Neofabricia mjoebergii* ± *Melaleuca viridiflora* ± *Grevillea pteridifolia* ± *Acacia torulosa* (Drainage depressions)

Low open-forests

134 (0.6%) *Acacia brassii* (Northern ranges and islands)

135 (20.5%) *Asteromyrtus brassii, Neofabricia myrtifolia, Allocasuarina littoralis* ± *Welchiodendron longivalve* (Northern CYP, sandy plateaus)

140 (5.3%) *Neofabricia myrtifolia, Asteromyrtus brassii, Lophostemon suaveolens, Leucopogon yorkensis* ± *Callitris intratropica* emergents (Elliot Creek)

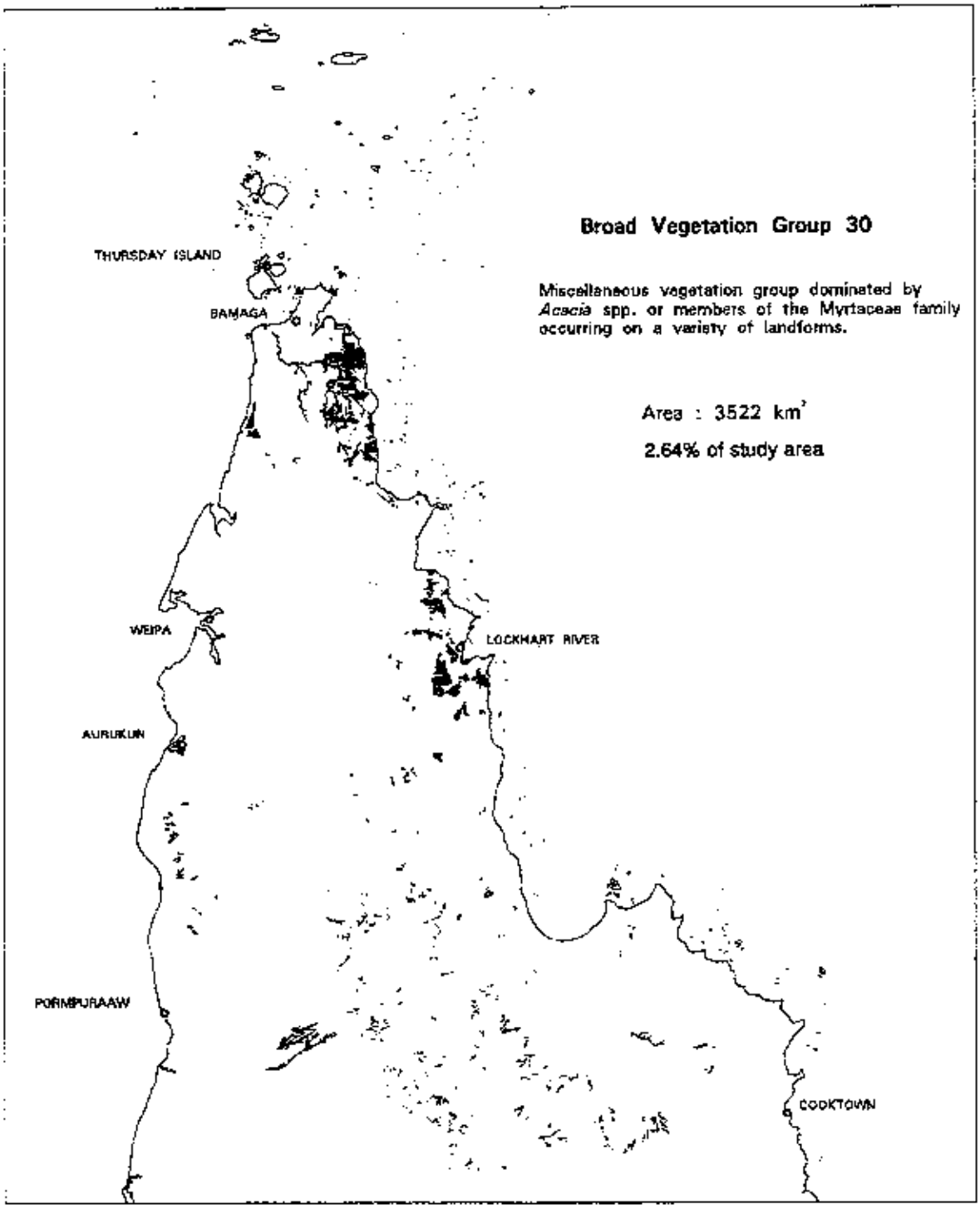


Figure 35. Spatial distribution of broad vegetation group 30.

Low woodlands

141 (0.4%) *Allocasuarina littoralis* ± *Acacia crassicarpa* ± *Grevillea glauca* ± *Melaleuca viridiflora* (Sandstone plateaus)

146 (10.1%) *Melaleuca viridiflora* ± *Neofabricia myrtifolia* ± *Allocasuarina littoralis* ± *Asteromyrtus brassii* ± *Acacia* spp. (Undulating plains, thin sand cover)

148 (0.4%) *Welchiodendron longivalve, Melaleuca viridiflora* ± *Neofabricia myrtifolia* ± *Acacia brassii* (Ridge crests, Iron Range area)

Tall shrublands

163 (2.1%) *Leptospermum purpurascens* (Granite hills, Pascoe River area)

Tall open-shrublands

166 (1.1%) *Neofabricia myrtifolia, Acacia calyculata, Jacksonia thesioides* ± *Leptospermum purpurascens* (Sandstone breakaways, Janet Range)

3.33 Vegetation summary

The vegetation of Cape York Peninsula is dominated by *Eucalyptus* spp. woodlands, open-woodlands and open-forests, which occupy 64% of the study area (see Table 7). This dominance of eucalypt savannas is repeated in other tropical areas of northern Australia.

Table 7. Extent of amalgamated broad vegetation groups

Amalgamated Broad Vegetation Groups	Area (sq km)	%Total Area
Eucalyptus spp. dominated woodlands, open-woodlands and open forests	85 417	64.0
Melaleuca spp. dominated low open-woodlands, low woodlands and tall shrublands	19 013	14.2
Grasslands and grassy open-woodlands	8 110	6.1
Closed-forests (excluding mangroves)	7 482	5.6
Heathlands	4 461	3.3
Miscellaneous communities (including mangroves, littoral vegetation and wetlands)	9 056	6.8
TOTAL	133 539	100.0

The messmate (*Eucalyptus tetrodonta*) dominated woodlands and tall woodlands (groups 16 and 17) are the most extensive, occupying 36.3% of the study area (see Table 8). *E. tetrodonta* dominates large areas in the Top End of the Northern Territory (Wilson, Brocklehurst, Clark and Dickinson, 1990) and significant areas in the Kimberley (Beard 1979). Darwin Woollybutt (*Eucalyptus miniata*) is a frequent codominant or dominant species with *E. tetrodonta* for large areas in the Northern Territory, but occurs in Queensland only south of 16°S.

Eucalyptus hylandii and/or *E. tetrodonta* dominated woodlands occurring on sandstone, metamorphic and ironstone ranges occupy 7.3% of the study area. Other larger broad vegetation groups dominated by *Eucalyptus* spp. are group 8 (5.6%), which is dominated by the bloodwoods (*E. clarksoniana, E. novoguinensis* and *E. polycarpa*); group 7 (5.0%), dominated by the boxes (*E. chlorophylla, E. microtheca* and *E. acroleuca*); group 9 (4.0%) dominated by the ironbarks (*E. cullenii* and *E. crebra*) and box (*E. persistens* subsp. *tardecidens*); and group 11 (3.1%), dominated by Molloy box (*E. leptophleba*).

Table 8. Extent of *Eucalyptus* spp. dominated communities

Broad Vegetation Group		Area (sq km)	%Area
16.	Woodlands and tall woodlands dominated by *Eucalyptus tetrodonta* on deeply weathered plateaus and remnants	25 910	19.4
17.	Woodlands dominated by *Eucalyptus tetrodonta* on erosional surfaces and residual sands	22 527	16.9
10.	Woodlands dominated by *Eucalyptus hylandii* var. *hylandii* or *E. tetrodonta* on sandstone, metamorphic and ironstone ranges	9 690	7.3
8.	Woodlands and open-woodlands dominated by *Eucalyptus clarksoniana, E. novoguinensis* or *E. polycarpa*	7 520	5.6
7.	Woodlands and open-woodlands dominated by *Eucalyptus chlorophylla, E. microtheca* or *E. acroleuca*	6 695	5.0
9.	Woodlands and open-woodlands dominated by *Eucalyptus cullenii, E. crebra* or *E. persistens* subsp. *tardecidens*	5 299	4.0
11.	Open woodlands and woodlands dominated by *Eucalyptus leptophleba* on river frontages and northern undulating plains	4 079	3.1
13.	Open-forests and woodlands dominated by *Eucalyptus nesophila* or *E. hylandii* var. *campestris*	1 240	0.9
12.	Woodlands dominated by *Eucalyptus leptophleba, E. platyphylla* or *E. erythrophloia* on undulating hills and plains in the south-east	1 192	0.9
15.	Open-forests and woodlands dominated by *Eucalyptus tessellaris, E. clarksoniana* or *E. brassiana* on coastal plains and ranges	1 155	0.9
14.	*Eucalyptus* spp. open-forests of the Wet Tropics region	110	0.1
TOTAL		85 417	64.0

The next most extensive vegetation group is the low open-woodlands, low woodlands and tall shrublands dominated by *Melaleuca* spp. (14.2% of total area), in particular *Melaleuca viridiflora* (broad vegetation group 18) which covers 10.4% of the study area.

Grasslands (6.1%), rainforests (5.6%) and heathlands (3.3%) are the next most extensive vegetation types.

Table 9 lists the 30 broad vegetation groups in decreasing order of areal extent.

Table 9. Broad Vegetation Groups in decreasing order of areal extent

	Broad Vegetation Group	Area (sq km)	% Area
16.	Woodlands and tall woodlands dominated by *Eucalyptus tetrodonta* on deeply weathered plateaus and remnants	25 910	19.4
17.	Woodlands dominated by *Eucalyptus tetrodonta* on erosional surfaces and residual sands	22 527	16.9
18.	Low open-woodlands and low woodlands dominated by *Melaleuca viridiflora* on depositional plains	13 904	10.4
10.	Woodlands dominated by *Eucalyptus hylandii* var. *hylandii* or *E. tetrodonta* on sandstone, metamorphic and ironstone ranges	9 690	7.3
8.	Woodlands and open-woodlands dominated by *Eucalyptus clarksoniana, E. novoguinensis* or *E. polycarpa*	7 520	5.6
7.	Woodlands and open-woodlands dominated by *Eucalyptus chlorophylla, E. microtheca* or *E. acroleuca*	6 694	5.0
21.	Tussock grasslands on marine and alluvial plains	5 396	4.0
9.	Woodlands and open-woodlands dominated by *Eucalyptus cullenii, E. crebra* or *E. persistens* subsp. *tardecidens*	5 299	4.0
24.	Open-heaths and dwarf open-heaths on dunefields, sandplains and headlands	4 461	3.3
11.	Open-woodlands and woodlands dominated by *Eucalyptus leptophleba* on river frontages and northern undulating plains	4 078	3.1
30.	Miscellaneous vegetation group dominated by *Acacia* spp. or members of the Myrtaceae family occurring on a variety of landforms	3 522	2.6
6.	Gallery closed-forests and *Melaleuca* spp. dominated open-forests on alluvia	3 358	2.5
20.	Low open-woodlands and tall shrublands dominated by *Melaleuca stenostachya, M. citrolens* or other *Melaleuca* spp.	3 282	2.5
19.	Open-forests and low open-forests dominated by *Melaleuca* spp. in seasonally inundated swamps	1 827	1.4
2.	Closed-forests of the McIlwraith-Iron Range region	1 805	1.4

Broad Vegetation Group		Area (sq km)	% Area
23.	Tussock grasslands on longitudinal drainage depressions, headlands or continental islands	1 714	1.3
26.	Closed-forests and low closed-forests dominated by mangroves	1 594	1.2
29.	Rocky and bare sandy areas, eg. saltpans, sand blows and rock pavements	1 568	1.2
27.	Sedgelands, lakes and lagoons	1 360	1.0
13.	Open-forests and woodlands dominated by *Eucalyptus nesophila* or *E. hylandii* var. *campestris*	1 240	0.9
12.	Woodlands dominated by *Eucalyptus leptophleba, E. platyphylla* or *E. erythrophloia* on undulating hills and plains in the south-east	1 192	0.9
15.	Open-forests and woodlands dominated by *Eucalyptus tessellaris, E. clarksoniana* or *E. brassiana* on coastal plains and ranges	1 155	0.9
22.	Closed-tussock grasslands and open-woodlands on undulating clay plains	1 000	0.8
25.	Woodlands and herblands on beach ridges and the littoral margin	981	0.7
3.	Closed-forests of northern Cape York Peninsula and the Torres Strait Islands	752	0.6
5.	Deciduous low closed-forests on slopes and alluvia.	615	0.5
1.	Closed-forests of the Wet Tropics region	521	0.4
4.	Closed-forests of coastal dunes, dunefields and the Jardine River frontage	430	0.3
14.	*Eucalyptus* spp. open-forests of the Wet Tropics region.	110	0.1
28.	Vegetation of the coral atolls, shingle cays and sand cays	31	0.02

4.0 VEGETATION MAPPING GIS INFORMATION

4.1 Vegetation mapping coverage

The vegetation mapping coverage was constructed using ARC/INFO Version 6.1.1 on a SPARC station IPC. It consists of the line (arc) coverage storing the vegetation mapping boundaries, and the polygon coverage, representing unique mapping areas (UMAs) with specific vegetation attribute information. The coverage contains information on up to four natural vegetation units and two disturbed vegetation units that make up each polygon together with the percentage contribution of each for the 17 444 polygons.

VEG.PAT - polygon attribute table

4.2 Vegetation point attribute tables

Three vegetation point attribute tables that store a number of attributes from the site database:

SITE.PAT - detailed site table
OBS.PAT - observational point table
HELI.PAT - helicopter observation table

4.3 Lookup tables

VEG.LEG - brief descriptions of the 201 natural and 8 disturbed vegetation units
VEG.STR - descriptions of the 21 vegetation structural formations
VEG.BVG - descriptions of the 30 broad vegetation groups
VEG.REL - relates the attributes in the other 3 tables

4.4 CORVEG site database

The complete CORVEG site database has been submitted to the CYPLUS GIS.

4.5 Standard documentation files

There are a number of standard documentation files attached to the digital coverage;

VEG.DCT - data dictionary file defines the attributes used in the vegetation coverage
VEG.QAL - data quality file discusses the derivation of the line work, positional accuracy, logical consistency and completeness of the polygon coverage
VEG.RME - read me file describes the basic settings of the GIS coverage
VEG.TBA - FINDAR information file
VEG.TBB - FINDAR information file

4.6 Access to information

The vegetation coverage resides on the CYPLUS GIS at Department of Lands (Brisbane) and NRIC (Canberra), and on the Queensland Herbarium GIS at Indooroopilly. A Memorandum of Understanding regarding the use of this data exists under CYPLUS. A few additional conditions of use are required from the data custodian, The Chief Botanist, Queensland Herbarium, Meiers Road, Indooroopilly, Q, 4880.

5.0 FLORISTICS

5.1 Floristic notes

The flora of Cape York Peninsula is summarised statistically in Tables 10 to 13. The total number of vascular species recorded is 3338. This is 805 greater than that recorded by Clarkson and Kenneally (1988) in their comparative analysis of the Cape York and Kimberley floras. Care should be taken however, in making direct comparisons between the figures quoted here and those given by Clarkson and Kenneally. Only published names were used in the earlier analysis whereas recognised but undescribed species have been included in the present study. If the figures given here are discounted for these undescribed species the net increase in total vascular species is 582. This still represents a significant increase (23%) and the results of recent field studies suggest that the numbers will continue to increase for some years yet. Interesting finds are liable to come from wet season collecting when short-lived ephemerals appear briefly or as previously uncollected areas are systematically surveyed by botanists familiar with the flora of the Peninsula.

Table 10. Summary of the vascular flora

	Pteridophytes	Gymnosperms	Angiosperms	Total
Families	30	5	183	218
Genera	73	6	1,118	1,197
Species	157	8	3,173	3,338

Table 11. Ranking of the 10 largest families based on the number of genera listing the number of genera and their percentage of the total vascular genera

Family	No. of Genera	Percentage
Poaceae	93	7.7
Orchidaceae	62	5.1
Fabaceae	56	4.6
Euphorbiaceae	45	3.7
Asteraceae	45	3.7
Rubiaceae	35	2.9
Myrtaceae	32	2.6
Sapindaceae	26	2.1
Cyperaceae	23	1.9
Rutaceae	20	1.6

Table 12. **Ranking of the 10 largest families based on the number of species listing the number of native species and the percentage of the total species**

Family	No. of Species	Percentage
Poaceae	313	9.3
Cyperaceae	184	5.5
Fabaceae	182	5.4
Myrtaceae	173	5.1
Orchidaceae	168	5.0
Euphorbiaceae	141	4.2
Rubiaceae	106	3.1
Sapindaceae	79	2.3
Mimosaceae	68	2.0
Lauraceae	66	1.9

Table 13. **Genera with 10 or more species ranked by the number of species**

Cyperus	64	*Endiandra*	14
Acacia	48	*Plectranthus*	14
Dendrobium	44	*Elaeocarpus*	14
Eucalyptus	44	*Diospyros*	14
Fimbristylis	41	*Aristida*	13
Syzygium	33	*Bulbophyllum*	13
Ficus	29	*Dysoxylum*	13
Cryptocarya	27	*Eriocaulon*	13
Eragrostis	25	*Eleocharis*	13
Mitrasacme	23	*Brachychiton*	12
Ipomoea	21	*Panicum*	12
Scleria	20	*Digitaria*	12
Eriachne	19	*Terminalia*	12
Phyllanthus	19	*Planchonella*	11
Euphorbia	18	*Spermacoce*	11
Solanum	17	*Polygala*	11
Canthium	17	*Brachiaria*	11
Melaleuca	17	*Glochidion*	11
Tephrosia	17	*Croton*	11
Crotalaria	17	*Rhynchospora*	11
Stylidium	16	*Cissus*	10
Austromyrtus	16	*Psychotria*	10
Utricularia	16	*Grevillea*	10
Desmodium	16	*Hibiscus*	10
Pandanus	15	*Capparis*	10
Indigofera	15	*Parsonsia*	10
Amyema	14		

In an attempt to determine which areas have been poorly collected and might warrant further study, the total number of specimens held by the Queensland Herbarium (BRI) was calculated for a grid based on 30 minutes of latitude by 30 minutes of longitude. The results are shown in Figure 36. This clearly shows that collecting effort to date has concentrated mainly in areas of closed-forest. A vast area in the southwest remains under collected. Recent field studies have shown that detailed collecting in the isolated closed-forest pockets of BVG 3 and BVG 5 has the potential to yield significant additions to the flora.

