LAND SYSTEMS OF THE

WESTERN HALF OF MELVILLE ISLAND, N.T.

by

M.R. Wells, H.R.M. van Cuylenburg and C.R. Dunlop

LC78/10

Land Conservation Unit
Territory Parks and Wildlife Commission
DARWIN, N.T.
ACKNOWLEDGEMENTS:

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1. INTRODUCTION

At the request of the Forestry unit of this Commission, a broad-scale land resource survey of approximately 1,500 sq. km. of the western half of Melville Island was conducted in September 1977 (Figure 1.). The aim of this survey was to provide qualitative and quantitative soil and vegetation information which could be used in the development of management plans for that portion of the island.

Within the planned survey region, two areas were of more specific interest in 1977. These areas were adjacent to the current Tuyu, and Yapilika Forestry plantations (Figure 1.), where detailed land resource information was required to assist in the planning of immediately foreseeable future extensions to those plantations. Survey results pertaining to those areas are presented in the separate report "Land Units of Areas Adjacent to the Tuyu and Yapilika Forestry Plantations, Melville Island, N.T." (Wells and van Cuylenburg 1978).

Previous detailed resource survey work on Melville Island was conducted by Land Conservation in 1973 on an area known as the 17 mile plain which lies between and adjacent to the above mentioned plantation areas. Both this 17 mile plain area report and the plantation area reports provide interpretative information as specific land use proposals existed at the time of each survey. The reports described discrete entities known as 'land units' which each possess relatively homogeneous soil, vegetation and landform characteristics.

The report herein relies heavily on information gathered from the more detailed surveys and is based partly on an extrapolation of that data. The survey technique was based on the delineation of patterns on aerial photographs (scale approx. 1:80,000), followed by field reconnaissance to determine the various soil, vegetation and landform characteristics of those areas which had not previously been mapped
Fig. 1 Melville Island – approximate survey areas (1977)

Land System Survey

Land Unit Surveys
(a) Yapillika
(b) Tuyu – Three Ways
at the more detailed level. This report is therefore basically a broadscale resource inventory. It contains no interpretative information, as specific land use proposals had yet to be formulated at the time of the survey for those areas outside the more detailed 'land unit' survey areas.

The report does however provide the base resource information upon which future development plans can be imposed to rationalize future land use proposals with the available soil and vegetation resources. This information is presented in the form of 'land systems' which are described in tabular form herein and delineated at a scale of 1:100,000 on the accompanying map sheet. Land systems are composite mapping units defined by Christian and Stewart (1953), as areas or groups of areas throughout which there are recurring patterns of topography soils and vegetation. Ten land systems have been delineated for the western half of Melville Island.
2. LAND SYSTEMS

The essential difference between the land system and land unit concepts is one of scale. The land systems described herein have been mapped at a scale of 1:100,000. Land units are usually mapped at a scale of 1:50,000 or more detailed. It is important to remember that with the exception of those areas covered by the 17 mile plain area report (van Cuylenburg and Dunlop 1973), and the plantation area reports (Wells and van Cuylenburg 1978), the land units have only been identified, not mapped, and estimates of their relative proportions may therefore be inaccurate.

The land systems, classified according to their geomorphological relationship, are described in tabular form and illustrated with cross section diagrams in the following pages. Brief descriptions of the land system as a whole and its underlying geology are given above the diagram. Further details of the geological relationship shown schematically in each diagram are given in Appendix 1. The text below the diagram details the characteristics revealed following field inspection of each of the component patterns or units which comprise the delineated land system.

For each unit depicted, descriptions are given of parameters relating to landform, slope and vegetation as follows:

Landform: General description; topography and slope gradient; rock outcrop and surface gravels (if present).

Soils: Soil type, basically as defined by Northcote et al (1975); depth, texture trend of the profile and texture present; internal soil drainage assessment.