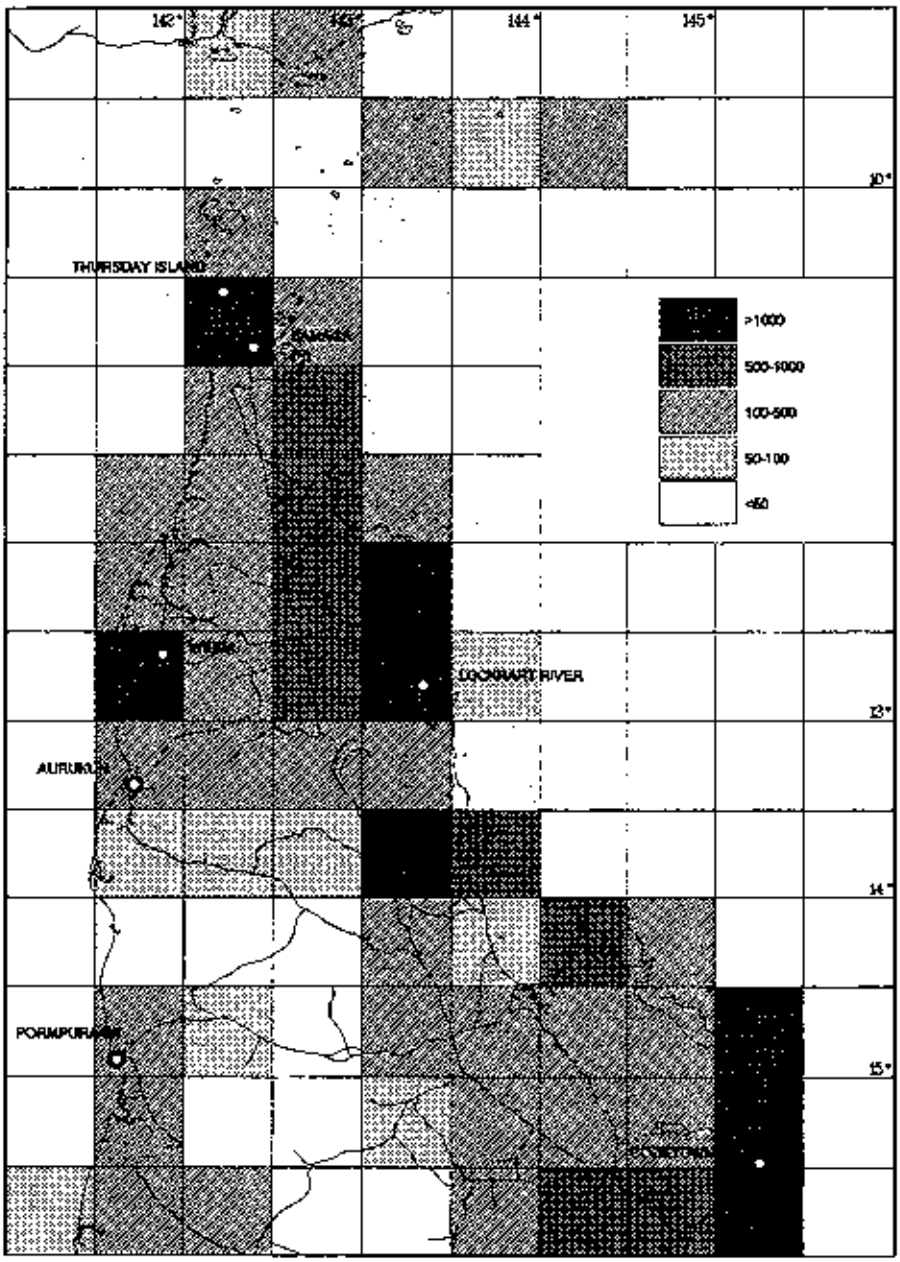


Figure 36. Distribution of the number of plant collections held by the Queensland Herbarium for the study area.

Plant taxonomy is a dynamic science and species numbers will change as field work or herbarium studies reveal previously unrecognised taxa. A conservative estimate suggests that approximately 225-250 species (6.5-7.5%) of the flora remains undescribed. This includes recognised but undescribed species and species where taxonomic opinion suggests that the names in current use are misapplied. A significant proportion of these plants were discovered for the first time in the course of the CYPLUS project. A full list of plants known to occur in the study area has been prepared (see Appendix 2 for example pages) and will be published soon (Clarkson & Neldner in prep).

5.2 Alien plants

Exotic species which have become naturalised account for 7.4% of the total vascular flora. While this is still low in comparison to the contribution these species make to the floras of more closely settled areas (see figures quoted by Clarkson & Kenneally 1988), it represents an increase of almost 106% in the number of aliens recorded for the area since the last similar analysis of the flora was undertaken less than 10 years ago (Clarkson and Kenneally 1988). This is more than 4.5 times the corresponding increase in native species added to the list in the same time. As land use patterns change leading to more extensive clearing, increased use of exotic pasture species and the importation of materials and machinery, this alarming trend is likely to continue. While the risk of undesirable species reaching Cape York Peninsula from the north is being carefully monitored by quarantine authorities, movement from the south is receiving little attention. A list of alien plant species recorded on Cape York Peninsula is given in Appendix 3. The distribution and impact of naturalised exotic species is being assessed as part of the CYPLUS Land Use Program.

5.3 Rare or threatened plants

Plants may be considered rare or threatened for a variety of reasons. They may be known from only a few herbarium specimens or in the field from only a few isolated localities. They may have been common at one time but disturbances such as land clearing, altered fire regimes or the impact of feral animals may have lead to severe depletion of natural populations. In many cases however, a poor knowledge of the occurrence of the plant in the field can result in a degree of uncertainty being associated with the status assigned to many species. These are coded K. Extensive collecting and field observation associated with the vegetation mapping program has removed many of these uncertainties from the list for Cape York Peninsula. However, 27% of the plants listed still fit into this category. These species are not afforded any special consideration under nature conservation legislation in Queensland. Taxa included under this category are currently being assessed for listing under an acceptable category or for deletion.

The 379 taxa listed as rare or threatened by the Queensland Herbarium (1994) and known to occur on Cape York Peninsula are listed in Appendix 4. This represents 10.7% of the total flora or 7.9% if the taxa coded K are disregarded. A summary is provided in Table 14. The criteria for derivation of the codes X, E and V are those defined by the Endangered Flora Network for the Australian and New Zealand Environmental and Conservation Council (ANZECC 1993). The codes for R & K are derived using the criteria of Thomas and McDonald (1989).

Table 14. Summary of taxa considered rare or threatened

	Extinct (X)	Endangered (E)	Vulnerable (V)	Rare (R)	Poorly Known (K)
Ferns	0	3	3	7	6
Gymnosperms	0	0	1	0	0
Angiosperms	0	12	45	206	96
Total	0	15	49	213	102

X - Presumed extinct
E - Endangered and at risk of disappearing from the wild state within 10 to 20 years if present land use and other casual factors continue to operate
V - Vulnerable but not presently endangered
R - Rare but not considered endangered or vulnerable
K - Poorly known but suspect of being at risk

The conservation status assigned to any taxon is dependent on the current knowledge of distribution and threatening processes. The coding assigned can be altered if there is a change in either. For example, *Neofabricia mjoebergii, N. sericisepala* and *Decaschistia peninsularis* were removed from the list when observations made in the course of field survey associated with this project showed these plants to be more widely distributed than originally thought (Neldner 1993). The conservation of rare or threatened species is being reviewed under the CYPLUS Land Use Program. Reassessment of the coding assigned to any species will require ratification by the Queensland scientific advisory committee.

Over half (56%) of the species listed for Cape York Peninsula fall into the rare but not endangered or vulnerable category (R). Discounting the total species listed for those which are poorly known and thus coded K, this figure rises to 77%. This high figure is a reflection of current land use based largely on extensive rather than intensive practices. A shift towards projects requiring more intensive development particularly widespread clearing or disturbance of key areas would probably be followed by an increase in the numbers of taxa coded E and V.

6.0 USERS AND POTENTIAL USERS

6.1 Introduction

While vegetation and land resource surveys are expensive projects, they will repay the investment many times over in the long term. By providing inventories of natural resources, land surveys allow informed management decisions to be made. Benefits such as the prevention of soil losses or land degradation, and the preservation of endangered species or communities, are not easily quantified in economic terms. However, Dent and Young (1981) estimate that for both Australia and the United States of America, benefit-cost ratios for land resource surveys are in the order of 40:1 or 50:1.

This survey of Cape York Peninsula maps the natural vegetation at 1:250 000 scale, using a uniform methodology over the whole study area. Natural vegetation is a good indicator of resource potential, as it reflects the climate, soils, regolith and history of a site (Webb *et al.* 1970; Havel 1981; Kirkpatrick and Dickinson 1986; Gunn *et al.* 1988). The scale of mapping is regional with applications including the assessment of development potential, pasture production areas, national and regional resource inventory (Reid 1988). The GIS vegetation coverage is seen as one of the key coverages for future planning and the development of a land use strategy for Cape York Peninsula.

6.2 CYPLUS users

Before the vegetation coverage was finalised in August 1994, a number of CYPLUS NRAP projects had accessed and used the mapping and site data. The Terrestrial Fauna Survey (NR03) ,the Marine Plant Distribution NR06) and Ecology of Golden Shouldered Parrots (NR21) acquired hard copy maps, while the Wetland Fauna Survey (NR09) and Environmental Region Analysis (NR11) acquired a digital coverage. The Flora Data and Modelling (NR18) project relied heavily upon site data.

The vegetation coverage has been used by a number of projects in the Land Use Program. Amalgamation of mapping units were used to derive "country type" maps by Gary Cotter for his study of the pastoral industry on Cape York Peninsula (Cotter 1994). These maps are also being used by the Pasture Production project. Crowley (1994) in her analysis of Fire on Cape York Peninsula derived amalgamated vegetation types from the GIS coverage. The Forest Assessment group acquired digital coverage of the high production *Eucalyptus tetrodonta* woodlands. The Department of Environment and Heritage and Australian Heritage Commission are using both the GIS coverage and site data in the Conservation and Natural Heritage Assessment projects.

6.3 Non-CYPLUS users

The GIS coverage and associated site data are being recognised as a key data set by workers across a wide range of disciplines. Numerous requests for information have been processed to date. Some examples follow. A vegetation map was acquired by Greg Calvert (James Cook University student) for ethnobotanical studies in the Hopevale area (Calvert 1993). Vegetation coverages have been used for property planning on a number of Cape York Peninsula properties, eg Kendall River, Olive Vale, by officers of the

Queensland Department of Primary Industries. Hard copy vegetation maps have also been supplied to the Injinoo and Kowanyama Community Councils. The Defence Department has used the digital vegetation coverage to assist in updating the land cover maps. Sections of the mapping coverage have been acquired by consultants, e.g. Environmental Science and Services (NQ) (1994), for a variety of environmental studies. The National Forest Inventory (NFI) has recently requested both the point and polygon data in digital form.

6.4 Future uses

The traditional uses of vegetation surveys and maps include strategic and regional planning, property planning, infrastructure planning, development control, environmental impact assessment, community participation, research and teaching, conservation, fauna distribution, forestry and military uses, and have been discussed more fully by Neldner (1993). Additional innovative uses are likely to appear as GIS technology becomes more widely applied.

The demand for vegetation information for these purposes will increase as government departments, land use planners and property owners embrace policies aimed at the sustainable land use and management (QDPI 1994). The vegetation mapping coverage of Cape York Peninsula is both a historical and geographical reference. Analyses can be made of the changes to the landscape over time. For example, a recent study by Smith, Shields and Danaher (1994) has used the vegetation survey of Neldner (1984) and a number of CSIRO land resource surveys to examine clearing of vegetation over time in South Central Queensland. Hopefully, informed planning decisions will prevent land degradation, but where areas require rehabilitation, this survey will provide information on the plants that are adapted to particular areas.

7.0 CONCLUSIONS

While vegetation and land resource surveys are expensive projects, they will repay the investment many times over in the long term. By providing inventories of natural resources, land surveys allow informed management decisions to be made. Benefits such as the prevention of soil losses or land degradation, and the preservation of endangered species or communities, are not easily quantified in economic terms. However, it has been estimated that benefit-cost ratios for land resource surveys are in the order of 40:1 or 50:1.

This survey of Cape York Peninsula maps the natural vegetation at 1:250 000 scale, using a uniform methodology over the whole study area. 201 natural and 8 disturbed vegetation units have been recognised and spatially delineated in 17 444 Unique Mapping Areas (UMAs). This is a quantum increase in the level of mapping compared to the 26 vegetation map units recognised by Pedley and Isbell (1971) in the previously most comprehensive mapping of Cape York Peninsula vegetation.

Natural vegetation is a good indicator of resource potential, as it reflects the climate, soils, geology, regolith and history of a site. The relationships between the vegetation cover and underlying soil, geology and landforms has been analysed by intersecting the vegetation cover with the CYPLUS soils (NR02), geology (NR05) and regolith (NR12) coverages. The scale of mapping is regional with applications including the assessment of development potential, pasture production areas, national and regional resource inventory. The GIS vegetation coverage is being used as one of the key coverages for future planning and the development of a land use strategy for Cape York Peninsula. To assist in the regional analyses of the study area, the 201 map units have been combined into 30 broad vegetation groups.

Another major increase in knowledge has been in the distribution of individual plant species. 1473 detailed sites recording structural and floristic data on all the species present at a site have been collected. In addition, 5700 vehicle observational sites and 2650 helicopter observations have been recorded. More than 4000 herbarium specimens, some new to science, have been collected and distributed to herbaria in Australia and overseas. These specimens have been used by botanists all over the world for taxonomic studies. The site information is being used extensively in the CYPLUS flora data modelling project (NR18) and the nature conservation and natural heritage assessment project of the Land Use Program.

The data produced by this survey will remain as a reference point for all studies in the future. It will allow monitoring of changes in the spatial distribution and composition of the vegetation to be documented. Much further analysis is required to fully explore the information contained in the data. More comprehensive description and analysis of the flora and vegetation of Cape York Peninsula is being prepared for the companion volumes, *Plants of Cape York Peninsula* (Clarkson and Neldner in prep.) and *Vegetation of Cape York Peninsula* (Neldner and Clarkson in prep.)

8.0 ACKNOWLEDGMENTS

We would like to acknowledge the dedicated and competent work of our technical assistants at the Queensland Herbarium, without whom the deadlines for this project would not have been met:

- Jack Kelley (Indooroopilly) produced the vegetation coverage, being involved in all processes from the transfer of linework from the aerial photographs, to the final editing and checking of the digital coverage.
- Damian Milne (Mareeba) performed a variety of tasks including field assistance, database manipulation, transcribing tape transcripts, processing of herbarium specimens and producing graphics from the GIS coverages.
- Val Halbert (Mareeba) entered, checked and edited the substantial CORVEG database.
- Ceri Pearce (Mareeba) assisted with data entry and checking, processing of herbarium specimens and a variety of other tasks.
- Hans Dillewaard (Indooroopilly) assisted us with the customising of CORVEG for our requirements and wrote a number of retrieval programs to enable efficient analysis of the data.

The staff of the Queensland Herbarium (Indooroopilly) gave excellent administrative and technical support. Others who assisted in Mareeba include Lorraine Higgins, Marg Hudson and George Precoma.

Joint field trips with Andrew Biggs, Seonaid Philip and Peter Wilson of CYPLUS NR02 soils mapping and David Fell and Peter Stanton of NR01 rainforest inventory were enjoyable and enlightening. Peter Stanton also provided a spare seat during helicopter surveying of two National Parks. Bob Reid and Kerry Trapnell of the CYPLUS taskforce provided organisational support. CYPLUS projects NR02 (soils), NR12 (regolith) and NR05 (geology) provided access to their digital GIS coverages, and Fell and Stanton provided their site data. The team at ERIN (NR18) performed a number of analyses on the vegetation data. Professor Henry Nix and Janet Stein of the Centre of Resource and Environmental Studies (CRES), Australian National University, provided advice and programming assistance for performing the numerical analyses. Barbara Waterhouse of Department of Primary Industries, Mareeba assisted with the checking of the mapping of the northern Torres Strait Islands.

The Corporate Services support staff and Geographic Information Systems (GIS) staff at the Department of Primary Industries, Mareeba are thanked for word processing and technical GIS advice respectively. Helicopter pilots Don Blanch, Mark Daunt, James Lake, Mark Phillips and Perry Scholte provided safe transport in often challenging conditions.

The Australian Geographic Society Inc. and Royal Geographical Society of Queensland Inc. provided accommodation and logistic support for wet season expeditions held 9-17 June 1990 and 25 February - 10 March 1992 respectively. The residents of Cape York Peninsula for providing access, advice and assistance throughout the field seasons.

We would like especially like to pay tribute to our families who have endured our long absences in the field which were necessary to complete this work and who have supported us in the work.

9.0 REFERENCES

AUSLIG (1990). *Atlas of Australian Resources. Vegetation. Third Series*. Vol. 6. Australian Surveying and Land Information Group, Canberra.

Austin, M. P. and Belbin, L. (1982). A new approach to the species classification problem in floristic analysis. *Australian Journal of Ecology*, 7, 75-89.

AGSO (1994a). *Regolith of Cape York Peninsula*. Cape York Peninsula Land Use Strategy (CYPLUS). 1:250000 mapping coverage. Australian Geological Survey Organisation.

AGSO (1994b). *Geology of Cape York Peninsula*. Cape York Peninsula Land Use Strategy (CYPLUS) 1:250000 mapping coverage. Australian Geological Survey Organisation.

Beadle, N. C. W. and Costin, A. B. (1952). Ecological classification and nomenclature. *Proceedings of the Linnean Society of New South Wales*, 77, 61-82.

Beard, J. S. (1979). *Kimberley. Explanatory notes to sheet 1. Vegetation Survey of Western Australia*. University of Western Australia, Nedlands, Western Australia.

Beard, J. S. and Webb, M. J. (1974). *Great Sandy Desert. Explanatory notes to sheet 2. Vegetation Survey of Western Australia*. University of Western Australia, Nedlands, Western Australia.

Bedward, M., Keith, D. A. and Pressey, R. L. (1992). Homogeneity analysis: Assessing the utility of classifications and maps of natural resources. *Australian Journal of Ecology*, **17**, 133-139.

Belbin, L. (1988). *PATN, Pattern Analysis Package*. Reference Manuals. CSIRO Division of Wildlife and Rangelands Research, Canberra.

Belbin, L., Faith, D. P. and Mulligan, G. W. (1992). A comparison of two approaches to β-flexible clustering. *Multivariate Behavioural Research* **27**, 417-433.

Biggs, A. J. W. and Philip, S. R. (1994). *Soils of Cape York Peninsula*. Cape York Peninsula Land Use Strategy (CYPLUS) NR02 Report.

Blandford, D.C. and Associates Pty Ltd (1994). Skardon Kaolin Project. Environmental Impact Statement. Unpublished report.

Bleeker, P. and Laut, P. (1987). *A Soil Survey and Land Evaluation for Oil Palm and Cashew Nut of the Lockhart River Valley, Cape York, Queensland*. Divisional Report 87/1. CSIRO, Canberra.

Boyland, D. E. (1984). Vegetation Survey of Queensland. South Western Queensland. *Queensland Botany Bulletin*, 4.

Byrnes, N. B., Everist, S. L. and Reynolds, S. T. (1977). The vegetation of Lizard Island, North Queensland. *Proceedings of the Royal Society of Queensland*, **88**, 1-15.

Calvert, G. A. (1993). Dissertation on Ethnobotany of the Guugu Yimithirr Aboriginal Community (Hopevale, Cape York Peninsula). Unpublished Honors thesis, James Cook University, Townsville.

Clarkson, J. R. (1982). A Vegetation Survey of Special Bauxite Mining Lease 9, Aurukun. Department of Primary Industries, Brisbane.

Clarkson, J. R. and Kenneally, K. F. (1988). The floras of Cape York and the Kimberleys: a preliminary comparative analysis. *Proceedings of the Ecological Society of Australia*, **15**, 259-266.

Clarkson, J. R. and Neldner, V. J. (in prep.). *Plants of Cape York Peninsula. Vegetation Survey of Queensland.* Far Northern Queensland. Vol 1. Queensland Botany Bulletin, Queensland Herbarium, Queensland Department of Environment and Heritage, Brisbane.

Connell Wagner. (1989). *Cape York Peninsula Resource Analysis*. Department of the Premier, Economic Trade and Development, Brisbane.

Cotter, G. F. (1994). *A Study of the Pastoral Industry of Cape York Peninsula*. Queensland Department of Lands, Cape York Peninsula Land Use Strategy (CYPLUS) report.

Crowley, G. M. (1994). *Fire on Cape York Peninsula*. Cape York Peninsula Land Use Strategy (CYPLUS) Land Use Program report.

Danaher, K. F. (1994). *Marine Vegetation Project*. Draft Report. Cape York Peninsula Land Use Strategy (CYPLUS) and Natural Resources Analysis Program (NRAP)

Dent, D. and Young, A.(1981). *Soil Survey and Land Evaluation*. George Allen and Unwin, London.

Department of Forestry (1988). *Far Northern Queensland. 1:500 000 map*. Government Printing Office, Brisbane.

Environmental Science and Services (NQ) (1994). Torres Strait. Vegetation Mapping and Review. Unpublished report prepared for Island Co-ordinating Council, Cairns.

Galloway, R. W., Gunn, R. H. and Story, R. (1970). *The Lands of the Mitchell - Normanby Area, Queensland*. CSIRO Land Research Series, No. 26.

Gasteen, W. J. (1982). Lakefield National Park. A description of the natural environment. Unpublished report for the Queensland National Parks and Wildlife Service, Cairns.

Godwin, M. D. (1985). Land Units of the Weipa Region of Australia's Cape York Peninsula. Unpublished report for the Queensland National Parks and Wildlife Service, Cairns.

Grosenbaugh, L. R. (1952). Plotless timber estimates. *Journal of Forestry*, **52**, 32-37.

Grundy, M. J. and Heiner, I. J. (1991). *Soil associations of Batavia Downs. Queensland* Department of Primary Industries Establishments Publication, QR91002.

Gunn, R. H., Beattie, J. A., Riddler, A. M. H. and Lawrie, R. A.(1988). Mapping. In *Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys*, Eds. Gunn, R. H., Beattie, J. A., Reid, R. E. and Graaff van der, R. H. M. Inkata Press, Melbourne, pp. 90-112.

Gunness, A. G., Lawrie, J. W. and Foster, M. B. (1987). Land Units of the Weipa Environs. Unpublished report for Comalco Aluminium Limited, Weipa.

Gutteridge Haskins & Davey Pty Ltd (1990). Proposed airfield for the Royal Australian Air Force, Cape York Peninsula, North Queensland. Environmental Impact Statement. Unpublished report.

Havel, J. J. (1981). Vegetation classification as a basis for land use planning. In A.N. Gillison and D.J. Anderson (Eds.), *Vegetation Classification in Australia*. CSIRO and Australian National University Press, Canberra, pp. 219-226.

Hynes, R. A. and Tracey, J. G. (1980). Vegetation of the Iron Range Area, Cape York Peninsula. In *Contemporary Cape York Peninsula*, Stevens, N. C. and Bailey, A.(Eds.) Royal Society of Queensland, Brisbane, pp. 11-30, 1980.

Isbell, R. F. (1993). A Classification System for Australian Soils (3rd Approximation). Unpublished Technical Report No.2,

Isbell, R. F., Webb, A. A. and Murtha, G. G. (1968). *Atlas of Australia, Explanatory Data for Sheet 7, North Queensland*. CSIRO and Melbourne University Press,Canberra.

Kirkpatrick, J. B. and Dickinson, K. J. M. (1986). Achievements, concepts and conflicts in Australian small-scale vegetation mapping. *Australian Geographical Studies*, **24**, 222-234.

Küchler, A. W. (1967). *Vegetation Mapping*. The Ronald Press Company, New York.

Lavarack, P. S. (1977). Orchids of the Iron Range. Unpublished report to the Australian Orchid Foundation.

Lavarack, P. S. (1980). Orchids of McIlwraith Range. Unpublished report to the Australian Orchid Foundation.

Lavarack, P. S. (1984). Orchids of the Carron Valley Area. Unpublished report to the Australian Orchid Foundation.

Lavarack, P. S. (1986). Orchids of the Cape York and Jardine River Areas. Unpublished report to the Australian Orchid Foundation.

Lavarack, P. S. (1989). Orchids of the Torres Strait. Unpublished Report to the Australian Orchid Foundation.

Lavarack, P. S. and Stanton, J. P. (1977). Vegetation of the Jardine River catchment and adjacent coastal areas. *Proceedings of the Royal Society of Queensland*, **88**, 39-48.

Lavarack, P. S., Puniard, D. J. and Fell, D. G. (1990). McIlwraith Range Vegetation. A Study of the Biology of the Range with Particular Reference to the Vegetation. Unpublished Report.

Le Cussan, J. (1991). A Report on the Intertidal Vegetation of the Daintree, Endeavour and Russell/Mulgrave Rivers. Queensland National Parks and Wildlife Service, Cairns.

Le Cussan, J. (1993). Report on Estuarine Investigations from Port Stewart to Harmer Creek, Shelburne Bay. Unpublished report to the Queensland Department of Environment and Heritage.

Leigh, J., Boden, R. and Briggs, J. (1984). *Extinct and Endangered Plants of Australia.* MacMillan, South Melbourne.

Leigh, J., Briggs, J. and Hartley, W. (1981). Rare or threatened Australian plants. Australian National Parks and Wildlife Service. Special Publication, 7.

Macdonald Wagner Pty Ltd. (1986). Shelburne Silica Joint Venture, Environmental Impact Statement, Shelburne Bay. Vol. 1. Macdonald Wagner in assoc. with Environment Science and Services. Unpublished report.

McDonald, W. J. and Dillewaard, H. A. (1994). *CORVEG (Version 2.0) Vegetation and Flora Data Base for Queensland.* Queensland Herbarium, Queensland Department of Environment and Heritage, Brisbane.

Messel, H., Vorlicek, G.C., Wells, A.G., Green, W.J., Curtis, H.S., Roff,C.R.R., Weaver, C.M. and Johnson, A. (1981). *Surveys of tidal waterways on Cape York Peninsula, Queensland, Australia and their crocodile populations.* Monograph 16, Peragmon Press, Australia.

Morgan, G. (1984). Environmental Study of the Quinkan Area, North-east Queensland and Basis for Management. University of New England, Armidale.

Neldner, V. J. (1984). The Vegetation Survey of Queensland. South Central Queensland. *Queensland Botany Bulletin*, 3.

Neldner, V. J. (1991). Vegetation Survey of Queensland. Central Western Queensland. *Botany Bulletin*, 9.

Neldner, V. J. (1993). Vegetation Survey and Mapping in Queensland. *Queensland Botany Bulletin*, 12.

Neldner, V. J. (1993). The distribution and habitats of three presumed rare species from Cape York Peninsula. *Austrobaileya* **4**:121-127.

Neldner, V. J. and Clarkson, J. R. (1991). Vegetation Survey of Batavia Downs, Cape York Peninsula. *Research Establishments Publication QR91003*, Queensland Department of Primary Industries, Brisbane.

Neldner, V. J. and Clarkson, J. R. (in prep.). Vegetation of Cape York Peninsula. Vegetation Survey of Queensland, Far Northern Queensland Vol 2. *Queensland Botany Bulletin*.

Neldner, V. J. and Howitt, C. J. (1991). Comparison of an intuitive mapping classification and numerical classifications of vegetation in south-east Queensland, Australia. *Vegetatio*, **94**, 141-152.

Neldner, V. J., Crossley, D. C. and Cofinas, M. (in press). Using geographical information systems (GIS) to determine the adequacy of sampling in vegetation surveys. *Biological Conservation*.

Pedley, L. and Isbell, R. F. (1971). Plant communities of Cape York Peninsula. *Proceedings of the Royal Society of Queensland*, **82**, (5)51-74.

Pye, K. and Jackes, B. (1981). Vegetation of the coastal dunes at Cape Bedford and Cape Flattery dunefields, North Queensland. *Proceedings of the Royal Society of Queensland*, **92**, 37-42.

Queensland Department of Primary Industries (1994). The sustainable use and management of Queensland's resources. Policies and strategies. *Miscellaneous Publication QM94001*, Queensland department of Primary Industries, Brisbane.

Queensland Herbarium (1994). *Queensland Vascular Plants. Names and Distribution.* Queensland Government, Brisbane.

Reid, R. E. (1988). Soil survey specifications. In *Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys*, Eds. Gunn, R. H., Beattie, R. E., Reid, R. E. and Graaff, van der R. H. M., Inkata Press, Melbourne, pp. 60-72.

Smith, D. M., Shields, P. G. and Danaher, T. J. (1994). *An assessment of the extent of clearing in south-central Queensland.* Queensland Department of Primary Industries Land Resources Bulletin Series (QV94001), Brisbane.

Specht, R.L. (1970). Vegetation. In G.W. Leeper (Ed.), *The Australian Environment*. (4th edition). CSIRO and Melbourne University Press, Melbourne, pp. 44-67.

Specht, R.L. (1981). Foliage projective cover and standing biomass. In A.N. Gillison and D.J. Anderson (Eds.), *Vegetation Classification in Australia*. CSIRO and Australian National University Press, Canberra, pp. 10-21.

Specht, R. L., Salt, R. B. and Reynolds, S. T. (1977). Vegetation in the vicinity of Weipa, North Queensland. *Proceedings of the Royal Society of Queensland*, **88**, 17-38.

Stoddart, D. R. and Fosberg, F. R. (1991). Phytogeography and vegetation of the Reef Islands of the Northern Great Barrier Reef. *Atoll Research Bulletin*, **349**.

Thomas, M. B. and McDonald, W. J. F. (1989). *Rare and Threatened Plants of Queensland*. 2nd Edition. Queensland Department of Primary Industries, Brisbane.

Tracey, J. G. and Webb, L. J. (1975). Vegetation of the humid tropical region of North Queensland. 1:100 000 maps. CSIRO, Indooroopilly.

Tracey, J. G. (1982). *The Vegetation of the Humid Tropical Region of North Queensland*. CSIRO, Melbourne.

Unwin, G. L. and Sanderson, K. D. (1988). Report on forest rehabilitation at the Leswell Ck/Mt Walker site of the Collingwood joint venture. Unpublished CSIRO report, Atherton.

Walker, J. and Hopkins, M. S.(1990). Vegetation. In *Australian Soil and Land Survey Field Handbook*, Eds. McDonald, R. C., Isbell, J. G., Speight, J. G., Walker, J. and Hopkins, M. S. Inkata Press, pp. 58-86.

Webb, L.J. (1978). A general classification of Australian rainforests. *Australian Plants*, **9**, 349-363.

Webb, L.J., Tracey, J.G., Williams, W.T. and Lance, G.N. (1967). Studies in numerical analysis of complex rainforest communities. 1. Comparison of methods applicable to site-species data. *Journal of Ecology* 55:171-191.

Wilson, B.A., Brocklehurst, P.S., Clark, M.J. and Dickinson, K.J.M. (1990). *Vegetation Survey of Northern Territory, Australia*. Conservation Commission of the Northern Territory, Darwin, Technical Report Number 49.

Young, P.A.R. (1985). *Vegetation and flora of Brisbane Forest Park*. Brisbane Forest Park Administration Authority, Brisbane.

10.0 APPENDICES

10.1 APPENDIX 1. Examples of map unit descriptions

The map unit descriptions are derived by retrieving the detailed site data for each map unit from CORVEG, and running a retrieval program to calculate frequency of occurrence of each species in each layer and the mean and range of the structural parameters; height, projective foliage cover (pfc), basal area, and stem density. Dominant species are those that contribute most to the biomass at a site or in a layer. As well having a high frequency of occurrence, they also occur with a high basal area (trees only), stem density (trees and shrubs only) and/or pfc. These data are stored in CORVEG, but are not included in the descriptions.

Some of the species recorded as occurring in a map unit are deleted from the description to keep the descriptions concise. Generally species that occur in less than 20% of the sample sites are removed, and if a taxon is only known to generic level, eg *Aristida* spp., it must occur in at least 40% of the sites to be retained in the description. These general rules may be relaxed for some descriptions, particularly for the ground layer, where presence at a site can be dependent on the timing of sampling.

The distribution maps are derived from the 1:250 000 digital vegetation coverage. The subdominant areas include areas where the unit is the second, third or fourth most extensive unit in each polygon. The calculation of the area for each map unit uses the proportion assigned to that map unit in each polygon in the vegetation coverage, and produces a more accurate estimate than assuming a polygon is totally occupied by the dominant unit. Generally the dominant unit (V_1) in each polygon will occupy 50% or more of the area of the polygon, while subdominant units (V_2, V_3 and V_4) may only occupy 10%. Hence, for some map units, the area of subdominant occurrence appears to be overestimated on the map.

The sampling index is calculated by dividing the area of the unit by the number of sample sites. The landform statistics are derived by intersecting the vegetation coverage with the 1:250 000 regolith digital coverage (AGSO 1994a) on the GIS using ARCINFO. The soils and geology statistics are similarly derived by intersecting with the 1:250 000 soils coverage (Biggs and Philip 1994) and geology coverage (AGSO 1994b) respectively. The soil classification used is Isbell (1993). Generally only those units occupying greater than 7% are included in the description.

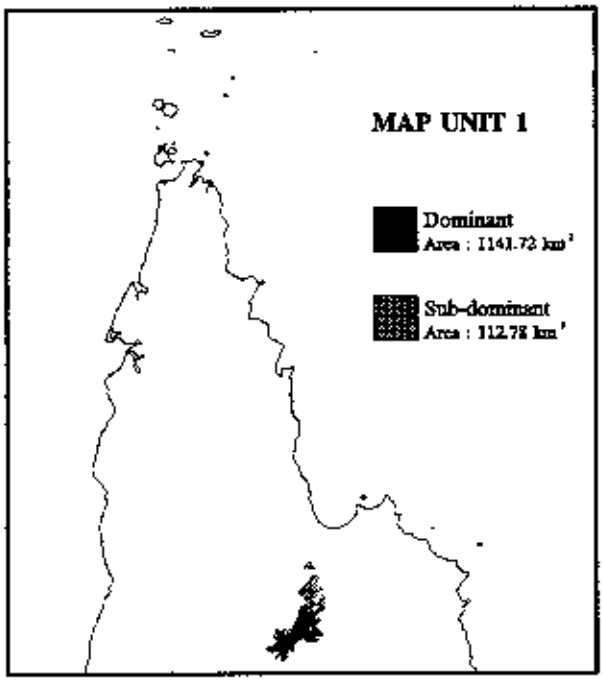
The total number of species recorded, mean and standard deviation (s.d.) for each unit are calculated from the relevant sample sites. The woody layers incorporate all strata apart from the ground layer. These calculations are based only on validly published names and accepted HISPID names. Clarkson and Neldner (in prep.) gives a complete listing of these names for Cape York Peninsula. Extensive common name - scientific name lists are also provided. All taxa not identified to species level are not included in the calculations.

The map units are ordered as they appear in the GIS coverage, firstly according to structure (following modified Specht 1970), and secondly alphabetically on the dominant

species in each map unit. The broad vegetation group that each unit is assigned to is noted in the description. The projective foliage cover categories used are those accepted by both Specht (1981) and Walker and Hopkins (1990); dense (> 70%); mid-dense (30-70%); sparse (10-30%) and very sparse (< 10%).

Six map unit descriptions from Neldner and Clarkson (in prep.) follow.

Map unit 1: ***Eucalyptus tetrodonta* ± *Eucalyptus hylandii* var. *campestris* ± *Erythrophleum chlorostachys*** **tall woodland**



Broad Vegetation Group: 16

Description: *Eucalyptus tetrodonta* predominates forming a distinct but discontinuous canopy (18-34m tall). *Eucalyptus hylandii* var. *campestris* and *Erythrophleum chlorostachys* occasionally occur in the canopy, but usually form a very sparse subcanopy layer (19-24m tall). Scattered low trees (4-8m tall) are sometimes present, and a low shrub layer (0.5-2m tall) composed of young trees and shrubby regrowth is usually present. The ground layer is usually very sparse to mid-dense and dominated by grasses, frequently *Schizachyrium* spp., *Alloteropsis semialata* and *Heteropogon triticeus*.

Structural formation range: Tall woodland 67%, woodland 33%

Basal Area Estimate: Mean 21, range 13-25 m^2/ha

Canopy tree layer: Ht. mean 27.7m, range 18-34m; PFC mean 23.3%, range 15-30%; Stem density mean 233, range 120-340 trees/ha
Frequent species: *Eucalyptus tetrodonta* (100%), *Erythrophleum chlorostachys* (33%), *Eucalyptus clarksoniana* (33%), *Eucalyptus crebra* (33%), *Eucalyptus hylandii* var. *campestris* (33%)

Subcanopy tree layer: Ht. mean 21.7m, range 19-24m; PFC mean 15.0%, range 5-25%.
Frequent species: *Erythrophleum chlorostachys* (100%), *Adenanthera abrosperma* (67%), *Eucalyptus hylandii* var. *campestris* (33%), *Eucalyptus tetrodonta* (33%)

Low tree layer: Ht. 4-8m; PFC < 10%; Density 140-220 stems/ha
Frequent species: *Grevillea glauca* (67%), *Parinari nonda* (33%), *Xylomelum scottianum* (33%)

Shrub layer: Ht. mean 0.8m, range 0.5-2.0m; PFC mean 18.3%, range 10.0-25.0%.
Frequent species: *Erythrophleum chlorostachys* (100%), *Alphitonia obtusifolia* (100%), *Croton arnhemicus* (100%), *Eucalyptus hylandii* var. *campestris* (100%), *Eucalyptus tetrodonta* (100%), *Grevillea parallela* (100%), *Indigofera pratensis* (100%), *Persoonia falcata* (100%), *Planchonia careya* (100%), *Planchonella pohlmaniana* (100%), *Pogonolobus reticulatus* (100%), *Capparis* sp. (67%), *Helicteres* sp. (67%), *Pandanus* sp. (67%), *Brachychiton diversifolius* subsp. *orientalis* (67%), *Pavetta australiensis* var. *australiensis* (67%), *Xylomelum scottianum* (67%)

Ground layer: Ht. mean 1.1m, range 0.4-2.0m; PFC mean 38.3%, range 15.0-60.0%.

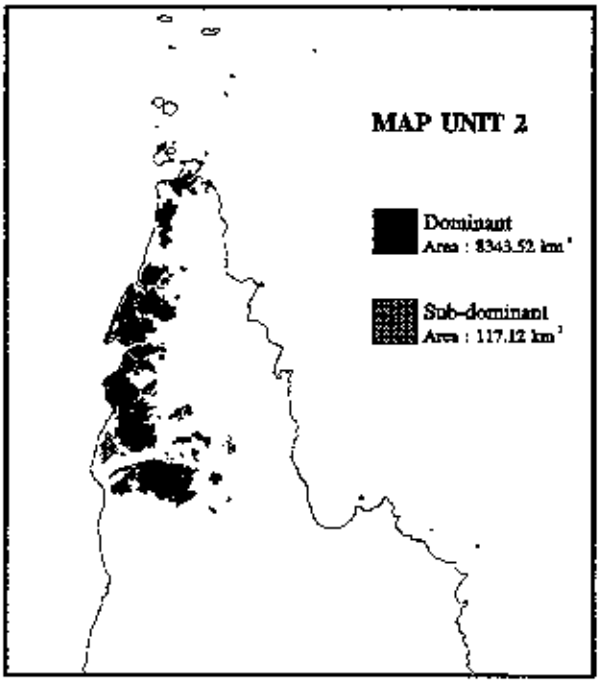
Forbs:
Frequent species: *Spermacoce* sp. (67%), *Euphorbia mitchelliana* (67%), *Phyllanthus virgatus* (67%), *Galactia muelleri* (67%), *Breynia oblongifolia* (33%), *Cassytha filiformis* (67%), *Ipomoea gracilis* (67%), *Xenostegia tridentata* (67%), *Crotalaria medicaginea* (33%), *Flemingia parviflora* (33%), *Hybanthus enneaspermus* (33%), *Oldenlandia mitrasacmoides* subsp. *nigricans* (33%), *Phyllanthus fuernrohrii* (33%), *Phyllanthus hebecarpus* (33%), *Polycarpaea corymbosa* (33%), *Rostellularia adscendens* (33%)

Graminoids:
Frequent species: *Thaumastochloa* sp. (100%), *Aristida* sp. (100%), *Schizachyrium* sp. (100%), *Alloteropsis semialata* (100%), *Heteropogon triticeus* (100%), *Eriachne* sp. (67%), *Lomandra* sp. (67%), *Panicum* sp. (67%), *Setaria* sp. (67%), *Aristida holathera* var. *holathera* (67%), *Sorghum plumosum* var. *plumosum* (67%), *Aristida perniciosa* (33%), *Cymbopogon refractus* (33%)

Sampling data	**Area:** 1254.5 km² (0.9% of total) **No. of sites:** 3 **Sampling index:** 1 site/418km²
Landforms	**Rises:** (78%) **Erosional plains:** (15%)
Geology	**Pliocene colluvium (TQs) (91%)**
Soils	Kimba (Km) (57%) Strath (St) (27%)
Species recorded	**Total:** 52 **Woody layers:** 33 **Ground layer:** 28 **Mean spp./site:** 30 s.d.= 1
Representative sites	27, 28, 29

Ecological notes: This association is restricted to the gently undulating plateau area locally referred to as "The Desert", which occurs on the Great Dividing Range, north-west of Laura. The trees in this association are some of the tallest on Cape York Peninsula, and form tall woodlands, which together with map unit 2, represent the highest structural development in the *Eucalyptus tetrodonta* continuum. The soils are predominantly deep Red Kandosols and deep Orthic Tenosols.

Map unit 2: ***Eucalyptus tetrodonta*** **,** ***E. nesophila*** **±** ***Erythrophleum chlorostachys*** **tall woodland**



Broad Vegetation Group: 16

Description: *Eucalyptus tetrodonta* predominates forming a distinct but discontinuous canopy (22-32m tall), with *Eucalyptus nesophila* a subdominant to codominant canopy species. Large *Erythrophleum chlorostachys* trees may be present, but occur just below the canopy. A very sparse subcanopy layer (8-25m tall) is dominated by *Eucalyptus* spp. and *Grevillea glauca*. Scattered low trees (4-8m tall) are sometimes present, and a low shrub layer (0.5-2m tall) dominated by *Acacia* spp. and *Eucalyptus* spp. is usually present. The ground layer is usually sparse to mid-dense and dominated by the grasses, *Sorghum plumosum* var. *plumosum* , *Heteropogon triticeus*, *Alloteropsis semialata* and *Eulalia mackinlayi*.