Vegetation: The vegetation class according to Specht (1970) is recorded along with a brief summary of the dominant tree, shrub and grass species present in each community.
The units described in the land systems are largely equivalent to single land units or groups of land units as described in the more detailed resource survey reports of Wells and van Cuylenburg (1978) and van Cuylenburg and Dunlop (1973). Where applicable these equivalents are shown in brackets beneath the unit number in the tabular land system descriptions.
(1) Van Diemen Land System (164 sq. Km)

Broad, gently dissected plateau surface. Open eucalypt forests (E. miniata, E tetrodonta, E nesophila), characteristically occur over deep sandy and loamy red earths.

Geology: Strongly weathered Tertiary Van Diemen sandstone.
<table>
<thead>
<tr>
<th>Unit</th>
<th>Area</th>
<th>Land Forms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (L.U: 1a1, 1a2)</td>
<td>20%</td>
<td>Flat plateau surface with slopes generally less than 2%, occasionally to 5%, generally occurs towards centre of plateau</td>
<td>Deep loamy red earths; gradational sandy loam to fine sandy clay loam; well drained.</td>
<td>Open forest; <em>E</em> miniata, <em>E</em> tetrodonta, <em>E</em> nesophila dominant with <em>Livistona</em> humilis and <em>Grevillea heliosperma</em> understory, annual and perennial grasses.</td>
</tr>
<tr>
<td>2. (L.U: 1b1, 1b2)</td>
<td>60%</td>
<td>Flat plateau surface with slopes generally less than 2%, occasionally to 5%.</td>
<td>Deep sandy red earths; gradational loamy sand to sandy clay loam, well drained.</td>
<td>As for Unit 1.</td>
</tr>
<tr>
<td>3. (L.U: 1c1, 1c2)</td>
<td>18%</td>
<td>Plateau surface with slopes less than 5% commonly peripheral areas with common rock outcrop and surface gravels</td>
<td>Moderately deep gravelly red earths; gradational loamy sand to sandy clay loam; well drained.</td>
<td>As for Unit 1. with occasional <em>E</em> bleeseri or <em>E</em> foelscheana.</td>
</tr>
<tr>
<td>4. (L.U: 1d)</td>
<td>2%</td>
<td>Low lying areas within the plateau surface occurring near the heads of drainage systems slopes less than 2%</td>
<td>Deep sandy mottled yellow earths; gradational loamy sand to sandy clay loam; imperfect to moderately well drained.</td>
<td>As for Unit 1 with <em>Tristania lactiflua</em>, <em>Melaleuca</em> spp and <em>Banksia dentata</em> also present.</td>
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</tbody>
</table>
### VAN DIEMEN LAND SYSTEM continued

<table>
<thead>
<tr>
<th>Unit</th>
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<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>very minor</td>
<td>Discrete erosional rises within plateau surface, common laterite outcrop</td>
<td>Shallow red skeletal soils, uniform, loamy sand, well drained.</td>
<td>Woodland: <em>E foelsheana</em> dominant, with a dense understory of <em>A. oncinoarpa</em>, <em>Livistona humilis</em>, and <em>Grevillea pteridifolia</em>; Grasses are <em>Sorghum plumosum</em> and <em>Eriachne avenacea</em>.</td>
</tr>
<tr>
<td></td>
<td>&lt; 1%</td>
<td>and surface gravels (50%) slopes less than 2%</td>
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</tbody>
</table>
Rugged terrain in the south of the survey area which is deeply dissected by many creeks and drainage lines. The vegetation structure and composition are variable. Soils within this land system are generally very shallow and highly erodible. Due to the general inaccessible of the area between the Three Ways - Pickertaramoor plateau surface (Van Diemen), and the Tjipripu river, a large proportion of this land system has been mapped by aerial photograph interpretation without the aid of field traverse information. The units which are described below were observed in the remaining portions of the land system and hence their occurrence in the untraversed areas is largely prediction.

Geology: Dominantly poorly consolidated Quaternary sediments overlying Van Diemen sandstone.