Structural formation range: Tall woodland 58%, woodland 34%, open-forest 8%

Basal Area Estimate: Mean 13, range 9-18 m2/ha

Canopy tree layer: Ht. mean 26.3m, range 22-32m; PFC mean 28.5%, range 25-35%; Stem density mean 203, range 80-700 trees/ha
Frequent species: *Eucalyptus tetrodonta* (100%), *Eucalyptus nesophila* (92%), *Erythrophleum chlorostachys* (33%), *Eucalyptus hylandii* var. *campestris* (25%)

Subcanopy tree layer: Ht. mean 12.0m, range 8-25m; PFC mean 7.0%, range 1-15%.
Frequent species: *Grevillea glauca* (67%), *Eucalyptus tetrodonta* (58%), *Erythrophleum chlorostachys* (42%), *Eucalyptus nesophila* (33%), *Parinari nonda* (33%), *Xylomelum scottianum* (33%), *Grevillea parallela* (25%), *Planchonia careya* (25%), *Acacia crassicarpa* (17%), *Acacia rothii* (17%), *Eucalyptus hylandii* var. *campestris* (17%), *Livistona muelleri* (17%)

Low tree layer: Ht. mean 5.1m, range 4-8m; PFC mean 3.0%, range 2-5%.
Frequent species: *Acacia rothii* (25%), *Grevillea glauca* (25%), *Acacia crassicarpa* (17%), *Erythrophleum chlorostachys* (17%), *Eucalyptus nesophila* (17%), *Planchonia careya* (17%)

Shrub layer: Ht. mean 1.1m, range 0.5-2.0m; PFC mean 10.8%, range 1.0-30.0%.
Frequent species: *Eucalyptus nesophila* (83%), *Acacia rothii* (75%), *Eucalyptus tetrodonta* (75%), *Pogonolobus reticulatus* (75%), *Erythrophleum chlorostachys* (67%), *Grewia retusifolia* (67%), *Morinda reticulata* (67%), *Pandanus* sp. (58%), *Planchonia careya* (58%), *Grevillea parallela* (50%), *Hibbertia* sp. (42%), *Croton arnhemicus* (42%), *Persoonia falcata* (42%), *Xylomelum scottianum* (42%), *Eucalyptus hylandii* var. *campestris* (33%), *Hibbertia candicans* (33%), *Livistona muelleri* (33%), *Parinari nonda* (33%), *Planchonella pohlmaniana* (33%), *Acacia crassicarpa* (25%), *Canarium australianum* (25%), *Ficus opposita* (25%), *Indigofera pratensis* (25%), *Petalostigma pubescens* (25%), *Smilax australis* (25%)

Ground layer: Ht. mean 0.9m, range 0.5-2.0m; PFC mean 45.4%, range 22.0-73.0%.

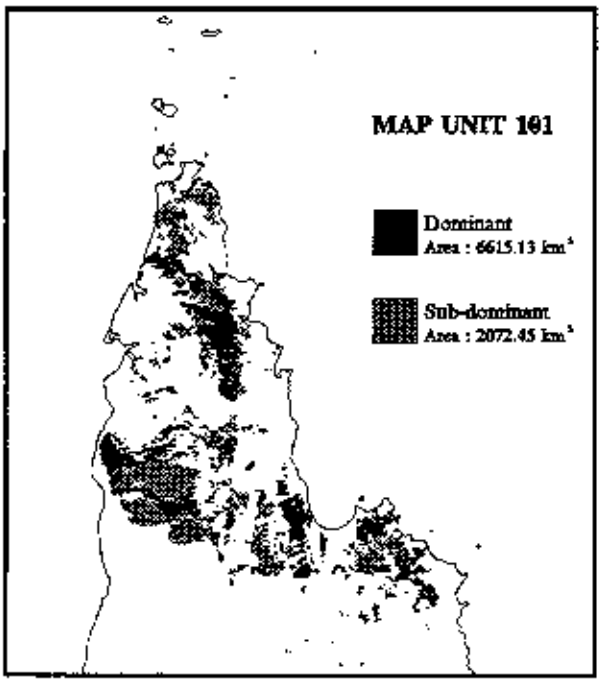
Forbs:
Frequent species: *Crotalaria medicaginea* (67%), *Spermacoce* sp. (58%), *Euphorbia mitchelliana* (50%), *Blumea saxatilis* (42%), *Flemingia parviflora* (42%), *Phyllanthus virgatus* (42%), *Uraria* sp. (33%), *Crotalaria montana* (33%), *Galactia muelleri* (33%), *Schelhammera multiflora* (33%), *Brunoniella* sp. (25%), *Polymeria* sp. (25%), *Aristolochia thozetii* var. *thozetii* (25%), *Eriosema chinense* (25%), *Evolvulus alsinoides* (25%), *Spermacoce laevigata* (25%), *Anisomeles* sp. (17%), *Cartonema* sp. (17%), *Flemingia* sp. (17%), *Austrodolichos errabundus* (17%), *Cassytha filiformis* (17%), *Sebastiania chamaelea* (17%), *Tacca leontopetaloides* (17%), *Vernonia cinerea* (17%), *Wedelia biflora* (17%)

Graminoids:
Frequent species: *Heteropogon triticeus* (83%), *Sorghum plumosum* var. *plumosum* (83%), *Lomandra* sp. (58%), *Alloteropsis semialata* (58%), *Aristida* sp. (50%), *Scleria* sp. (42%), *Eulalia mackinlayi* (42%), *Thaumastochloa* sp. (33%), *Capillipedium parviflorum* (33%), *Mnesithea rottboellioides* (33%), *Schizachyrium* sp. (25%), *Eriachne pallescens* (25%)

Sampling data	**Area:** 8460.7 km^2 (6.3% of total); **No. of sites:** 12; **Sampling index:** 1 site/ 705.1 km^2
Landforms	**Plateaus** (44%) ; **Erosional plains** (35%)
Geology	**Tertiary surfaces** (T&Qa) (73%) ; **Pliocene colluvium** (TQs) (8%)
Soils	**Weipa** (Wp) (61%) ; **Kool** (Kl) (14%) ; **Harmer** (Hr) (10%)
Species recorded	**Total:** 102 ; **Woody layers:** 54 ; **Ground layer:** 55 ; **Mean spp./site:** 28 ; **s.d.=** 9
Representative sites	244, 247, 344, 518, 535, 544, 887, 888, 893, 1132, 1133, 1134

Ecological notes: This association occurs predominantly on the weathered Tertiary plateaus and erosional plains in the north-west. The trees in this association are some of the tallest on Cape York Peninsula, and form tall woodlands, which together with map unit 1, represent the highest structural development in the *Eucalyptus tetrodonta* continuum. The soils are predominantly deep Red Kandosols, with some occurrences on Yellow Kandosols. Some areas of this map unit have been cleared for bauxite mining at Weipa.

Map unit 101: *Eucalyptus tetrodonta* , *E. nesophila* woodland



Broad Vegetation Group: 16

Description: *Eucalyptus tetrodonta* and *E. nesophila* dominate the sparse canopy (10-28m tall). In most situations both species are present and codominant, however in places, *E. nesophila* may be dominant or occasionally absent. *Eucalyptus hylandii* var. *campestris* is sometimes present in the canopy. A very sparse to sparse subcanopy tree layer (8-20m tall) is present with *Erythrophleum chlorostachys* (just below the canopy), *Grevillea glauca, Parinari nonda* and *Acacia rothii* the most frequent species. A very sparse low tree layer (2-8m tall) is sometimes present. The shrub layer (0.3-2.5m tall) is dominated mainly by species that also occur in the tree layers, and is sparse to mid-dense (particularly in areas recently burnt). The ground layer is dominated by grasses, with *Heteropogon triticeus, Sorghum plumosum* var. *plumosum, Thaumastochloa* spp. and *Eriachne* spp. frequently dominating the ground layer biomass.

Structural formation range: Woodland 76%, tall woodland 17%, open-forest 4%, open-woodland 3%

Basal Area Estimate: Mean 11, range 2-16 m2/ha

Canopy tree layer: Ht. mean 21.2m, range 10-28m; PFC mean 25.0%, range 5-40%; Stem density mean 347, range 63-1760 trees/ha
Frequent species: *Eucalyptus tetrodonta* (100%), *Eucalyptus nesophila* (97%), *Erythrophleum chlorostachys* (40%), *Eucalyptus hylandii* var. *campestris* (30%),

Subcanopy tree layer: Ht. mean 9.7m, range 3-20m; PFC mean 7.5%, range 1-20%.
Frequent species: *Grevillea glauca* (50%), *Parinari nonda* (50%), *Eucalyptus tetrodonta* (37%), *Acacia rothii* (33%), *Erythrophleum chlorostachys* (33%), *Eucalyptus nesophila* (33%), *Grevillea parallela* (27%), *Alphitonia obtusifolia* (23%), *Acacia flavescens* (20%), *Xylomelum scottianum* (20%), *Acacia crassicarpa* (17%), *Planchonella pohlmaniana* (17%)

Low tree layer: Ht. mean 4.4m, range 2-8m; PFC mean 3.8%, range 1-10%.
Frequent species: *Acacia crassicarpa* (10%), *Eucalyptus tetrodonta* (7%), *Grevillea glauca* (7%), *Planchonella pohlmaniana* (7%)

Shrub layer: Ht. mean 1.0m, range 0.3-2.5m; PFC mean 17.3%, range 1.0-50.0%.
Frequent species: *Eucalyptus tetrodonta* (80%), *Planchonia careya* (77%), *Eucalyptus nesophila* (67%), *Pogonolobus reticulatus* (67%), *Planchonella pohlmaniana* (53%), *Erythrophleum chlorostachys* (50%), *Acacia rothii* (47%), *Persoonia falcata* (47%), *Alphitonia obtusifolia* (43%), *Xylomelum scottianum* (43%), *Parinari nonda* (40%), *Grevillea parallela* (37%), *Grevillea glauca* (30%), *Morinda reticulata* (30%), *Hibbertia* sp. (27%), *Acacia flavescens* (27%), *Croton arnhemicus* (27%), *Indigofera pratensis* (27%), *Petalostigma pubescens* (27%), *Brachychiton* sp. (23%), *Pandanus* sp. (23%), *Acacia crassicarpa* (23%), *Canarium australianum* (23%), *Eucalyptus hylandii* var. *campestris* (20%), *Neofabricia myrtifolia* (20%)

Ground layer: Ht. mean 0.8m, range 0.3-2.0m; PFC mean 36.5%, range 15.0-90.0%.
Forbs:
Frequent species: *Phyllanthus virgatus* (43%), *Flemingia parviflora* (33%), *Vernonia cinerea* (33%), *Crotalaria montana* (30%), *Crotalaria medicaginea* (23%), *Cheilanthes* sp. (20%), *Euphorbia mitchelliana* (20%), *Hybanthus enneaspermus* (20%), *Schelhammera multiflora* (20%), *Spermacoce laevigata* (20%), *Galactia muelleri* (20%), *Spermacoce* sp. (17%), *Striga* sp. (17%), *Brunoniella australis* (17%), *Cassytha filiformis* (17%), *Wedelia biflora* (17%), *Smilax australis* (14%), *Stackhousia intermedia* (14%), *Vigna lanceolata* var. *filiformis* (14%), *Xenostegia tridentata* (14%), *Blumea saxatilis*

(13%), *Chamaecrista mimosoides* (10%), *Evolvulus alsinoides* (10%), *Phyllanthus fuernrohrii* (10%), *Pleurocarpaea denticulata* (10%), *Tacca leontopetaloides* (10%), *Thecanthes cornucopiae* (10%)

Graminoids:
Frequent species: *Heteropogon triticeus* (67%), *Aristida* sp. (63%), *Lomandra* sp. (57%), *Sorghum plumosum* var. *plumosum* (47%), *Alloteropsis semialata* (37%), *Eriachne* sp. (30%), *Thaumastochloa* sp. (30%), *Eragrostis* sp. (23%), *Scleria* sp. (23%), *Eulalia mackinlayi* (23%), *Dianella* sp. (20%), *Panicum* sp. (20%), *Schoenus* sp. (20%), *Cymbopogon refractus* (20%), *Schizachyrium fragile* (17%), *Fimbristylis recta* (13%), *Heteropogon contortus* (13%), *Mnesithea formosa* (13%), *Mnesithea rottboellioides* (13%)

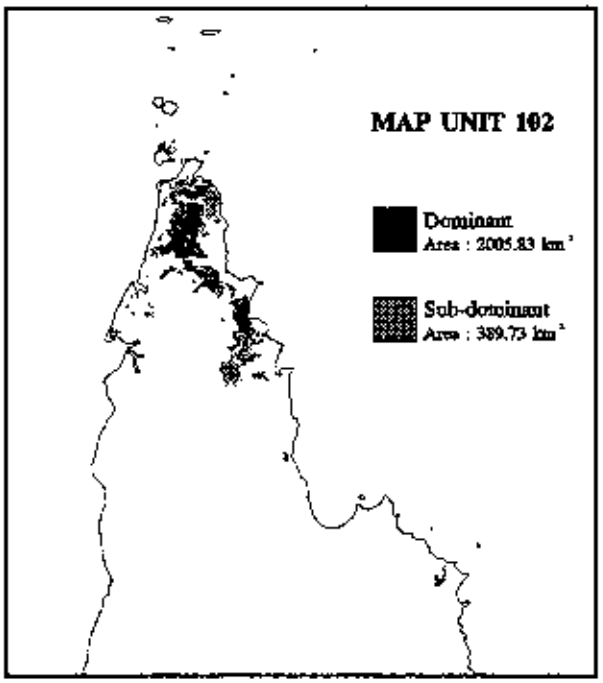
Sampling data	**Area:** 8687.6 km² (6.5% of total); **No. of sites:** 30 ; **Sampling index:** 1 site/ 289.2 km²
Landforms	**Rises** (27%); **Low hills** (21%); **Erosional plains** (15%); **Alluvial plains**(15%)
Geology	**Pliocene colluvium** (TQs) (41%); **Rolling Downs Group** (Klr) (14%); **Gilbert River Formation** (JKg) (11%)
Soils	**Kimba** (Kb) (19%); **Clark** (Cr) (16%); **Emma** (Em) (12%);**Batavia** (Bv) (9%); **Harmer** (Hm) (8%)
Species recorded	**Total:** 230 ; **Woody layers:** 104 ; **Ground layer:** 144 ; **Mean spp./site:** 29 ; **s.d.=** 11
Representative sites	43, 50, 51, 58, 60, 67, 46, 80, 81, 87, 95, 128, 133, 257, 260, 275, 276, 295, 313, 316, 367, 378, 390, 738, 788, 841, 881, 882, 901, 1137

Ecological notes: This map unit occurs extensively on gently undulating rises and low hills, where it generally occurs on deep Red Kandosols (most frequently Gn 2.11 and Gn 2.12). It also occurs on the lower slopes of rises and on some plains where the soils are generally Yellow Kandosols. In some areas such as the Embley Range, the canopy height reaches 25-27m tall and approaches tall woodlands.

Map unit 102: ***Eucalyptus tetrodonta* ± *E. nesophila* ± *Asteromyrtus brassii* ± *Neofabricia myrtifolia* woodland**

Broad Vegetation Group: 16

Description: *Eucalyptus tetrodonta* predominates forming a distinct but discontinuous canopy (14-25m tall), with *E. nesophila* a subdominant to codominant canopy species. A very sparse subcanopy layer (5-12m tall) is characterised by *Asteromyrtus brassii, Neofabricia myrtifolia, Grevillea glauca* and *Acacia rothii*. Scattered low trees (2-6m tall) are sometimes present, and a sparse to mid-dense low shrub layer (0.5-2m tall) is dominated by heath shrubs such as *Jacksonia thesioides, Neoroepera banksii, Choriceras tricorne, Asteromyrtus lysicephala* and *Acacia calyculata*, frequently at high densities. The ground layer is usually very sparse to mid-dense and dominated by the sedge *Schoenus sparteus* and the grasses *Heteropogon triticeus* and *Eulalia mackinlayi*.



Structural formation range: Woodland 77%, open-woodland 23%

Basal Area Estimate: Mean 8, range 2-16 m2/ha

Canopy tree layer: Ht. mean 17.8m, range 9-25m; PFC mean 16.3%, range 5-28%; Stem density mean 280, range 60-1680 trees/ha

Frequent species: *Eucalyptus tetrodonta* (100%), *Eucalyptus nesophila* (85%), *Erythrophleum chlorostachys* (15%), *Eucalyptus clarksoniana* (15%), *Eucalyptus hylandii* var. *campestris* (15%)

Subcanopy tree layer: Ht. mean 7.1m, range 2-12m; PFC mean 8.3%, range 1-25%.
Frequent species: *Grevillea glauca* (85%), *Asteromyrtus brassii* (77%), *Neofabricia myrtifolia* (69%), *Acacia rothii* (62%), *Eucalyptus tetrodonta* (46%), *Allocasuarina limoralis* (38%), *Parinari nonda* (38%), *Xylomelum scottianum* (38%), *Erythrophleum chlorostachys* (23%), *Grevillea parallela* (23%), *Persoonia falcata* (23%),

Low tree layer: Ht. mean 3.4m, range 2-6m; PFC mean 5.8%, range 1-10%.
Frequent species: *Grevillea glauca* (31%), *Acacia rothii* (23%), *Neofabricia myrtifolia* (23%)

Shrub layer: Ht. mean 1.2m, range 0.5-3.0m; PFC mean 20.2%, range 5.0-35.0%.
Frequent species: *Acacia calyculata* (77%), *Acacia rothii* (77%), *Neoroepera banksii* (77%), *Eucalyptus tetrodonta* (69%), *Morinda reticulata* (69%), *Neofabricia myrtifolia* (69%), *Persoonia falcata* (69%), *Pandanus* sp. (62%), *Eucalyptus nesophila* (62%), *Xylomelum scottianum* (62%), *Hibbertia candicans* (54%), *Planchonia careya* (54%), *Parinari nonda* (46%), *Planchonella pohlmaniana* (46%), *Pogonolobus reticulatus* (46%), *Acacia flavescens* (38%), *Anthobolus filifolius* (38%), *Grevillea glauca* (38%), *Lomandra banksii* (38%), *Acacia crassicarpa* (31%), *Alyxia spicata* (31%), *Choriceras tricorne* (31%), *Croton arnhemicus* (31%), *Hibbertia banksii* forma *banksii* (31%), *Lamprolobium fruticosum* (31%), *Melaleuca viridiflora* (31%), *Myrtella obtusa* (31%), *Petalostigma pubescens* (31%), *Platysace valida* (31%), *Xanthorrhoea johnsonii* (31%), *Clerodendrum* sp. (23%), *Acacia leptocarpa* (23%), *Asteromyrtus lysicephala* (23%), *Breynia cernua* (23%), *Dodonaea polyandra* (23%), *Erythrophleum chlorostachys* (23%), *Grevillea pteridifolia* (23%), *Jacksonia thesioides* (23%), *Leucopogon lavarackii* (23%), *Myrtella retusa* (23%), *Petalostigma banksii* (23%)

Ground layer: Ht. mean 0.6m, range 0.3-1.5m; PFC mean 23.2%, range 6.0-48.0%.
Forbs:
Frequent species: *Cassytha filiformis* (54%), *Phyllanthus virgatus* (46%), *Spermacoce laevigata* (46%), *Euphorbia mitchelliana* (38%), *Spermacoce* sp. (31%), *Euphorbia vachellii* (31%), *Ipomoea gracilis* (31%), *Phyllanthus* sp. (23%), *Vigna* sp. (23%), *Lomandra banksii* (23%), *Schelhammera multiflora* (23%), *Aristolochia thozetii* var. *thozetii* (15%), *Brunoniella acaulis* (15%), *Ceratanthus longicornis* (15%), *Hybanthus enneaspermus* (15%), *Schizaea dichotoma* (15%), *Sebastiania chamaelea* (15%),

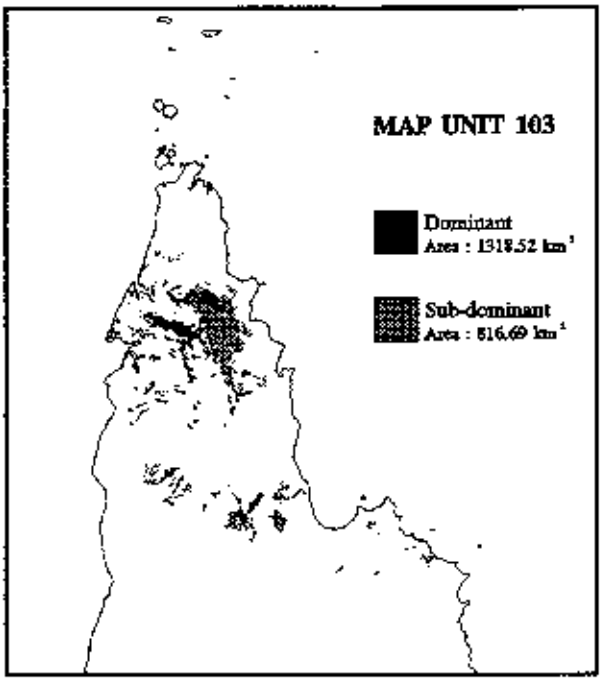
Graminoids:
Frequent species: *Schoenus sparteus* (100%), *Lomandra* sp. (69%), *Aristida* sp. (54%), *Eulalia mackinlayi* (54%), *Heteropogon triticeus* (54%), *Alloteropsis semialata* (46%), *Sorghum plumosum* var. *plumosum* (46%), *Cleistochloa* sp. (38%), *Eriachne* sp. (38%), *Fimbristylis recta* (38%), *Thaumastochloa* sp. (31%), *Dianella* sp. (23%), *Cleistochloa subjuncea* (23%), *Eriachne pallescens* (23%), *Schelhammera multiflora* (23%), *Schizachyrium fragile* (23%), *Capillipedium parviflorum* (15%), *Eremochloa bimaculata* (15%), *Eriachne stipacea* (15%), *Haemodorum coccineum* (15%), *Leptocarpus schultzii* (15%), *Whiteochloa airoides* (15%), *Xyris complanata* (15%)

Sampling data	**Area:** 2395.6 km^2 (1.8% of total); **No. of sites:** 15 ; **Sampling index:** 1 site/159.7 km^2
Landforms	**Low hills** (83%) ;**Rises** (5%)
Geology	**Helby Beds** (JKb) (60%); **Garraway Beds** (Jw) (9%); **Pliocene colluvium** (TQs) (6%)
Soils	**Harmer** (Hm) (58%); **Emma** (Em) (22%)
Species recorded	**Total:** 147 ; **Woody layers:** 88 ; **Ground layer:** 88 ; **Mean spp./site:** 39 ; **s.d.**= 10
Representative sites	192, 193, 201, 308, 315, 342, 363, 365, 379, 383, 385, 391, 515, 540, 803

Ecological notes: This map unit occurs extensively on the low undulating sandstone hills and rises of the northern Peninsula. The soils are predominantly Yellow and Red Kandosols. The low shrub layer is composed of species which dominate the heath communities and is the distinctive feature of this map unit. There is frequently an ecotone area of up to 500m between the heath associations and this map unit.