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**RUGGED**

Van Diemen Unit 1. Unit 2. Unit 4. Unit 3. Unit 5. Littoral

- Plateau surface; southern areas
- Crests and upper slopes > 15%
- Lower slopes; wash slopes 5-15%
- Undulating terrain; red soils.
- Drainage line; 5%, yellow soils.
### RUGGED LAND SYSTEM

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>10%</td>
<td>Crests and upper slopes greater than 15%, with many cliffs, abundant to massive rock outcrop, 50-80% surface gravels.</td>
<td>Very shallow skeletal soils, dominantly red and gravelly, uniform sandy loam, well drained.</td>
<td>Variable - Open forest of <em>E nesophila</em>, <em>E tetrodonta</em> <em>E miniata</em> with sparse shrub layer of <em>Acacia</em> spp, <em>Livistona humilis</em> and <em>Petalostigma</em> spp, to shrubland of <em>Boronia</em> spp, <em>Calytrix</em> spp and <em>Livistona humilis</em>.</td>
</tr>
<tr>
<td>2.</td>
<td>45%</td>
<td>Wash slopes with occasional cliffs; slopes between 5 &amp; 15%; common to massive rock outcrop, 20-80% surface gravels.</td>
<td>As for Unit 1. with soils becoming moderately deep on lesser slopes.</td>
<td>As for Unit 1.</td>
</tr>
<tr>
<td>3.</td>
<td>25%</td>
<td>Lower slopes and undulating terrain with slopes up to 5%, very rare rock outcrop, 20-80% surface gravels.</td>
<td>Moderately deep gravelly yellow massive earths, gradational sandy loam to sandy clay loam, imperfectly drained.</td>
<td>Tall open shrubland to low woodland: <em>E porrecta</em> or <em>Eugenia bleeseri</em> may be dominant, under-story variable mainly <em>Grevillea pteridifolia</em>, <em>Acacia</em> spp, <em>Tristania lactiflua</em> and <em>Persoonia falcata</em>; grasses mainly perennial. <em>Eriachne avenacea</em>, <em>Eriachne squarrosa</em>, <em>Aristicia</em> sp. <em>Planchonella pohlmanniana</em>.</td>
</tr>
<tr>
<td>Unit Area</td>
<td>Landforms</td>
<td>Soils</td>
<td>Vegetation</td>
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<tr>
<td>4. (L.U.:</td>
<td>Lower undulating slopes in rugged terrain, slopes up to 4%. This unit occurs more frequently to the west of the land system.</td>
<td>Dominantly deep red earthy sands, uniform loamy sand to sandy loam, well to excessively well drained.</td>
<td>Variable, tall shrubland to open forest. Areas of open forest occur more frequently towards the west of the land system and are dominated by <em>E nesophila</em> or <em>E miniata E tetrodonta</em>. An understory of tall shrubs, <em>Grevillea spp Acacia sp</em> and <em>Alphitonia sp</em> over a ground cover of annual and perennial grasses also occurs. Shrubland areas contain dense <em>Acacia spp</em>, <em>Grevillea spp</em> and <em>Calytrix extipulata</em> with scattered emergents of <em>Livistona humilis</em> and <em>Wrightia saligna</em> and both annual and perennial grasses.</td>
<td></td>
</tr>
<tr>
<td>3c, 5b)</td>
<td></td>
<td></td>
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</tbody>
</table>

| 5. (L.U: | Creeklines, springs and drainage lines in rugged terrain. | Dominantly deep, sandy apedal mottled yellow duplex soils, poorly drained, less commonly friable pedal gley duplex soils, also poorly drained. | Grassland (wet) with tall open shrubland patches. Tree species include *Grevillea pteridifolia*, *Tristania* and scattered clumps of *Pandanus*, *Melaleuca* and *Eugenia bleeseri*. Grasses mainly dense perennial *Eulalia mackinlayi*, *Eriachne burkittii* and *Ectrosia sp.* |
| 7a)     |           |       |            |
(3) Dundas Land System (44 sq. km.)

Undulating terrain commonly containing intermittent streams and drainage depressions. Small areas of internally draining estuarine plains also occur. Open eucalypt forest vegetation and sandy or loamy red earths occur on rises; variable shrubland vegetation and mottled sandy or clayey soils occur in depressions.

Geology: Dominantly Quaternary deposits of silt, fine sand and minor gravel alluvium overlying Van Diemen sandstone. Towards the western coast of the island some areas of this land system occur directly over the Tertiary Van Diemen sandstone.
### Dundas Land System

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75%</td>
<td>Flat to gently sloping rises occurring above and between drainage areas; slopes less than 2%; Minor areas of rock outcrop and surface gravels (0-10%)</td>
<td>Dominantly deep sandy or loamy red earths. Small areas of sandy yellow earths or gravely red earths also occur. The dominant soils are gradational, loamy sand or sandy loam, to sandy clay loam or clay loam. All are well drained.</td>
<td>Open forest: <em>E miniata</em>, <em>E tetrodonta</em>, <em>E nesophila</em> and <em>E confectiflora</em> dominant; medium dense understory layer of <em>Livistona humilis</em> with <em>Cycas armstrongii</em> common; annual and perennial grasses.</td>
</tr>
<tr>
<td>2</td>
<td>15%</td>
<td>Flat to gently sloping plains in upper reaches of drainage system; up to 5% surface gravel.</td>
<td>Dominantly deep loamy red earths; gradational sandy loam to clay loam, well drained.</td>
<td>Tall shrubland; <em>Grevillea pteridifolia</em> dominant, dense understory of <em>Eucalyptus</em> coppice, mainly <em>E porrecta</em>; Grasses mainly <em>Sorghum plumosum</em> <em>Eulalia mackinlayi</em> and <em>E avenacea</em>.</td>
</tr>
<tr>
<td>3</td>
<td>10%</td>
<td>Drainage depressions and seasonally inundated billabongs.</td>
<td>Deep, mottled loamy and sandy yellow earths gradational sandy loam to light clay or loamy sand to sandy clay loam: imperfectly drained.</td>
<td>Tall shrubland; <em>Melaleuca viridiflora</em>, <em>Tristania lactiflora</em> dominant; <em>Banksia dentata</em>, <em>Pandanus</em>, <em>Planchonia careya</em> and <em>Grevillea pteridifolia</em> less common; grasses mainly <em>Eriachne triseta</em>.</td>
</tr>
<tr>
<td>Unit</td>
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<td>Soils</td>
<td>Vegetation</td>
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<tr>
<td>4.</td>
<td>Minor</td>
<td>Intermittent stream lines and channels between billabongs.</td>
<td>Deep mottled sandy non-cracking clays, uniform sandy clay; poorly drained, less commonly sandy apetal mottled yellow duplex soils, also poorly drained.</td>
<td>Tall shrubland: Grevillea pteridifolia. Banksia dentata dominant grasses mainly Eulalia mackinlayi with some sedges present.</td>
</tr>
</tbody>
</table>
PLATE 1 Dundas Land System (Unit 1):
Essentially flat areas of deep sandy red earths carrying open eucalypt forest vegetation are characteristic.

PLATE 2; Dundas Land System (Unit 2):
Flat to gently sloping red earth plains carrying dominantly Grevillea shrubland and occurring on the upper reaches of the Kilu Impini Creek.
(4) Tiwi Land System (110 sq.Km.)

Gently undulating terrain between the northern sand plains (Piper), and the central plateau surface areas (Van Diemen). Dominantly open eucalypt forest vegetation over deep sandy red earths.

Geology: Mainly poorly consolidated Quaternary sand and silt overlying Tertiary Van Diemen sandstone. The latter is exposed in limited areas south of the 17 mile plain.

Plateau surface, northern areas, (May also be undulating terrain - Dundas) Very gently undulating terrain; sandy red earths.