A variant of these map unit (102A) was recorded at 2 sites (315 and 365) south of Heathlands. It is characterised by the presence of *Lophostemon suaveolens*, *Eucalyptus brassiana* or a *Xanthostemon* sp. The ground and shrub layers are similar to unit 102, although the shrub densities are much lower. *Asteromyrtus brassii* and *Neofabricia myrtifolia* were prominent in the subcanopy.

Map unit 103: ***Eucalyptus tetrodonta*** **±** ***E. nesophila*** **±** ***E. hylandii*** **var.** ***campestris*** **±** ***E. leptophleba*** **woodland**



Broad Vegetation Group: 16

Description: *Eucalyptus tetrodonta* and either *E. nesophila* or *E. hylandii* var. *campestris* usually codominate to form the canopy (13-28m tall). *E. leptophleba*, and sometimes *E. clarksoniana* , are frequently present as scattered canopy or subcanopy trees. *Erythrophleum chlorostachys* and *Eucalyptus confertiflora* frequently form a very sparse subcanopy layer (12-18m tall). *Acacia rothii*, *Melaleuca viridiflora*, *Grevillea glauca* and *Petalostigma* spp. are also abundant in the subcanopy layer, but usually reach 3-8m in height. A very sparse low tree layer (2-4m tall) is occasionally present, and a very sparse to mid-dense shrub layer (0.5-2m tall) dominated by shrubs and shrubby trees is always present. The ground layer is dominated by grasses, with *Schizachyrium* spp., *Sorghum plumosum* var. *plumosum*, *Heteropogon triticeus* and *Thaumastochloa* spp. frequent dominants.

Structural formation range: Woodlands 100%

Basal Area Estimate: Mean 10, range 5-16 m2/ha

Canopy tree layer: Ht. mean 18.9m, range 13-28m; PFC mean 22.7%, range 12-31%; Stem density mean 416, range 160-1040 trees/ha
Frequent species: *Eucalyptus tetrodonta* (95%), *Eucalyptus nesophila* (73%), *Eucalyptus leptophleba* (55%), *Erythrophleum chlorostachys* (50%), *Eucalyptus confertiflora* (36%), *Eucalyptus hylandii* var. *campestris* (36%), *Eucalyptus clarksoniana* (32%)

Subcanopy tree layer: Ht. mean 7.4m, range 3-18m; PFC mean 5.7%, range 1-15%.
Frequent species: *Acacia rothii* (36%), *Erythrophleum chlorostachys* (32%), *Grevillea glauca* (32%), *Melaleuca viridiflora* (27%), *Eucalyptus nesophila* (23%), *Melaleuca nervosa* (23%), *Parinari nonda* (23%), *Alphitonia obtusifolia* (18%), *Eucalyptus tetrodonta* (18%), *Planchonia careya* (18%), *Xylomelum scottianum* (18%), *Acacia crassicarpa* (14%), *Petalostigma banksii* (9%), *Petalostigma pubescens* (9%)

Low tree layer: Ht. mean 2.8m, range 2-4m; PFC mean 2.0%, range 2-2%.
Frequent species: *Acacia crassicarpa* (9%), *Petalostigma banksii* (5%), *Petalostigma pubescens* (5%)

Shrub layer: Ht. mean 0.7m, range 0.5-2.0m; PFC mean 9.2%, range 1.0-55.0%.
Frequent species: *Eucalyptus tetrodonta* (55%), *Pogonolobus reticulatus* (55%), *Eucalyptus nesophila* (45%), *Acacia rothii* (41%), *Erythrophleum chlorostachys* (41%), *Parinari nonda* (41%), *Grevillea glauca* (36%), *Melaleuca viridiflora* (36%), *Planchonia careya* (36%), *Xylomelum scottianum* (32%), *Grevillea parallela* (27%), *Melaleuca nervosa* (27%), *Persoonia falcata* (27%), *Alphitonia obtusifolia* (23%), *Decaschistia peninsularis* (23%), *Acacia flavescens* (18%), *Indigofera pratensis* (18%), *Planchonella pohlmaniana* (18%) (5%)

Ground layer: Ht. mean 0.7m, range 0.2-2.0m; PFC mean 42.5%, range 10.0-70.0%.
Forbs:
Frequent species: *Phyllanthus virgatus* (36%), *Spermacoce laevigata* (36%), *Flemingia parviflora* (32%), *Euphorbia mitchelliana* (27%), *Buchnera linearis* (18%), *Crotalaria medicaginea* (18%), *Crotalaria montana* (18%), *Pleurocarpaea denticulata* (18%), *Schelhammera multiflora* (18%), *Galactia* sp. (14%), *Helicteres* sp. (14%), *Brunoniella australis* (14%), *Drosera petiolaris* (14%), *Evolvulus alsinoides* (14%), *Tacca leontopetaloides* (14%), *Thecanthes cornucopiae* (14%), *Vernonia cinerea* (14%), *Alysicarpus rugosus* (9%), *Brunoniella acaulis* (9%), *Cartonema parviflorum* (9%), *Chamaecrista mimosoides* (9%), *Desmodium trichostachyum* (9%), *Pycnospora lutescens* (9%), *Rostellularia adscendens* (9%), *Tylophora erecta* (9%), *Vigna lanceolata* var. *filiformis* (9%),
Graminoids:
Frequent species: *Heteropogon triticeus* (41%), *Sorghum plumosum* var. *plumosum* (41%), *Lomandra* sp. (32%), *Alloteropsis semialata* (27%), *Schizachyrium fragile* (23%), *Setaria surgens* (23%), *Panicum* sp. (18%), *Eulalia*

mackinlayi (18%), *Xyris complanata* (18%), *Aristida* sp. (14%), *Eremochloa bimaculata* (14%), *Mnesithea formosa* (14%), *Themeda triandra* (14%), *Eriachne squarrosa* (9%), *Eriachne stipacea* (9%), *Eriachne triseta* (9%), *Fimbristylis recta* (9%), *Mnesithea rottboellioides* (9%), *Thaumastochloa monilifera* (9%), *Thaumastochloa pubescens* (9%),

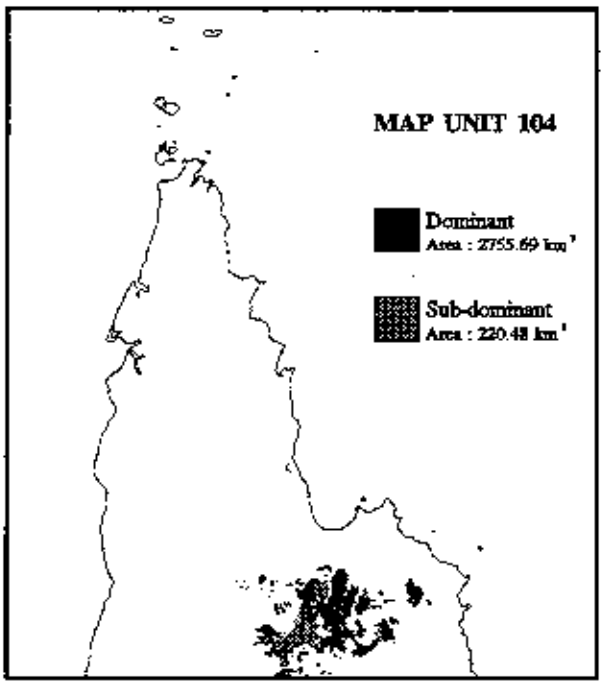
Sampling data	**Area:** 2135.2km^2 (1.6% of total); **No. of sites:** 24 ; **Sampling index:** 1 site/ 89.3 km^2
Landforms	**Rises** (39%) ; **Erosional plains** (36%) ; **Alluvial plains** (8%)
Geology	**Rolling Downs Group** (Klr) (29%) ; **Bulimba Formation** (KTi) (28%); **Pliocene colluvium** (TQs) (12%)
Soils	**Batavia** (Bv) (16%) ; **Kool** (Kl) (13%) ; **Cox** (Cx) (9%) ; **Emma** (Em) (9%); **Clark** (Cr) (7%); **Bertie** (Bt) (7%)
Species recorded	**Total:** 185 ; **Woody layers:** 85 ; **Ground layer:** 144 ; **Mean spp./site:** 25 ; s.d.= 13
Representative sites	53, 57, 61, 63, 66, 69, 70, 71, 82, 88, 89, 48, 90, 124, 129, 131, 134, 205, 302, 337, 490, 588, 590, 896

Ecological notes: This map unit occurs widely in the central Peninsula, and generally occupies the lower slopes and plains below map unit 101. The presence of *Eucalyptus leptophleba* and *E. clarksoniana* in the canopy or subcanopy, and frequently *Melaleuca viridiflora* in the subcanopy layer are helpful indicators of these unit. Generally trees in this unit are lower than unit 101. The soils are variable with deep Red Kandosols, Yellow Kandosols and Yellow Dermosols the dominant soils.

In some widely scattered areas, a variant of this map unit (103A) occurs which is characterised by a conspicuous subcanopy layer of *Livistona muelleri* (5-9m tall; density 240-320 stems/ha). *Eucalyptus nesophila* usually dominates the canopy with *Eucalyptus tetrodonta* also present. The other layers have a similar composition to unit 103. Representative sites for this association are 337 and 588.

Map unit 104: *Eucalyptus tetrodonta* ± *E. clarksoniana* ± *E. nesophila* ± shrubby layer woodland

Broad Vegetation Group: 16



Description: *Eucalyptus tetrodonta* predominates forming a distinct but discontinuous canopy (17-26m tall). *E. nesophila* and *E. clarksoniana* may be subdominant in the canopy. *Erythrophleum chlorostachys* may occur just below the canopy, occasionally forming a mid-dense layer. Low trees (2-15m tall) are sometimes present. A sparse low shrub layer (0.5-2m tall) composed of young trees and shrubby regrowth is usually present. The ground layer is usually very sparse to mid-dense and dominated by grasses, frequently *Schizachyrium* spp., *Sorghum plumosum* var. *plumosum*, *Panicum* spp., *Alloteropsis semialata* and *Thaumastochloa* spp.

Structural formation range: woodland 75%, open-forest 25%.

Basal Area Estimate: Mean 12, range 10-16 m2/ha

Canopy tree layer: Ht. mean 22.3m, range 17-26m; PFC mean 25.0%, range 15-30%; Stem density mean 195, range 120-300 trees/ha
Frequent species: *Eucalyptus tetrodonta* (100%), *Eucalyptus clarksoniana* (50%), *Erythrophleum chlorostachys* (25%), *Eucalyptus hylandii* var. *campestris* (25%), *Eucalyptus nesophila* (25%)
Subcanopy tree layer: Ht. mean 8.6m, range 4-15m; PFC mean 5.3%, range 2-10%.
Frequent species: *Grevillea glauca* (75%), *Persoonia falcata* (75%), *Acacia rothii* (50%), *Erythrophleum chlorostachys* (50%), *Erythroxylum ellipticum* (50%), *Grevillea parallela* (50%), *Pogonolobus reticulatus* (50%), *Acacia flavescens* (25%), *Alphitonia obtusifolia* (25%), *Canarium australianum* (25%), *Melaleuca nervosa* (25%), *Melaleuca stenostachya*

(25%), *Parinari nonda* (25%), *Planchonella pohlmaniana* (25%), *Pouteria sericea* (25%), *Wrightia saligna* (25%), *Xylomelum scottianum* (25%)

Low tree layer: Ht. mean 3.5m, range 2-5m; PFC mean 30.0%, range 30-30%.
Frequent species: *Acacia platycarpa* (25%), *Exocarpos latifolius* (25%), *Ixora klanderiana* (25%), *Petalostigma pubescens* (25%), *Pogonolobus reticulatus* (25%), *Pouteria sericea* (25%), *Xylomelum scottianum* (25%)

Shrub layer: Ht. mean 1.1m, range 0.5-2.0m; PFC mean 5.0%, range 5.0-5.0%.
Frequent species: *Erythrophleum chlorostachys* (75%), *Grevillea parallela* (75%), *Indigofera pratensis* (75%), *Planchonia careya* (75%), *Pogonolobus reticulatus* (75%), *Acacia rorhii* (50%), *Adenanthera abrosperma* (50%), *Alphitonia obtusifolia* (50%), *Croton arnhemicus* (50%), *Eucalyptus tetrodonta* (50%), *Grevillea glauca* (50%), *Grewia retusifolia* (50%), *Planchonella pohlmaniana* (50%), *Wrightia saligna* (50%), *Xylomelum scottianum* (50%), *Acacia flavescens* (25%), *Alyxia spicata* (25%), *Brachychiton diversifolius* subsp. *orientalis* (25%), *Erythroxylum ellipticum* (25%), *Eucalyptus clarksoniana* (25%), *Eucalyptus hylandii* var. *campestris* (25%), *Eucalyptus nesophila* (25%), *Glochidion disparipes* (25%), *Grevillea dryandri* subsp. *dryandri* (25%), *Hibbertia candicans* (25%), *Hibiscus meraukensis* (25%), *Maytenus cunninghamii* (25%), *Melaleuca stenostachya* (25%), *Parinari nonda* (25%), *Sebastiania chamaelea* (25%), *Syzygium suborbiculare* (25%), *Tinospora smilacina* (25%)

Ground layer: Ht. mean 0.9m, range 0.3-2.0m; PFC mean 38.0%, range 16.0-61.0%.
Forbs:
Frequent species: *Spermacoce* sp. (75%), *Crotalaria medicaginea* (75%), *Galactia muelleri* (75%), *Phyllanthus virgatus* (75%), *Euphorbia mitchelliana* (50%), *Evolvulus alsinoides* (50%), *Hybanthus enneaspermus* (50%), *Phyllanthus hebecarpus* (50%), *Polygala pycnophylla* (50%), *Desmodium* sp. (25%), *Brunoniella australis* (25%), *Cassytha filiformis* (25%), *Chamaecrista absus* (25%), *Crotalaria linifolia* (25%), *Desmodium filiforme* (25%), *Desmodium rhytidophyllum* (25%), *Fimbristylis recta* (25%), *Flemingia parviflora* (25%), *Heliotropium tenuifolium* (25%), *Ipomoea gracilis* (25%), *Rostellularia adscendens* (25%), *Tephrosia juncea* (25%), *Tephrosia leptoclada* (25%), *Tephrosia simplicifolia* (25%), *Uraria lagopodioides* (25%), *Uraria picta* (25%), *Vernonia cinerea* (25%), *Vigna lanceolata* (25%)

Graminoids:
Frequent species: *Aristida* sp. (100%), *Panicum* sp. (100%), *Sorghum plumosum* var. *plumosum* (100%), *Thaumastochloa* sp. (75%), *Alloteropsis semialata* (75%), *Cymbopogon refractus* (75%), *Digitaria* sp. (50%), *Fimbristylis* sp. (50%), *Heteropogon triticeus* (50%), *Schizachyrium fragile* (50%), *Aristida hygrometrica* (25%), *Ectrosia laxa* (25%), *Eragrostis pubescens* (25%), *Eriachne armitii* (25%), *Eriachne stipacea* (25%), *Eriachne triseta* (25%), *Planichloa nervilemma* (25%), *Schizachyrium pachyarthron* (25%), *Thaumastochloa rariflora* (25%)

Sampling data	**Area:** 2976.1 km² (2.2% of total); **No. of sites:** 4 ; **Sampling index:** 1 site/744.0 km²
Landforms	**Erosional plains** (48%) ; **Rises** (34%)
Geology	**Pliocene colluvium** (TQs) (72%) ; **Holocene alluvia** (Qa) (7%)
Soils	**Kimba** (Kb) (55%) ; **Clark** (Cr) (13%); **Emma** (Em) (6%)
Species recorded	**Total:** 85 ; **Woody layers:** 40 ; **Ground layer:** 47 ; **Mean spp./site:** 35 ; s.d.= 1
Representative sites	7, 14, 498, 719

Ecological notes: This map unit is restricted to undulating rises and slopes in the south. It occurs primarily on deep, well-drained Red Kandosols, but also on Yellow Kandosols and Orthic Tenosols. Water is probably available to the woody plants for most of the year, because of capillary action from the water table below, and this may account for the mid-dense low tree layer that can occur in places. This map unit occurs in similar situations to unit 101, and replaces it in the south. The canopy is characterised by the greater biomass of *Eucalyptus clarksoniana* and less frequent occurrence of *E. nesophila* than in unit 101.

10.2 APPENDIX 2. Example pages of species list (From Clarkson and Neldner in prep.)

A full list of the vascular plants known to occur on Cape York Peninsula including the islands of the Great Barrier reef and Torres Strait has been prepared for publication. This will appear as *Plants of Cape York Peninsula* (Clarkson and Neldner in prep.) a companion volume to *Vegetation of Cape York Peninsula* (Neldner and Clarkson in prep.). The list will provide an indication of the most commonly encountered life form for each species and common names where they are known. The occurrence of each species in the 30 broad vegetation groups recognised will also be indicated. A description of the broad vegetation groups recognised and a brief analysis of the flora will accompany the list.

KEY TO CODES USED IN THE SPECIES LIST

Two columns to the left of the species name indicate:

† No specimen of this plant from Cape York Peninsula is held by the Queensland Herbarium (BRI). The record is based upon material held in an herbarium other than BRI or upon a reliable field sighting.

* An introduced species not native to Cape York Peninsula.

Columns to the right of the species name indicate:

R an entry in this column indicates that the plant is considered rare or threatened

- **X** - presumed extinct
- **E** - endangered and at risk of disappearing from the wild state within 10 to 20 years if present land use and other causal factors continue to operate
- **V** - vulnerable but not presently endangered
- **R** - rare but not considered endangered or vulnerable
- **K** - poorly known but suspect of being at risk

Lf the entry in this column indicates the most commonly encountered life form together with an indication of any specialised habitat preference.