Slightly Northern sloping mar- sand gins to plains. Littoral areas; earthy sands.
## TIWI LAND SYSTEM

<table>
<thead>
<tr>
<th>Unit Area</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. 85%</td>
<td>Generally flat terrain, slopes less than 1°.</td>
<td>Dominantly deep sandy red earths with rare loamy red and mottled sandy yellow earths, gradational loamy sand to sandy clay loam; well drained.</td>
<td>Variable: Open Forest <em>E. miniata</em>, <em>E. tetrodonta</em>, <em>E. nesophila</em> and <em>E. confertiflora</em>; dense shrub layer of <em>Acacia</em> spp. and <em>Livistona humilis</em>, or less dense shrub layer of <em>Cycas media</em>, <em>Grevillea decurrens</em>, <em>Planchonia careya</em>, <em>Pandanus</em> and main grasses of <em>Imperata cylindrica</em>, <em>Pseudopogonatherum</em> and <em>Eriachne triseta</em>.</td>
</tr>
<tr>
<td>2. 15%</td>
<td>Margins of land system generally sloping at less than 2° although locally steeper in the Luxmore Head Region where lateritized sandstone outcrop and surface gravels (40-50%) occur.</td>
<td>Dominantly deep red or yellow earthy sands in areas adjacent to Littoral land system, elsewhere sandy red earths and gravelly red earths of variable depth. Earthy sands are uniform sandy to loamy sand and well to excessively well drained; red earths are gradational, loamy sand to sandy clay loam, and well drained.</td>
<td>Open forest of <em>E. miniata</em>, <em>E. nesophila</em>, <em>E. tetrodonta</em> dominant; sparse to moderately dense shrub layer of <em>Acacia</em> spp. dominant, less common species are <em>Livistona humilis</em>, <em>Cycas armstrongii</em>, <em>Grevillea pteridifolia</em>; grasses are mainly <em>Eriachne triseta</em>, <em>Pseudopogonatherum</em> and <em>Imperata sp.</em></td>
</tr>
</tbody>
</table>
Plate 3, Tiwi Land System (Unit 1): open eucalypt forest vegetation (*E. miniata*, *E. tetrodonta* *E. nesophila*) over an understory which includes *Livistona humilis*, characteristically occurs on the deep sandy red earths.

Plate 4, Tiwi Land System (Unit 2): Gently sloping margins of this land system carry a more varied vegetation over earthy sands.
(5) **Piper Land System (108 sq. Km.)**

Flat to very gently sloping sandplains, restricted to the north of the survey area. Open eucalypt forest vegetation occurs on dominantly red earthy sands.

**Geology:** Poorly consolidated Quaternary sand and silt overlying Tertiary Van Diemen sandstone.

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**PIPER**

Gently undulating terrain. Gentle sandy slopes abutting Tiwi. Flat sandy plains under open forest. Isolated patches of lightly vegetated sand plain.
# PIPER LAND SYSTEM

<table>
<thead>
<tr>
<th>Unit Area</th>
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<th>Soils</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. 90%</td>
<td>Flat sandy plains, slopes less than 30’.</td>
<td>Deep red earthy sands, brownish sands and pale sands with colour B horizons; uniform sand to loamy sand, well to excessively well drained.</td>
<td>Open forest of <em>E. tetrodonta</em>, <em>E. nesophila</em> and <em>E. miniata</em> with a moderately dense shrub layer of <em>Acacia</em> spp, <em>Ironwood</em>, <em>Planchonia careya</em>, <em>Brachychiton diversifolium</em> and <em>Petalostigma pubescens</em>; Grasses are mainly <em>E. triseta</em>.</td>
</tr>
<tr>
<td>2. 5%</td>
<td>Gentle sandy slopes frequently abutting Tiwi land system: slopes up to 1° 30’.</td>
<td>Deep sandy mottled yellow earths; gradational loamy sand to sandy clay loam; moderately well drained.</td>
<td>Open forest of <em>E. miniata</em> and <em>E. nesophila</em>, with <em>Persoonia falcata</em>, <em>Pandanus</em>, <em>Livistona humilis</em> and <em>Cycas armstrongii</em> being the dominant understory species. Grasses are <em>Imperata cylindrica</em> and <em>E. triseta</em>.</td>
</tr>
<tr>
<td>&lt; 5%</td>
<td>Isolated 'pockets' of flat, lightly vegetated sand plain; slopes less than 30’.</td>
<td>Deep red earthy sands; uniform, sand to loamy sand; well to excessively well drained.</td>
<td>Open Woodland of <em>Syzygium</em> sp over tall shrubland of <em>Acacia oocinocarpa</em> and <em>Persoonia falcata</em> and a low shrub layer of <em>C. pteridifolia</em> and <em>Livistona humilis</em>. Grasses mainly <em>Eriachne tristeta</em>.</td>
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</tbody>
</table>
Plate 5: Piper Land System (Unit 1): The flat sand plains carry tall open eucalypt forest vegetation (*E* miniata, *E* tetrodonta, *E* nesophila), over dominantly red earthy sands.

Plate 6: Piper Land System (Unit 3): Isolated 'pockets' of shrubland vegetation occur within the forested sand plains although the soil type remains constant. Reasons for this phenomenon are unclear.
Plate 7; Piper Head: The considerable depth of the red earthy sands in the Piper Land System is apparent in this photography. Where exposed, these soils erode rapidly.
(6) Rainforest Land System (29 sq. Km.)
Dense closed monsoonal rainforest areas, generally restricted to coastal fringes in the north east of the survey area. The impene-trable nature of the land system has restricted the number of observations and hence individual unit descriptions cannot be given.

Areas of such rainforest vegetation are extremely rare within this part of Australia and their preservation should be regarded as essential.

Geology: Strongly weathered Tertiary Van Diemen sandstone.

Landform: Essentially flat, north eastern coastal margins of the sand plain country (Piper land system). The land system terminates on the coastal side with cliffs up to 20 metres high. Slopes are less than 1%.

Soils: Earthy sand with high amounts of organic matter, occur on the fringes of this land system. Uniform loamy sand, generally well drained.

Vegetation: Closed forest (rainforest) Bombax ceiba, Albizzia proccera, Syzygium rubiginosum, Ficus Virens; evergreen and deciduous species in the main body of the rainforest.
Plate 8; Rainforest Land System; Dense monsoonal forest with a wide variety of both deciduous and evergreen species over organic sandy soils.
(7) Callemondah Land System (213 sq. Km.)

Rugged timbered terrain largely formed on the weathered Van Diemen sandstone surface. This land system represents the colluvial slopes adjacent to areas of Van Diemen, Tiwi and Piper land systems. It includes the weathered plateau remnants that occur between Karslake peninsula and the 17 mile plain, and the plateau footslopes to the north. Small, but unmappable areas also occur adjacent to the plateau surface between Three Ways and Pickertaramoor. Open eucalypt forest vegetation is dominant on the sandy and gravelly red massive earths which are frequently shallow.

Geology: Weathered, lateritized Van Diemen sandstone.
### Callemonda Land System

<table>
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</thead>
<tbody>
<tr>
<td>1. (LU: 2a4)</td>
<td>15%</td>
<td>Plateau margins and wash slopes greater than 15%. Abundant to massive rock outcrop 50-80% surface gravel and stony.</td>
<td>Dominantly shallow skeletal soils, uniform, loamy sand well drained.</td>
<td>Open forest of E miniata, E tetrodonta, E nesophila, with a low dense regeneration layer of Ironwood. Main grass species is Eriachne triseta.</td>
</tr>
<tr>
<td>2. (LU: 2a2, 2a3)</td>
<td>45%</td>
<td>Plateau margins and wash slopes between 5 &amp; 15%, common to massive rock outcrop, surface frequently stony and gravelly (20-80%).</td>
<td>Shallow to moderately deep gravelly red massive earths, sandy red massive earths and skeletal soils. Dominant soils are gradational, loamy sand to sandy clay loam, well drained.</td>
<td>Open forest of E miniata, E nesophila and E tetrodonta dominant, with sub dominant species of E confertiflora and Ironwood; moderately dense understory of Livistona humilis, Pandanus sp, Cycas sp, Petalostigma pubescens; main grasses are Imperata cylindrica.</td>
</tr>
<tr>
<td>3. (LU: 7b)</td>
<td>25%</td>
<td>Rugged gully areas at the heads of creeks and drainage systems.</td>
<td>Sandy organic soils (probably earthy sands) of variable depth, well drained.</td>
<td>Tall closed monsoonal rainforest, with Bombax sp, Albizzia procera, Syzygium sp, Ficus virens, Denhamia sp, Exocarpus sp, Polyalthia sp, Evergreen and deciduous species in the main body of the rainforest.</td>
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### CALLEMONDAH LAND SYSTEM - continued