Predominant life form:

- **T** - *tree* - a woody plant > 2 m tall with a single stem or branching well above the base
- **S** - *shrub* - a woody plant either mulistemmed at the base or within 0.2 m from ground level and > 1.5 m tall or if single stemmed < 2 m tall.
- **B** - *subshrub* - a woody plant < 1 m tall, often multi-stemmed.
- **C** - *scandent shrub* - a woody plant with weak stems usually straggling over surrounding vegetation but without special modifications for climbing.

F - *forb* - an herbaceous or slightly woody plant not having a grass-like appearance.
G - *graminoid* - an herbaceous plant with a grass-like appearance.
V - *vine* - a climbing or trailing plant usually with special modifications for climbing. Vines may range from herbaceous plants such as members of the Cucurbitaceae to robust woody lianes such as many Menispermaceae.

Specialised habitat preference:

a - *aquatic* - growing in water either rooted in the substrate or free floating.
e - *epiphytic* - growing upon another plant but not parasitically.
l - *lithophytic* - growing upon rocks.
m - *mangrove* - growing at or below high water mark in tidal areas.
p - *parasitic or saprophytic* - growing upon another plant (living or dead) and drawing some or all of the nutrients required for growth from the host.
t - *terrestrial* - growing in soil (used only for Pteridophytes and Orchidaceae where this character can be useful in identifying species).

1 - 30 Broad vegetation groups define in sections 3.3 to 3.32 amalgamated in the following way:

1 - 6	closed-forests (excluding mangroves)
7 - 17	*Eucalyptus* spp. dominated woodlands, open-woodlands and open-forests
18 - 20	*Melaleuca* spp. dominated low-open woodlands, low woodlands and tall shrublands
21 - 23	grasslands and grassy open-woodlands
24 - 30	heathlands mangroves and miscellaneous communities

	R	Lf	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
MYRTACEAE																																
Acmena hemilampra (F. Muell. ex F.M. Bailey) Merr. & L.M. Perry																																
subsp. ***hemilampra***		T	1	2	3	4		6																								
subsp. ***orophila*** B. Hyland		T	1	2																												
Acmena macklaoniana B. Hyland	R	T		2				6																								
Acmena sp. (Mt Misery G. Sankowsky+ 1131)		T	1																													
Acmenosperma claviflorum (Roxb.) Kausel		T	1	2	3			6																								
Acmenosperma pringlei B. Hyland	R	T																														
Archirhodomyrtus beckleri (F. Muell.) A.J. Scott		TS	1																													
Asteromyrtus angustifolia (Gaertn.) Craven		TS			3	4											15									24						
Asteromyrtus brassii (Hyrnes) Craven		ST		2	3	4		6		8		10			13		15	16	17	18	19					24			27			30
Asteromyrtus lysicephala (F. Muell. & F.M. Bailey) Craven		S				4	5			8				12				16		18	19					24			27			30
Asteromyrtus symphyocarpa (F. Muell.) Craven		ST			3	4		6		8		10						16	17		19	20				24			27			30
Austromyrtus bidwillii (Benth.) Burret		T		2			5	6																								
Austromyrtus dallachiana (F. Muell.) L.S. Sm.		T		2																												
Austromyrtus floribunda (A.J. Scott) Guymer		T			3	4	5	6									15															
Austromyrtus hillii (Benth.) Burret		T																														
Austromyrtus lucida (Gaertn.) L.S. Sm.	R	T	1	2			5																									
Austromyrtus minutiflora Burret		T	1	2				6																								
Austromyrtus shepherdii (F. Muell.) L.S. Sm.		T						6																								
Austromyrtus sp. (Bamaga B.P. Hyland 10235)	R	T		2																												
Austromyrtus sp. (Byerstown Range G.P. Guymer 2037)	R	T		2			5																									
Austromyrtus sp. (Cape Flattery L.J. Webb+ 13537)		T				4																				24						
Austromyrtus sp. (Claudie River G.P. Guymer 2052)	K	T		2		4	5	6																								
Austromyrtus sp. (Danbulla L.S. Smith 10123)		T																														
Austromyrtus sp. (Isabella Falls G. Sankowsy+ 959)		T																														
Austromyrtus sp. (Lizard Island G.N. Batianoff 12183)		T																														
Austromyrtus sp. (Mellwraith Range B.P. Hyland 11148)	R	T																														
Austromyrtus sp. (Windsor Tableland B. Gray 412)		T																														
Backhousia bancroftii F.M. Bailey & F. Muell. ex F.M. Bailey	R	T																														
Backhousia hughesii C.T. White		T																														
Baeckea frutescens L.		TS																			19					24			27			
Baeckea sp. (Tozer Range L.J. Brass 19348)	V	S																														
Callistemon polandii F.M. Bailey		S																											27			
Callistemon viminalis (Sol. ex Gaertn.) G. Don ex Loudon		S						6																								
Calytrix leptophylla Benth.		SB																		18		20										
Decaspermum humile (G. Don) A.J. Scott		ST	1	2	3	4		6																								
Eucalyptus acroleuca L.A.S. Johnson & K.D. Hill		T							7														21	22								
Eucalyptus brassiana S.T. Blake		T				4		6		8	9	10	11	12	13		15	16		18	19					24						30
Eucalyptus camaldulensis Dehnh.		T						6		8			11																			
Eucalyptus chlorophylla Brooker & Done		T							7	8	9	10	11	12	13		15	16		18		20		22								
subsp. (Archer River K. Hill+ 1771)		T							7																							
Eucalyptus citriodora Hook.		T														14																
Eucalyptus clarksoniana D.J. Carr & S.G.M. Carr		T		2		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19			22	23	24	25					30
Eucalyptus cloeziana F. Muell.		T														14																

	R	Lf	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Eucalyptus confertiflora F. Muell.		T						6	7	8	9	10	11					16	17	18												
Eucalyptus crebra F. Muell.		T					5				9		11		13	14	15	16										27				
Eucalyptus cullenii Cambage		T					5				9	10	11	12	13	14	15	16	17			20										30
Eucalyptus curtipes D.J. Carr & S.G.M. Carr		T								8																						
Eucalyptus drepanophylla F. Muell. ex Benth.		T													13		15															
Eucalyptus ellipsoidea D.J. Carr & S.G.M. Carr		T									9																					
Eucalyptus erythrophloia Blakely		T												12																		
Eucalyptus exserta F. Muell.		T																														
Eucalyptus hylandii D.J. Carr & S.G.M. Carr																																
var. ***campestris*** D. Carr & S.G.M. Carr		T							7	8	9			12	13	14	15	16	17	18		20										30
var. ***hylandii***		T										10																				
Eucalyptus intermedia R.T. Baker		T												12	13	14	15				19					24	25					
Eucalyptus leptophleba F. Muell.		T	1	2			5	6	7	8	9	10	11	12	13	14	15	16	17	18				22				27				
Eucalyptus microneura Maiden & Blakely		T																														
Eucalyptus microtheca F. Muell.		T							7													20	21	22								
Eucalyptus nesophila Blakely		T								8	9	10		12	13	14	15	16	17	18						24			27			30
Eucalyptus novoguinensis D.J. Carr & S.G.M. Carr		T						6		8			11		13		15	16	17	18	19	20				24	25					30
Eucalyptus papuana F. Muell.		T				4		6	7	8	9	10	11	12			15	16	17	18		20	21	22	23		25					
Eucalyptus pellita F. Muell.		T		2				6							13	14										24						
Eucalyptus persistens L.A.S. Johnson & K.D. Hill																																
subsp. ***tardecidens*** L.A.S. Johnson & K.D. Hill		T									9																					
Eucalyptus phoenicea F. Muell.		T										10			13				17													
Eucalyptus platyphylla F. Muell.		T								8	9	10	11	12	13	14	15	16	17	18		20										
Eucalyptus polycarpa F. Muell.		T						6	7	8									17	18												
Eucalyptus reducta L.A.S. Johnson & K.D. Hill		T														14																
Eucalyptus resinifera Sm.		T	1	2												14																
Eucalyptus setosa Schauer		T								8									17													
subsp. (Musgrave K. Hill+ 1914)		T								8																						
Eucalyptus similis Maiden		T										10																				
Eucalyptus sp. (Archer Point D.F. Blaxell+ 89/136)		T																														
Eucalyptus sp. (Fox Range K. Hill+ 3780)		T																														
Eucalyptus sp. (Lake Galilee S.W. Jacobs 5905)		T																														
Eucalyptus sp. (Mt Mulligan J.R. Clarkson 5889)		T									9	10			13	14																
Eucalyptus sp. (Mt Tozer K. Hill+ 1862)		T																														
Eucalyptus staigeriana F. Muell. ex F.M. Bailey		T										10																				
Eucalyptus stockeri D.J. Carr & S.G.M Carr		T																														
Eucalyptus tereticornis Sm.		T	1					6						12	13	14																
Eucalyptus tessellaris F. Muell.		T		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		21	22	23		25					
Eucalyptus tetrodonta F. Muell.		T								8	9	10	11		13		15	16	17	18		20				24			27			30
Eucalyptus tokwa D.J. Carr & S.G.M. Carr		T																														
Eucalyptus torelliana F. Muell.		T	1																													
Eugenia reinwardtiana (Blume) DC.		ST	1	2	3	4	5	6																		24	25			28	29	
Homoranthus tropicus Byrnes	R	B																				20										
Leptospermum amboinense Blume		ST																														
Leptospermum brachyandrum (F. Muell.) Druce		S																														

	R	Lf	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Leptospermum madidum A.R. Bean																																
subsp. ***madidum***		ST						6																								
Leptospermum polygalifolium Salisb.																																
subsp. ***tropicum*** Joy Thomps.		S																								24			27			
Leptospermum purpurascens Joy Thomps.	R	ST					5																			24						30
Lindsayomyrtus racemoides (Greves) Craven		T																														
Lophostemon confertus (R. Br.) Peter G. Wilson & J.T. Waterh.		T																														
Lophostemon grandiflorus (Benth.) Peter G. Wilson & J.T. Waterh.																																
subsp. ***riparius*** (Domin) Peter G. Wilson & J.T. Waterh.		T					5	6																								
Lophostemon suaveolens (Sol. ex Gaertn.) Peter G. Wilson & J.T. Waterh.		T	1	2	3	4	5	6		8	9	10	11	12	13	14	15	16	17	18	19	20		22		24	25		27			30
Melaleuca acacioides F. Muell.																																
subsp. ***acacioides***		TS																			19	20			23							
Melaleuca arcana S.T. Blake		TS				4															19					24	25		27			
Melaleuca argentea W. Fitzg.		TS						6																								
Melaleuca bracteata F. Muell.		ST																														
Melaleuca cajuputi Powell		T																														
subsp. (Dalntree River B.A. Barlow+ 3889)		T																														
Melaleuca citrolens Barlow		TS					5		7											18	19	20			23							30
Melaleuca dealbata S.T. Blake		T				4		6												18	19						25					
Melaleuca foliolosa A. Cunn. ex Benth.		ST							7		9		11							18		20			23	24						30
Melaleuca leucadendra (L.) L.		T		2		4		6		8			11		13		15	16			19											
Melaleuca minutifolia F. Muell.																																
subsp. ***monantha*** Barlow		ST																														
Melaleuca nervosa (Lindl.) Cheel		ST							7	8	9	10	11	12	13	14	15	16	17	18	19					24	25					
Melaleuca quinquenervia (Cav.) S.T. Blake		T						6		8				12							19					24			27			
Melaleuca saligna Schauer		T						6		8										18	19	20			23	24				28		
Melaleuca sp. (Archer River J.R. Clarkson 6039)		T						6																								
Melaleuca sp. (Emu Lagoon J.R. Clarkson+ 9582)		T																			19	20										
Melaleuca stenostachya S.T. Blake		ST							7	8	9	10	11	12	13	14		16	17	18		20		22	23	24						30
Melaleuca trichostachya Lindl.		ST						6																								
Melaleuca viridiflora Sol. ex Gaertn.		TS					5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		27	28		30
Myrtella obtusa (Endl.) A.J. Scott		BS				4																				24	25					30
Myrtella retusa (Endl.) A.J. Scott		BS			3						9						15	16	17			20				24					29	30
Neofabricia mjoebergii (Cheel) Joy Thomp.		ST								8		10							17	18												30
Neofabricia myrtifolia (Gaertn.) Joy Thomp.		ST			3	4	5	6		8		10			13		15	16	17	18	19	20				24			27			30
Neofabricia sericisepala J.R. Clarkson & Joy Thomp.		ST										10							17	18		20										30
Osbornia octodonta F. Muell.		Sm																										26		28		
Pilidiostigma recurvum (C.T. White) A.J. Scott		ST	1	2		4		6																								
Pilidiostigma tetramerum L.S. Sm.		ST	1																													
Rhodamnia australis A.J. Scott		TS		2	3	4	5	6																								
Rhodamnia blairiana F. Muell.		T		2	3			6																								
Rhodamnia sessiliflora Benth.		TS	1					6																								
Rhodamnia sp. (Cape York L.S. Smith 12538)		T																														
Rhodamnia sp. (Mellwraith Range L.J. Webb+ 9527)		T																														
Rhodamnia sp. (Upper Massey Creek L.S. Smith 11733)		T					5																									

	R	Lf	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Rhodamnia spongiosa F.M. Bailey		TS		2				6																								
Rhodomyrtus effusa Guymer	R	S																														
Rhodomyrtus macrocarpa Benth.		ST	1		3	4	5	6																								
Rhodomyrtus pervagata Guymer																																
Rhodomyrtus sericea Burret		S	1					6																								
Rhodomyrtus trineura (F. Muell.) F. Muell. ex Benth.																																
subsp. ***capensis*** Guymer		S	1	2	3			6													19											
Sphaerantia chartacea Peter G. Wilson & B. Hyland	R	T																														
Syncarpia glomulifera (Sm.) Nied.		T														14																
Syzygium angophoroides (F. Muell.) B. Hyland		T	1	2	3	4	5	6													19											
Syzygium apodophyllum (F. Muell.) B. Hyland		T	1	2																												
Syzygium aqueum (Burm. f.) Alston	R	T		2																												
Syzygium argyropedicum B. Hyland	R	T				4															19					24						
Syzygium bamagense B. Hyland		T	1	2	3	4	5	6																								
Syzygium banksii (Britten & S. Moore ex S. Moore) B. Hyland		T			3	4																				24						30
Syzygium branderhorstii Lauterb.		T			3			6																								
Syzygium buettnerianum (K. Schum.) Nied.	R	T			3	4		6																								
Syzygium bungadinnia (F.M. Bailey) B. Hyland		T	1	2	3	4		6																								
Syzygium canicortex B. Hyland		T																														
Syzygium cormiflorum (F. Muell.) B. Hyland		T	1	2	3			6																								
Syzygium endophloium B. Hyland		T	1																													
Syzygium erythrocalyx (C.T. White) B. Hyland		T																														
Syzygium erythrodoxum (S. Moore) B. Hyland		TS																														
Syzygium eucalyptoides (F. Muell.) B. Hyland																																
subsp. ***bleeseri*** (O. Schwarz) B. Hyland		TS																														
subsp. ***eucalyptoides***		TS			3			6		8		10								18		20				24	25					30
Syzygium fibrosum (F.M.Bailey) T.G. Hartley & L.M. Perry		T	1	2	3	4		6																								
Syzygium forte (F. Muell.) B. Hyland																																
subsp. ***forte***		T	1	2	3	4	5	6																		24						
subsp. ***potamophilum*** B. Hyland		T			3	4		6																								
Syzygium gustavioides (F.M. Bailey) B. Hyland		T	1																													
Syzygium johnsonii (F. Muell.) B. Hyland		T	1	2																												
Syzygium kuranda (F.M. Bailey) B. Hyland		T	1					6																								
Syzygium luehmannii (F. Muell.) L.A.S. Johnson		T	1					6																								
Syzygium maciwraithianum B. Hyland	R	T																														
Syzygium malaccense (L.) Merr. & L.M. Perry	R	T	1					6																								
Syzygium pseudofastigiatum B. Hyland	R	T		2	3			6																								
Syzygium puberulum Merr. & L.M. Perry	R	T		2				6																								
Syzygium rubrimolle B. Hyland	R	T																														
Syzygium sayeri (F. Muell.) B. Hyland		T	1																													
Syzygium suborbiculare (Benth.) T.G. Hartley & L.M. Perry		TS			3	4	5	6		8		10	11		13		15	16	17	18	19					24	25		27	28		30
Syzygium tierneyanum (F. Muell.) T.G. Hartley & L.M. Perry		T	1	2		4		6																								
Syzygium velarum B. Hyland	V	T			3																											
Syzygium wesa B. Hyland		T																														

	R	Lf	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Syzygium wilsonii (F. Muell.) B. Hyland																																
subsp. ***cryptophlebium*** (F. Muell.) B. Hyland		T	1																													
† ***Syzygium xerampelinum*** B. Hyland	R	TS																														
Thryptomene oligandra F. Muell.		ST				4		6				10		12			15		17	18	19				23	24	25		27			30
Tristaniopsis exiliflora (F. Muell.) Peter G. Wilson & J.T. Waterh.		T	1	2				6																								
Uromyrtus metrosideros (F.M. Bailey) A.J. Scott	R	T																														
Waterhousea hedraiophylla (F. Muell.) B. Hyland	R	T																														
Waterhousea unipunctata B. Hyland		T				4																										
Welchiodendron longirame (F. Muell.) Peter G. Wilson & J.T. Waterh.		TS		2	3	4	5	6				10		12	13		15	16	17			20			23	24			27			30
Xanthostemon arenarius Peter G. Wilson	R	T				4																										
Xanthostemon chrysanthus (F. Muell.) F. Muell. ex Benth.		T	1	2				6																		24						
Xanthostemon crenulatus C.T. White		T		2	3	4		6		8			11								19	20							27			
Xanthostemon umbrosus (A. Cunn. ex Lindl.) Peter G. Wilson & J.T.Waterh.		T		2		4	5	6				10																				
Xanthostemon verticillatus (C.T. White & W.D. Francis) L.S. Sm.	R	T																														
Xanthostemon xerophilus Peter G. Wilson	R	T			3													16								24						30
Xanthostemon youngii C.T. White & W.D. Francis	V	ST				4		6																		24						

10.3 APPENDIX 3. Naturalised exotic plants known to occur on Cape York Peninsula

ACANTHACEAE
- *Asystasia gangetica*
- *Barleria cristata*
- *Ruellia malacosperma*
- *Thunbergia alata*

AGAVACEAE
- *Agave sisalana*
- *Sansevieria trifasciata*

AIZOACEAE
- *Trianthema portulacastrum*

AMARANTHACEAE
- *Alternanthera bettzickiana*
- *Alternanthera denata*
- *Alternanthera ficoidea*
- *Amaranthus viridis*
- *Celosia argentea*
- *Gomphrena celosioides*

ANACARDIACEAE
- *Anacardium occidentale*
- *Mangifera indica*

ANNONACEAE
- *Annona glabra*
- *Annona reticulata*
- *Annona squamosa*

APOCYNACEAE
- *Catharanthus roseus*

ARECACEAE
- *Cocos nucifera*

ASCLEPIADACEAE
- *Asclepias curassavica*
- *Calotropis gigantea*
- *Calotropis procera*
- *Cryptostegia grandiflora*
- *Hoya serpens*

ASTERACEAE
- *Acanthospermum hispidum*
- *Ageratum conyzoides*
- *Ageratum houstonianum*
- *Bidens bipinnata*
- *Bidens pilosa* var. *pilosa*
- *Conyza leucantha*
- *Cosmos caudatus*
- *Eclipta prostrata*
- *Elephantopus scaber*
- *Eleutheranthera ruderalis*
- *Emilia sonchifolia*
- *Emilia sonchifolia* var. *sonchifolia*

ASTERACEAE (Cont.)
- *Gamochaeta spicata*
- *Sigesbeckia orientalis*
- *Sonchus oleraceus*
- *Synedrella nodiflora*
- *Tithonia diversifolia*
- *Tridax procumbens*
- *Wedelia trilobata*
- *Xanthium pungens*

BIGNONIACEAE
- *Tecoma stans*

BIXACEAE
- *Bixa orellana*

BORAGINACEAE
- *Heliotropium indicum*

BRASSICACEAE
- *Coronopus integrifolius*
- *Raphanus raphanistrum*

CACTACEAE
- *Opuntia stricta* var. *stricta*

CAESALPINIACEAE
- *Bauhinia monandra*
- *Cassia fistula*
- *Cassia siamea*
- *Chamaecrista nigricans*
- *Chamaecrista rotundifolia*
- *Senna alata*
- *Senna obtusifolia*
- *Senna occidentalis*
- *Senna pendula* var. *glabrata*
- *Tamarindus indica*