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>4. (LU: 2a1)</td>
<td>15-20%</td>
<td>Undulating terrain, mainly the slopes of the northern plateau (occurring north of 17 mile plain) slopes less than 5%, minor rock outcrop, surface frequently stony and gravelly (5-60%).</td>
<td>Moderately deep to deep gravelly red massive earths and less commonly sandy red massive earths, very rarely loamy red massive earths. Dominant soils are gradational, loamy sand to sandy clay loam, well drained.</td>
<td>Open forest of <em>E nesophila</em>, <em>E miniata</em>, <em>E tetrodonta</em> dominant with sub dominant species <em>E confertiflora</em> and <em>Ironwood</em>; main understory species are <em>Livistona humilis</em>, <em>Petalostigma pubescens</em>, and <em>Planchnoria careya</em>; dominant grasses are <em>Eriachne triseta</em> and <em>Eriachne mackinlayi</em>.</td>
</tr>
<tr>
<td>5.</td>
<td>15%</td>
<td>Sandy wash slopes, up to 5% gradient bordering onto sand plain country (Piper), or drainage lines.</td>
<td>Deep red earthy sands, uniform, loamy sand to sandy loam, well to excessively well drained. Sandy red massive earths, gradational, loamy sand to sandy clay loam, well drained.</td>
<td>Open forest of <em>E nesophila</em>, <em>E miniata</em>, <em>E tetrodonta</em>; with a moderately dense understory of <em>Acacia</em> spp and <em>Ironwood</em> dominant; main grasses are <em>Eriachne triseta</em> and <em>Imperata cylindrica</em>.</td>
</tr>
<tr>
<td>6. (LU: 7a)</td>
<td>&lt;5%</td>
<td>Creeks, springs and drainage lines.</td>
<td>Dominantly deep sandy apedal mottled yellow duplex soils, poorly drained.</td>
<td>Grassland (wet) with tall open shrubland patches. Tree species include <em>Grevillea pteridifolia</em>, <em>Tristania</em> and scattered clumps of <em>Pandanus</em>, <em>Melaleuca</em> and <em>Eugenia</em> bleeseri; grasses mainly dense perennials <em>Eulalia mackinlayi</em>; <em>Eriachne burkitti</em> and <em>Ectrosia</em>.</td>
</tr>
</tbody>
</table>
Plate 9: Callemondah Land System (Unit 1): Stony slopes beneath plateau surface (Van Diemen), with abundant laterite outcrop.

Plate 10: Callemondah Land System (Unit 5): The colluvial slopes on the margins of sand plain country (Piper), are characteristically gentle (<5%) and support low open forest vegetation on red earthy sands.
(8) Mirikau Land System (57 sq. Km.)

Undulating erosional rises occurring between the Three Ways plateau area and the eastern portion of the 17 mile plain. The area is commonly incised by drainage lines which form the head of the Mirikau-yunga drainage system.