CHENOPODIACEAE
- *Salsola kali*

COMBRETACEAE
- *Quisqualis indica*

COMMELINACEAE
- *Commelina benghalensis*

CONVOLVULACEAE
- *Argyreia nervosa*
- *Ipomoea cairica*
- *Ipomoea carnea* subsp. *fistulosa*
- *Ipomoea hederifolia*
- *Ipomoea nil*
- *Ipomoea quamoclit*
- *Ipomoea triloba*
- *Merremia dissecta*

CONVOLVULACEAE (Cont.)
Merremia quinquefolia

CRASSULACEAE
Bryophyllum daigremontianum

CUCURBITACEAE
Citrullus lanatus
Cucumis anguria var. *anguria*
Cucumis melo subsp. *agrestis*
Cucumis metuliferus
Lagenaria siceraria
Momordica charantia

CYPERACEAE
Cyperus brevifolius
Cyperus compressus
Cyperus esculentus
Cyperus metzii
Cyperus rotundus
Cyperus sphacelatus
Cyperus tuberosus

DIOSCOREACEAE
Dioscorea alata

EUPHORBIACEAE
Acalypha wilkesiana
Euphorbia cyathophora
Euphorbia heterophylla
Euphorbia hirta
Euphorbia hyssopifolia
Euphorbia prostrata
Euphorbia thymifolia
Jatropha curcas
Jatropha gossypiifolia
Manihot esculenta
Pedilanthus tithymaloides subsp. *smallii*
Phyllanthus tenellus
Ricinus communis

FABACEAE
Aeschynomene aspera
Aeschynomene brevifolia
Aeschynomene indica
Calopogonium mucunoides
Centrosema pubescens
Clitoria ternatea
Crotalaria anagyroides
Crotalaria goreensis
Crotalaria juncea
Crotalaria laburnifolia
Crotalaria lanceolata
Crotalaria pallida
Crotalaria spectabilis
Crotalaria verrucosa
Desmodium heterophyllum
Desmodium scorpiurus
Desmodium tortuosum
Indigofera tinctoria
Macroptilium atropurpureum

FABACEAE (Cont.)
Macroptilium lathyroides
Mucuna pruriens var. *utilis*
Neonotonia wightii
Pachyrhizus erosus
Pueraria lobata
Pueraria phaseoloides
Stylosanthes guianensis
Stylosanthes hamata
Stylosanthes humilis
Stylosanthes scabra
Stylosanthes viscosa
Teramnus labialis
Vigna adenantha
Vigna radiata
Vigna unguiculata subsp. *dekindtiana*

LAMIACEAE
Hyptis capitata
Hyptis suaveolens
Leonotis nepetifolia
Leucas decemdentata
Ocimum americanum
Ocimum basilicum
Ocimum menthifolium
Ocimum tenuiflorum
Salvia misella

LYTHRACEAE
Ammannia auriculata

MALVACEAE
Abelmoschus manihot subsp. *manihot*
Abelmoschus manihot subsp. *tetraphyllus*
Gossypium barbadense
Malvastrum americanum
Sida acuta
Sida cordifolia

MIMOSACEAE
Acacia farnesiana
Leucaena leucocephala
Mimosa pudica

MOLLUGINACEAE
Mollugo verticillata

MORINGACEAE
Moringa pterygosperma

MUSACEAE
Musa acuminata

ONAGRACEAE
Ludwigia peploides subsp. *montevidensis*

PASSIFLORACEAE
Passiflora foetida var. *foetida*
Passiflora suberosa

PHYTOLACCACEAE
Rivina humilis

POACEAE
Andropogon gayanus
Axonopus compressus
Axonopus fissifolius
Bothriochloa pertusa
Brachiaria decumbens
Brachiaria humidicola
Brachiaria mutica
Cenchrus brownii
Cenchrus ciliaris
Cenchrus echinatus
Cenchrus pennisetiformis
Cenchrus setiger
Chloris gayana
Chloris inflata
Chloris virgata
Cynodon nlemfuensis var. *nlemfuensis*
Dactyloctenium aegyptium
Dichanthium annulatum
Dichanthium aristatum
Digitaria ciliaris
Digitaria eriantha subsp. *pentzii*
Echinochloa colona
Echinochloa crus-galli
Echinochloa polystachya
Eleusine indica
Eragrostis bahiensis
Eragrostis cilianensis
Eragrostis pilosa
Hymenachne amplexicaulis
Melinis minutiflora
Melinis repens
Panicum maximum var. *coloratum*
Panicum maximum var. *maximum*
Panicum maximum var. *trichoglume*
Paspalum notatum
Paspalum paniculatum
Paspalum plicatulum
Pennisetum pedicellatum subsp. *unispiculum*
Setaria italica
Setaria pumila subsp. *pallide-fusca*
Setaria pumila subsp. *pumila*
Setaria sphacelata var. *sericea*
Sorghum bicolor
Sporobolus coromandelianus
Sporobolus pyramidalis var. *jacquemontii*
Themeda quadrivalvis
Urochloa mosambicensis
Urochloa oligotricha

POLYGALACEAE
Polygala chinensis

PONTEDERIACEAE
Eichhornia crassipes

PORTULACACEAE
Portulaca pilosa
Talinum paniculatum

PRIMULACEAE
Anagallis pumila

RHAMNACEAE
Ziziphus mauritiana

ROSACEAE
Prunus grisea

RUBIACEAE
Anthocephalus chinensis
Geophila repens
Mitracarpus hirtus
Oldenlandia corymbosa var. *corymbosa*
Richardia brasiliensis
Richardia scabra
Spermacoce latifolia
Tarenna dallachiana

SAPINDACEAE
Cardiospermum halicacabum var. *halicacabum*

SCROPHULARIACEAE
Angelonia salicariifolia
Bacopa procumbens
Scoparia dulcis

SOLANACEAE
Capsicum annuum var. *glabriusculum*
Capsicum frutescens
Datura metel
Nicotiana tabacum
Physalis ixocarpa
Solanum americanum subsp. *nodiflorum*
Solanum erianthum
Solanum seaforthianum
Solanum torvum

STERCULIACEAE
Melochia pyramidata

TILIACEAE
Grewia asiatica

VERBENACEAE
Clerodendrum heterophyllum var. *baueri*
Duranta erecta
Lantana camara
Lippia alba var. *alba*
Phyla nodiflora var. *nodiflora*
Stachytarpheta jamaicensis
Stachytarpheta mutabilis
Stachytarpheta x adulterina

ZINGIBERACEAE
Curcuma longa
Kaempferia sp. (Murray Island M. Lawrie 5)
Zingiber officinale
Zingiber zerumbet

10.4 APPENDIX 4. Rare or threatened plants known to occur on Cape York Peninsula

FLOWERING PLANTS

ACANTHACEAE
- K *Hemigraphis royenii*
- K *Lepidagathis royenii*
- R *Peristrophe brassii*
- K *Rhaphidospora cavernarum*

AIZOACEAE
- K *Macarthuria* sp. (McIvor River J.R. Clarkson 5447)

ALISMATACEAE
- R *Limnophyton australiense*

ALSEUOSMIACEAE
- R *Crispiloba disperma*

ANNONACEAE
- R *Ancana hirsuta*
- R *Artabotrys* sp. (Claudie River B. Gray 3240)
- R *Haplostichanthus johnsonii*
- R *Haplostichanthus* sp. (Mt Finnigan L.W. Jessup 632)
- R *Haplostichanthus* sp. (Topaz L.W. Jessup 520)
- K *Melodorum* sp. (Claudie River B.P. Hyland 21171V)
- K *Melodorum* sp. (Font Hills G. Sankowsky 380)
- K *Polyaulax* sp. (Mt Lewis L.W. Jessup 554)
- K *Uvaria rufa*

APOCYNACEAE
- R *Alyxia orophila*
- R *Neisosperma poweri*
- K *Parsonsia densivestita*
- K *Parsonsia* sp. (Capt Billy Landing K.A. Williams 85222)
- R *Parsonsia* sp. (Possum Scrub P.I. Forster+ PIF13519)
- R *Wrightia versicolor*

APONOGETONACEAE
- V *Aponogeton elongatus*
- R *Aponogeton queenslandicus*

ARACEAE
- R *Pothos brassii*
- R *Remusatia vivipara*
- R *Rhaphidophora pachyphylla*
- R *Scindapsus altissimus*

ARALIACEAE
- R *Schefflera bractescens*

ARECACEAE
- V *Arenga australasica*
- K *Arenga microcarpa*
- R *Calamus aruensis*
- V *Calamus warburgii*
- V *Gulubia costata*
- R *Linospadix microcarya*
- R *Linospadix palmeriana*
- R *Livistona* sp. (Cooktown A.K. Irvine 2178)
- V *Normanbya normanbyi*
- V *Wodyetia bifurcata*

ARISTOLOCHIACEAE
- R *Aristolochia chalmersii*
- K *Aristolochia* sp. (Lamond Hill G. Sankowsky+ 382)
- K *Aristolochia* sp. (Woopen Creek G. Sankowsky+ 685)

ASCLEPIADACEAE
- R *Cryptolepis grayi*
- V *Dischidia littoralis*
- R *Heterostemma acuminatum*
- R *Hoya anulata*
- R *Hoya macgillivrayi*
- R *Hoya revoluta*
- E *Marsdenia* sp. (Bromley D.J. Liddle AQ561263)
- R *Sarcolobus vittatus*
- R *Secamone auriculata*
- V *Tylophora williamsii*

ASTERACEAE
- K *Acomis* sp. (Alice River J.R. Clarkson 5016)

BIGNONIACEAE
- R *Dolichandrone spathacea*
- R *Neosepicaea viticoides*
- R *Tecomanthe* sp. (Roaring Meg L.J. Brass 20326)

BORAGINACEAE
- V *Carmona retusa*

CAESALPINIACEAE
- R *Caesalpinia hymenocarpa*
- R *Cassia queenslandica*
- R *Crudia papuana*
- R *Labichea buettneriana*

CAMPANULACEAE
- R *Lobelia douglasiana*

CAPPARACEAE
- R *Crateva religiosa*

CELASTRACEAE
- R *Euonymus globularis*
- R *Hypsophila halleyana*

CLUSIACEAE
- V *Calophyllum bicolor*
- K *Garcinia* sp. (Claudie River L.J. Brass 19658)

COMBRETACEAE
- R *Combretum trifoliatum*
- K *Dansiea grandiflora*
- K *Terminalia prostrata*

CONNARACEAE
- R *Rourea brachyandra*

CONVOLVULACEAE
- K *Ipomoea stolonifera*
- R *Operculina brownii*

CUCURBITACEAE
- K *Momordica cochinchinensis*
- E *Muellerargia timorensis*
- K *Mukia* sp. (Little Annan River B. Gray 101)

CUNONIACEAE
- K *Ceratopetalum* sp. (Mt Hemmant B.P. Hyland RFK3338)

CYPERACEAE
- R *Carex rafflesiana*
- K *Cyperus serotinus*
- K *Fimbristylis costiglumis*
- K *Hypolytrum compactum*
- R *Paramapania parvibractea*
- K *Rhynchospora gracillima*
- K *Scleria carphiformis*
- K *Scleria pergracilis*

DATISCACEAE
- R *Tetrameles nudiflora*

DICHAPETALACEAE
- K *Dichapetalum* sp. (Claudie River B.P. Hyland 7006)

DILLENIACEAE
- R *Hibbertia echiifolia*
- K *Hibbertia* sp. (Mt Tozer L.J. Brass 19024)

DIOSCOREACEAE
- K *Dioscorea pentaphylla* var. *papuana*

EBENACEAE
- R *Diospyros* sp. (Bamaga B.P. Hyland 2517)
- R *Diospyros* sp. (Mt Lewis L.S. Smith 10107)

ELAEOCARPACEAE
- R *Elaeocarpus* sp. (Mt Lewis B.P. Hyland 2907)
- R *Elaeocarpus thelmae*

EPACRIDACEAE
- V *Leucopogon cuspidatus*
- R *Leucopogon spathaceus*

ERICACEAE
- R *Rhododendron lochiae*

ERIOCAULACEAE
- K *Eriocaulon fistulosum*
- K *Eriocaulon pusillum*

EUPHORBIACEAE
- R *Cleistanthus myrianthus*
- R *Croton brachypus*
- R *Croton stockeri*
- R *Glochidion pungens*
- V *Macaranga polyadenia*
- R *Margaritaria indica*
- R *Omphalea papuana*
- R *Phyllanthus hypospodius*
- R *Pimelodendron amboinicum*

FABACEAE
- R *Bossiaea arenicola*
- K *Derris rubrocalyx* subsp. *rubrocalyx*
- K *Ormocarpum orientale*
- R *Phylacium bracteosum*
- R *Phyllodium pulchellum*
- K *Phyllodium* sp. (Montalbion H.S. McKee 9430)
- K *Pterocarpus* sp. (Archer River B.P. Hyland 3078)
- R *Sesbania erubescens*
- K *Tephrosia debilis*
- K *Tephrosia maculata*
- R *Tephrosia savannicola*

GROSSULARIACEAE
- K *Argophyllum verae*

HALORAGACEAE
- V *Myriophyllum coronatum*
- K *Myriophyllum muricatum*

HAMAMELIDACEAE
- R *Ostrearia australiana*

HERNANDIACEAE
- R *Hernandia albiflora*

HYDROCHARITACEAE
- R *Vallisneria gracilis*

ICACINACEAE
- R *Ryticaryum longifolium*

LAMIACEAE
- R *Plectranthus arenicola*
- K *Teucrium ajugaceum*

LAURACEAE
- R *Beilschmiedia castrisinensis*
- R *Beilschmiedia peninsularis*
- R *Cinnamomum baileyanum*
- K *Cryptocarya bamagana*
- R *Cryptocarya bellendenkerana*
- R *Cryptocarya burckiana*
- R *Cryptocarya claudiana*
- R *Cryptocarya glaucocarpa*
- R *Endiandra collinsii*
- R *Litsea macrophylla*

LILIACEAE
- K *Dianella incollata*

LOGANIACEAE
- K *Mitreola petiolata*

LORANTHACEAE
- K *Cecarria obtusifolia*
- R *Dactyliophora novaeguineae*

MALVACEAE
- R *Macrostelia grandifolia* subsp. *grandifolia*
- R *Macrostelia grandifolia* subsp. *macilwraithensis*

MELASTOMATACEAE
- R *Medinilla balls-headleyi*

MELIACEAE
- R *Aglaia argentea*
- R *Aglaia brassii*
- R *Dysoxylum setosum*

MENISPERMACEAE
- K *Cissampelos pareira*
- K *Cissampelos pareira* var. (Upper Massey Creek L.S. Smith 11741)
- K *Pycnarrhena ozantha*
- R *Tiliacora australiana*
- R *Tinospora angusta*

MENYANTHACEAE
- K *Nymphoides elliptica*

MIMOSACEAE
- R *Acacia albizioides*
- R *Acacia armillata*
- R *Acacia armitii*
- R *Acacia fleckeri*
- R *Acacia ommatosperma*
- R *Acacia pennata* subsp. *kerrii*
- V *Acacia* sp. (McIvor River J.R. Clarkson 5475)
- R *Albizia retusa* subsp. *morobei*
- R *Albizia retusa* subsp. *retusa*

MIMOSACEAE (Cont.)
- R *Archidendron hirsutum*
- R *Archidendropsis xanthoxylon*

MONIMIACEAE
- K *Wilkiea* sp. (Palmerston B.P. Hyland 80)

MORACEAE
- R *Fatoua pilosa*
- K *Ficus melinocarpa* var. *hololampra*
- K *Ficus triradiata* var. *sessilicarpa*

MYRTACEAE
- R *Acmena mackinnoniana*
- R *Acmenosperma pringlei*
- R *Austromyrtus lucida*
- R *Austromyrtus* sp. (Bamaga B.P. Hyland 10235)
- R *Austromyrtus* sp. (Byerstown Range G.P. Guymer 2037)
- K *Austromyrtus* sp. (Claudie River G.P. Guymer 2052)
- R *Austromyrtus* sp. (McIlwraith Range B.P. Hyland 11148)
- R *Backhousia bancroftii*
- V *Baeckea* sp. (Tozer Range L.J. Brass 19348)
- R *Homoranthus tropicus*
- R *Leptospermum purpurascens*
- R *Rhodomyrtus effusa*
- R *Sphaerantia chartacea*
- R *Syzygium aqueum*
- R *Syzygium argyropedicum*
- R *Syzygium buettnerianum*
- R *Syzygium macilwraithianum*
- R *Syzygium malaccense*
- R *Syzygium pseudofastigiatum*
- K *Syzygium puberulum*
- R *Syzygium rubrimolle*
- V *Syzygium velarum*
- R *Syzygium xerampelinum*
- R *Uromyrtus metrosideros*
- R *Waterhousea hedraiophylla*
- R *Xanthostemon arenarius*
- R *Xanthostemon verticillatus*
- R *Xanthostemon xerophilus*
- V *Xanthostemon youngii*

OLACACEAE
- K *Anacolosa papuana*

ORCHIDACEAE
- V *Acriopsis javanica*
- K *Aphyllorchis queenslandica*
- R *Appendicula australiensis*
- R *Bulbophyllum blumei*
- V *Bulbophyllum gracillimum*
- R *Bulbophyllum grandimesense*
- V *Bulbophyllum longiflorum*
- R *Cadetia collinsii*
- R *Cadetia wariana*

ORCHIDACEAE (Cont.)
- K *Corybas neocaledonicus*
- E *Dendrobium antennatum*
- V *Dendrobium bigibbum*
- V *Dendrobium carronii*
- V *Dendrobium johannis*
- E *Dendrobium lithocola*
- R *Dendrobium lobbii*
- R *Dendrobium malbrownii*
- E *Dendrobium mirbelianum*
- E *Dendrobium nindii*
- V *Dendrobium phalaenopsis*
- R *Dendrobium toressae*
- V *Dendrobium tozerensis*
- R *Dendrobium wassellii*
- V *Dendrobium x superbiens*
- K *Didymoplexis pallens*
- R *Dipodium ensifolium*
- E *Dipodium pictum*
- R *Eria dischorensis*
- R *Eria irukandjiana*
- K *Eulophia zollingeri*
- R *Flickingeria convexa*
- R *Gastrodia queenslandica*
- R *Goodyera grandis*
- R *Habenaria hymenophylla*
- E *Habenaria macraithii*
- R *Habenaria rumphii*
- R *Liparis condylobulbon*
- R *Malaxis fimbriata*
- E *Malaxis lawleri*
- R *Nervilia crociformis*
- R *Oberonia carnosa*
- R *Oeceoclades pulchra*
- R *Pachystoma pubescens*
- V *Phaius pictus*
- E *Phaius tancarvilleae*
- E *Phalaenopsis rosenstromii*
- V *Pomatocalpa marsupiale*
- V *Rhinerrhiza moorei*
- R *Robiquetia wassellii*
- V *Sarcochilus hirticalcar*
- R *Schoenorchis sarcophylla*
- V *Spathoglottis paulinae*
- V *Spathoglottis plicata*
- K *Taeniophyllum confertum*
- K *Taeniophyllum lobatum*
- K *Thelasis carinata*
- V *Trichoglottis australiensis*
- V *Vanda hindsii*

PANDANACEAE
- R *Freycinetia marginata*
- R *Freycinetia percostata*
- R *Pandanus gemmifer*
- R *Pandanus zea*

POACEAE
- R *Apluda muica*
- K *Aristida cumingiana*

POACEAE (Cont.)
- K *Arthragrostis clarksoniana*
- R *Bambusa forbesii*
- K *Brachiaria kurzii*
- V *Centotheca philippinensis*
- K *Coix gasteenii*
- K *Cyrtococcum capitis-york*
- K *Dallwatsonia felliana*
- K *Dimeria acinaciformis*
- K *Ectrosia anomala*
- K *Enteropogon dolichostachyus*
- R *Eremochloa ciliaris*
- E *Eremochloa muricata*
- R *Garnotia stricta* var. *longiseta*
- V *Germainia capitata*
- R *Heterachne baileyi*
- R *Lepturus geminatus*
- R *Lepturus xerophilus*
- K *Lophatherum gracile*
- K *Paspalum multinodum*
- K *Scrotochloa tararaensis*
- K *Scrotochloa urceolata*
- K *Thelepogon australiensis*

POLYGALACEAE
- R *Polygala pycnophylla*

PROTEACEAE
- R *Buckinghamia ferruginiflora*
- V *Macadamia claudiensis*
- R *Stenocarpus cryptocarpus*
- R *Triunia montana*

RHAMNACEAE
- K *Cryptandra* sp. (Mt Mulligan J.R. Clarkson 5949)
- R *Gouania australiana*
- R *Gouania hillii*

RUBIACEAE
- K *Aidia* sp. (Gap Creek L.W. Jessup 651)
- K *Canthium* sp. (Thursday Island E. Cowley 10)
- V *Gardenia psidioides*
- K *Gardenia rupicola*
- R *Gardenia scabrella*
- R *Hedyotis philippensis*
- V *Hodgkinsonia frutescens*
- K *Lasianthus cyanocarpus*
- V *Myrmecodia beccarii*
- R *Oldenlandia polyclada*
- K *Psychotria lorentzii*
- R *Psychotria submontana*
- R *Randia audasii*

RUTACEAE
- R *Acronychia chooreechillum*
- K *Boronia* sp. (Massy Creek R.G. Coveny+ 7174)
- K *Boronia* sp. (Mt Mulligan J.R. Clarkson 5301)

RUTACEAE (Cont.)
- V *Eriostemon* sp. (Mt Tozer L.J. Brass 19483)
- R *Flindersia brassii*
- R *Medicosma glandulosa*
- R *Medicosma riparia*
- R *Medicosma sessiliflora*
- R *Microcitrus garrawayae*
- K *Zanthoxylum rhetsa*

SANTALACEAE
- R *Dendromyza reinwardtiana*

SAPINDACEAE
- K *Alectryon repandodentatus*
- R *Arytera macrobotrys*
- K *Arytera pseudofoveolata*
- R *Diploglottis harpullioides*
- R *Dodonaea oxyptera*
- K *Guioa* sp. (Mt Misery P.I. Forster+ PIF10757)
- R *Harpullia arborea*
- R *Harpullia ramiflora*
- V *Jagera javanica* subsp. *australiana*
- R *Lepiderema hirsuta*
- R *Mischocarpus albescens*
- R *Sarcopteryx acuminata*
- R *Tristiropsis canarioides*

SAPOTACEAE
- R *Chrysophyllum lanceolatum*
- R *Chrysophyllum* sp. (Mt Lewis A.K. Irvine 1042)
- R *Planchonella ripicola*

SCROPHULARIACEAE
- R *Torenia polyganoides*

SIMAROUBACEAE
- K *Quassia* sp. (Kennedy River J.R. Clarkson 5645)

SMILACACEAE
- K *Smilax blumei*
- K *Smilax kaniensis*

SOLANACEAE
- V *Solanum dunalianum*
- R *Solanum multiglochidiatum*

STACKHOUSIACEAE
- K *Stackhousia* sp. (McIvor River J.R. Clarkson 5201)

STEMONACEAE
- V *Stemona angusta*

STERCULIACEAE
- R *Argyrodendron* sp. (Whyanbeel B.P. Hyland RFK1106)
- R *Brachychiton albidus*
- R *Brachychiton grandiflorus*

STERCULIACEAE (Cont.)
- R *Brachychiton velutinosus*
- R *Brachychiton vitifolius*
- R *Sterculia shillinglawii* subsp. *shillinglawii*

SYMPLOCACEAE
- R *Symplocos* sp. (Mt Finnigan L.J. Brass 20129)
- R *Symplocos stawellii* var. *montana*

THYMELAEACEAE
- V *Jedda multicaulis*

TILIACEAE
- R *Brownlowia argentata*
- K *Grewia australis*

VERBENACEAE
- K *Premna hylandiana*

VITACEAE
- K *Cissus aristata*

WINTERACEAE
- R *Bubbia queenslandiana* subsp. *queenslandiana*

ZINGIBERACEAE
- R *Amomum dallachyi*
- R *Amomum queenslandicum*
- R *Etlingera australasica*
- R *Globba marantina*

GYMNOSPERMS

CYCADACEAE
- V *Cycas silvestris*

FERNS AND FERN ALLIES

ADIANTACEAE
- K *Doryopteris ludens*

ASPLENIACEAE
- K *Asplenium macilwraithense*

CYATHEACEAE
- E *Cyathea exilis*
- R *Cyathea felina*

DRYOPTERIDACEAE
- K *Tectaria silifolia*

GLEICHENIACEAE
- R *Sticherus milnei*

GRAMMITIDACEAE
- V *Ctenopteris blechnoides*
- K *Grammitis adspersa*
- V *Grammitis reinwardtii*

HYMENOPHYLLACEAE
- R *Hymenophyllum eboracense*

LINDSAEACEAE
- E *Lindsaea repens* var. *marquesensis*
- K *Lindsaea repens* var. *sessilis*
- R *Lindsaea walkerae*

LYCOPODIACEAE
- E *Huperzia carinata*
- R *Huperzia phlegmaria*
- V *Huperzia phlegmarioides*
- R *Lycopodiella limosa*

POLYPODIACEAE
- K *Lecanopteris sinuosa*

VITTARIACEAE
- R *Antrophyum plantagineum*

RARITY CODES

- X - Presumed extinct
- E - Endangered and at risk of disappearing from the wild state within 10 to 20 years if present land use and other casual factors continue to operate
- V - Vulnerable but not presently endangered
- R - Rare but not considered endangered or vulnerable
- K - Poorly known but suspect of being at risk

X, E & V as defined by the Australian and New Zealand Conservation Council (ANZECC 1993)
R & K as defined by Thomas and McDonald (1989)

10.5 APPENDIX 5. Examples of rainforest site data collected by D.G. Fell and J.P. Stanton

SITE 50 (CMP) HOWICK RIVER

Date:	9 May 1993
Air Photo Ref:	Cape Melville 1970 Run 6 Photo # 42 (55mm, 98mm)
Topo Ref:	Jeannie River 1:100 000 Sheet 7868 BD 406729
Lat Long:	14° 42' 18.37"S 144° 35' 27.77"E
Altitude:	80m
Location:	Head of the Howick River 48.9km ENE of Lakefield Ranger Base (59.2°)
Tenure:	Kalpowar Pastoral Holding
Plate:	Roll 7 #4

STRUCTURE

DRY SEMI-DECIDUOUS NOTOPHYLL/MICROPHYLL VINE FOREST on weathered products of ferruginous sandstone (colluvial fan) with dominant *Syzygium argyropedicum* and occasional *Bombax ceiba* var. *leioccarpum* and *Gyrocarpus americanus*.

FLORISTICS (16 species within 33 individuals)
(* denotes obligate deciduous species)

Emergents

Height: 20 - 26m

Syzygium argyropedicum

Canopy

Height: 12 - 22m

*Syzygium argyropedicum, Arytera bifoliolata, *Vitex acuminata, *Croton arnhemicus, *Bombax ceiba* var. *leiocladа, *Gyrocarpus americanus, Celtis philippensis, Drypetes deplanchei, *Premna dallachiana, *Pongamia pinnata, *Wrightia pubescens* subsp. *penicillata, *Canarium australianum, Mimusops elengi, *Briedelia sp.* (Stone Crossing J.R. Clarkson 9032), *Terminalia* sp. aff. *T. muelleri, *Celtis* sp. (Cape Melville D.G. Fell + DGF 3025)
(outside plot: *Garuga floribunda* var. *floribunda*)

Subcanopy

Height: 8 - 14m
Density: 266 stems/ha

*Arytera bifoliolata, *Wrightia pubescens* subsp. *penicillata, Cryptocarya exfoliata, *Tabernaemontana orientalis, *Celtis sp.* (Cape Melville D.G. Fell+ DGF 3025), *Microcitrus garrawayae, Pouteria sericea, *Briedelia sp.* (Stone Crossing J.R. Clarkson 9032)

Understorey

Height: 1 - 8m

**Ziziphus oenopolia, Celtis* sp. (Cape Melville D.G. Fell + DGF 3025), *Phyllanthus novae-hollandiae, Arytera bifoliolata, *Premna dallachyana, Diospyros compacta* var. *reticulata, Memecylon pauciflorum* var. *pauciflorum, Melicope erythrococca, Croton arnhemicus, Wrightia pubescens subsp. penicillata, Cryptocarya exfoliata, Uvaria membranaceum, Austromyrtus sp.* (Bakers Blue G.P. Guymer 2037), *Ficus virens* var. *petiolaris, Breynia cernua, Drypetes deplanchei, Amorphospermum antilogum, Cassine melanocarpum, Harrisonia brownii, Euphorbia plumerioides* var. *plumerioides, Briedelia sp.* (Stone Crossing J.R. Clarkson 9032), *Abutilon micropetalum, Litsea glutinosa*

Lianes & Epiphytes

Ventilago ecorollata, Uvaria membranaceum, Dendrobium bigibbum

Groundcover (~ denotes seedlings)

Height: 0 - 1m

Asystasia australasica, Panicum trichoides, ~Euphorbia plumerioides var. *plumerioides, ~Pongamia pinnata, ~Croton arnhemicus*

ECOLOGICAL NOTES

This is a unique patch of vine forest. It occurs on a colluvial fan of red-brown sandy loam, the products of ferruginous sandstone. Other patches nearby occur on ferruginous sandstone hillsides. These are the same type as those that occur on the Altanmoui Range sampled previously in sites 9 and 48.

Site 50 sits in the uppermost catchment divide of the Howick River. It occurs adjacent to white sand country overlying sandstone. The Howick itself rises out of springs in the sand. Broad adjacent slopes support large tracts of almost pure *Eucalyptus phoenicea* open forest.

The semi-deciduous nature of this forest occurs through the presence of *Bombax, Gyrocarpus, Vitex, Pongamia, Premna, Wrightia, Terminalia* and *Croton*. Crown cover is dominated by tall robust *Syzygium argyropedicum*. Their large size on the Howick side of the patch may be attributed to the tapping of the water table.

The seasonal abundance of water provides a focus for feral cattle and pigs. The understorey is very disturbed with the country smelling and looking like a cattle camp. The prolific Acanthaceous herb *Asystasia australasica* has been extensively browsed by cattle.

This patch of vine forest is unlike any encountered to date. It is a unique floristic type and is considered to have extremely high conservation value. This uniqueness is provided by the presence of the rare and threatened listed *Syzygium argyropedicum* as the dominant canopy tree. This tree species was formerly known only from consolidated dune sands on Silver Plains Holding. As a result of these surveys its northern limit of distribution has been confirmed on coastal aeolian sands within Iron Range National Park (Sites 113,114). The record here on the Howick represents a highly disjunct southern limit of distribution.

SITE 86 (SAM)

Date:	16 October 1993
Air Photo Ref:	Orford Bay 1974 Run #25 Photo #0112 (70mm, 94mm)
Topo Ref:	Shelburne Bay 1:100000 Sheet 747454L XN 857066
Lat/Long:	11° 41′ 42.26″S 142° 42′ 13.28″E
Altitude:	120 metres
Location:	14.6km NE of Heathlands Ranger Base 'Messum' catchment
Tenure:	R 7, Heathlands D & O Reserve
Geology:	Sandstone

STRUCTURE

COMPLEX EVERGREEN NOTOPHYLL VINE FOREST on permanently moist sandstone escarpments with *Calophyllum sil, Planchonella obovoidea, Maranthes corymbosa* and conspicuous palms *Gulubia costata, Caryota rumphiana, Licuala ramsayi.*

FLORISTICS (20 species with 33 individuals)
(* denotes obligate deciduous species)

Canopy

Height: 15-35m

Calophyllum sil, Planchonella obovoidea, Maranthes corymbosa, Ternstroemia cherryi, Endiandra longipedicellata, Gulubia costata, Litsea breviumbellata, Buchanania arborescens, Cryptocarya cunninghamii, Garcinia warrenii, Xanthophyllum octandrum, Syzygium bungadinnia, Gmelina dalrympleana, Carallia brachiata, Aglaia euryanthera, Ilex arnhemicus subsp. *ferdinandii, Dysoxylum arborescens, Gomphandra australiana, Ptychosperma elegans, Licuala ramsayi*
(outside of plot: *Melicope elleryana, Blepharocarya involucrigera, Horsfieldia australiensis, Ficus destruens, Ficus obliqua var. obliqua, Podocarpus grayae)*

Subcanopy

Height: 20-30m

Ternstroemia cherryi, Ptychosperma elegans, Caryota rumphiana, Helicia australasica, Gulubia costata, Polyscias elegans, Gmelina dalrympleana, Maranthes corymbosa, Hydriastele wendlandiana, Aglaia sapindina, Garcinia warrenii, Vavaea amicorum, Planchonella obovoidea, Pternandra coerulescens, Ficus obliqua var. obliqua

Understorey

Height: 1-10m

Licuala ramsayi, Macaranga polyadenia, Aglaia sapindina, Ternstroemia cherry, Ptychosperma elegans, Caryota rumphiana, Pleomele angustifolia, Helicia australasica, Calophyllum bicolor, Gulubia costata, Polyscias elegans, Cryptocarya bamagana, Pternandra coerulescens, Archidendron hirsutum, Endiandra cowleyana, Maranthes corymbosa, Melicope elleryana, Podocarpus grayi, Hydriastele wendlandiana, Cyathea felina, Salacia chinensis, Palaquium galactoxylon, Cryptocarya hypospodia, Ficus sp. (Heathlands D.G. Fell + DFG 3738), *Diospyros hebecarpa, Garcinia warrenii, Vavaea amicorum, Cryptocarya*

cunninghamii, Haplostichanthus sp. (Rocky River P.I. Forster+ PIF 10617), *Planchonella obovoidea, Horsfieldia australiana, Syzygium forte* subsp. *forte, Myristica insipida, Pittosporum ferrugineum, Mallotus polyadenos, Mackinlaya confusa, Dictyoneura obtusa, Adenanthera pavonina, Deplanchea tetraphylla, Neolitsea brassii, Cordyline cannifolia, Syzygium fibrosum, Gomphandra australiana, Emmenosperma alphitonioides, Decaspermum humile, Randia sessilis, Aidia racemosa, Quassia* sp. (Tozer Range L.J. Brass 19393), *Garcinia dulcis, Cleistanthus hylandii, Drypetes deplanchei, Pandanus conicus, Mischocarpus lachnocarpus, Lasianthus strigosus*

Lianes & epiphytes

Stenochlaena palustris, Calamus australis, Calamus hollrungii, Freycinetia percostata, Medinilla hallsheadleyi, Pachygone ovata, Austrosteenisia sp. (DGF 3737), *Ichnocarpus frutescens, Pycnarrhena* sp. (DGF 3740), *Melodinus australis, Tetracera nordtiana, Smilax australis, Flagellaria indica, Strychnos colubrina, Cryptolepis grayi,* vine (DGF 3743), *Tetrastigma thorsborneorum, Melodorum* sp. (Stone Crossing L.W. Jessup 814), *Hugonia jenkinsii, Pyrrosia lanceolata, Pyrrosia longifolia, Dendrobium johannis, Cymbidium* sp., *Antrophyum callifolium*

Groundcover (– denotes seedlings)

Height: 0-1m

Angiopteris evecta, Cyathea felina, Drynaria sparsisora, Dianella bambusifolia, Hypolytrum nemorum, Stenochlaena palustris, Tectaria brachiata, Leptaspis banksii, Sphaerostephanos heterocarpus, Leptaspis banksii, Lindsaea media,
–Gulubia costata, –Caryota rumphiana, –Calamus hollrungii, –Podocarpus grayi, –Hydriastele wendlandiana, –Ptychosperma macarthurii, –Myristica insipida, –Pandanus conicus

ECOLOGICAL NOTES

Site 86 represents vine forest which is as close as you can get to a complex type on Cape York Peninsula. It is situated at the head of the coastal catchment draining the sandstone escarpment. This escarpment represents the northern extremity of the Great Dividing Range. This Divide separates the westerly flowing Jardine catchment from the multitude of unnamed watercourses flowing into sand dune country between Captain Billy Creek and Shelburne Bay. This forest type is unique to the country between Shelburne and Newcastle Bays and is considered to have high conservation values.

The vine forest grows on the alluvial products of sandstone. This rock outcrops in steep areas and may form small shelves. Of major significance to the structure and composition of the forest is the presence of permanent springs rising out of the sandstone. The gullies are therefore perennially moist. There is also favourable moisture influence from the almost constant moisture-laden south-east winds and squalls that the area encounters.

These escarpment forests are thus different to the other sites surveyed in the Heathlands - Jardine - Escape River area. It must be noted that they are not conserved in the present Jardine River National Park, but occur on adjoining Departmental and Official Purposes Reserve. They have developed and survived over time in a refugial situation. They are in fact, islands of well developed vine forest of a type otherwise found at Iron Range and at Bamaga. Evidence to this is in their well developed structure, abundance of lifeforms, species richness, and the presence of disjunct taxa such as *Ternstroemia cherryi, Pternandra coerulescens, Gulubia costata, Sphaerostephanos heterocarpus, Angiopteris evecta, Cyathea felina, Dictyoneura obtusa* and *Ilex arnhemensis* subsp. *ferdinandii.*

A total of eight rare and threatened species are recorded among an overall total of 100 taxon. This is by far the richest site examined to date.

Sites 87 and 88 are other examples of this type.

Broad Vegetation Groups of Far Northern Queensland

V.J. Neldner & J.R. Clarkson

PAPUA NEW GUINEA

Boigu Island

Saibai Island

TORRES STRAIT

Darnley Island

Moer Island

Badu Island

Moa Island

THURSDAY ISLAND

Horn Island

Prince of Wales Island

BAMAGA

CORAL SEA

Shelburne Bay

WEIPA

LOCKHART RIVER

AURUKUN

PORMPURAAW

Cape Melville

Princess Charlotte Bay

Cape Flattery

COOKTOWN

10°S

11°S

12°S

13°S

14°S

15°S

142°E

143°E

144°E

145°E

REFERENCE

1. Closed-forests of the Wet Tropics region.
2. Closed-forests of the Melville Hills-Iron Range region.
3. Closed-forests of northern Cape York Peninsula and the Torres Strait Islands.
4. Closed-forests of coastal dunes, dunefields, and the Jardine River floodplain.
5. Deciduous low closed-forests on slopes and alluvia.
6. Gallery closed-forests and *Melaleuca* spp. dominated open-forests on alluvia.
7. Woodlands and open-woodlands dominated by *Eucalyptus chlorophylla, E. microtheca* or *E. acroleuca*.
8. Woodlands and open-woodlands dominated by *Eucalyptus clarksoniana, E. novoguinensis* or *E. polycarpa*.
9. Woodlands and open-woodlands dominated by *Eucalyptus cullenii, E. crebra* or *E. persistens* subsp. *tardecidens*.
10. Woodlands dominated by *Eucalyptus hylandii* or *E. tetrodonta* on sandstone, metamorphic and ironstone ranges.
11. Open-woodlands and woodlands dominated by *Eucalyptus leptophleba* on river frontages and northern undulating plains.
12. Woodlands dominated by *Eucalyptus leptophleba, E. platyphylla* or *E. erythrophloia* on undulating hills and plains in the south-east.
13. Open-forests and woodlands dominated by *Eucalyptus nesophila* or *E. hylandii* var. *campestris*.
14. *Eucalyptus* spp. open-forests of the Wet Tropics region.
15. Open-forests and woodlands dominated by *Eucalyptus tessellaris, E. clarksoniana* or *E. brassiana* on coastal plains and ranges.
16. Woodlands and tall woodlands dominated by *Eucalyptus tetrodonta* on deeply weathered plateaus and remnants.
17. Woodlands dominated by *Eucalyptus tetrodonta* on erosional surfaces and residual sands.
18. Low open-woodlands and low woodlands dominated by *Melaleuca viridiflora* on depressional plains.
19. Open-forests and low open-forests dominated by *Melaleuca* spp. on seasonally inundated swamps.
20. Low open-woodlands and tall shrublands dominated by *Melaleuca stenostachya, M. cuticularis* or other *Melaleuca* spp.
21. Tussock grasslands on riverine and alluvial plains.
22. Closed-tussock grasslands and open-woodlands on undulating clay plains.
23. Tussock grasslands on longitudinal dunefields, depressions, floodplains or continental islands.
24. Open-heaths and dwarf open-heaths on shrubby sandplains and headlands.
25. Woodlands and heathlands on beach ridges and the littoral margin.
26. Closed-forests and low closed-forests dominated by mangroves.
27. Saltpans, lakes and lagoons.
28. Vegetation of the coral atolls and coral cays.
29. Rocks and bare sandy areas, e.g. saltpans, sand blows and rock pavements.
30. Miscellaneous vegetation group dominated by *Acacia* spp. or members of the Myrtaceae family occurring on a variety of landforms.

kilometres 40 0 40 80 120

kilometres

This map is produced at approximately 1:3 000 000 scale.

Photointerpretation of 1:85 000 black and white aerial photographs by V.J. Neldner.
Cartography by J. Kelley. Graphic produced by D.J. Milne.
Queensland Herbarium, Queensland Department of Environment and Heritage.

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