Geology: Poorly consolidated Quaternary sand and silt overlying Tertiary Van Diemen sandstone.
<table>
<thead>
<tr>
<th>Unit</th>
<th>Area</th>
<th>Landforms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65%</td>
<td>Undulating timbered terrain forming long gentle colluvial foot-slopes (less than 3%) away from plateau margins, rare rock outcrop and surface gravels (20-60%) in limited areas.</td>
<td>Dominantly deep sandy red massive earths and less commonly gravelly red massive earths and red earthy sands, gradational loamy sand to sandy clay loam, well drained.</td>
<td>Woodland to open forest. In sandy red earth areas, open forest with E minoriata generally dominant and occasional E nesophila, E tetrodonta over moderately dense understory of Acacia spp, Grevillea pteridifolia Persoonia falcata and Erythrophleum chlorostachys; mostly perennial grasses, Eriachne triseta, Eulalia mackinlayi. In areas of gravelly soils E bleeseri and E porrecta are more prevalent and in areas of red earthy sands E tetrodonta woodland occurs.</td>
</tr>
<tr>
<td>2</td>
<td>30%</td>
<td>Undulating non timbered terrain with slopes less than 4%, rare rock outcrop and surface gravels (20-60%).</td>
<td>Shallow to moderately deep gravelly yellow massive earths, gradational loamy sand to sandy clay loam; imperfectly drained.</td>
<td>Tall open shrubland to low woodland: E porrecta or Eugenia bleeseri may be dominant, understory variable, mainly Grevillea pteridifolia, Acacia spp Tristania lactiflua and Persoonia falcata; grasses mainly perennial: Eriachne avenacea, E aquarrosa, Planchonella pohlmanniana, Aristida sp.</td>
</tr>
<tr>
<td>Unit Area</td>
<td>Landforms</td>
<td>Soils</td>
<td>Vegetation</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>3 (LU: 7a)</td>
<td>Creeklines, springs and associated drainage flats</td>
<td>Deep sandy apedal mottled yellow duplex soils; loamy sand to mottled light clay, and deep friable pedal gley duplex soils, duplex sandy loam to mottled light clay; poorly drained.</td>
<td>Grassland (wet) with tall open shrubland patches: Tree species include Grevillea pteridifolia, Tristania and scattered clumps of Pandanus, Melaleuca and Eugenia bleeseri; grasses mainly dense perennials Eulalia mackinlayi, Eriachne burkitti and Ectrosia sp.</td>
<td></td>
</tr>
</tbody>
</table>
(9) Moonkinu Land System (156 sq. Km.)

Broad, flat to gently undulating plains and associated drainage lines. These areas are predominantly non timbered and the major part of the land system is known as the 17 mile plain.

Geology: The major part of this land system occurs over sublabile sandstone, siltstone and mudstone which forms the Moonkinu member of the Bathurst Island formation (Lower to Upper Cretaceous Age)
### MOONKINU LAND SYSTEM

<table>
<thead>
<tr>
<th>Unit Area</th>
<th>Landforms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 25% (LU: 3a, 3a1, 3a2, 3b, 3c, 3c1)</td>
<td>Gently undulating, frequently as long gentle colluvial footslopes away from plateau margins; slopes less than 3%.</td>
<td>Deep sandy red earths and less commonly gravelly red massive earths and red earthy sands; gradational loamy sand to sandy clay loam; well drained.</td>
<td>Woodland to open forest: In sandy red earth areas, open forest with E. miniata generally dominant and occasional E. nesophila, E. tetrodonta; moderately dense understory of Acacia spp. Grevillea pteridifolia, Persoonia falcata and Erythrophleum chlorostachys; mostly perennial grasses, Eriachne triseta, Bulalia mackinlayi. In areas of gravelly soils E. bleeseri and E. porrecta are more prevalent and in areas of red earthy sands E. tetrodonta woodland occurs.</td>
</tr>
<tr>
<td>2. 5-10% (LU: 4a, 4b, 4c)</td>
<td>Gently undulating terrain with slopes up to 4%, rare rock outcrop and surface gravels (20-60%) in some areas.</td>
<td>Deep sandy yellow massive earths, gradational loamy sand to sandy clay loam; Deep yellow earthy sands (pale sands with a colour B horizon); uniform loamy sand to sandy loam; Moderately deep gravelly yellow earths, gradational sandy loam to sandy clay loam; all soils moderately well drained.</td>
<td>Low shrubland to low woodland; In sandy yellow earth and yellow earthy sand areas, the dominant shrubs are Banksia dentata and Acacia spp with Grevillea pteridifolia and Tristania emergent. Suckers of the tree species E. ptychocarpa, Melaleuca sp and Eugenia bleeseri also occur with mainly perennial grasses. In areas with gravelly yellow earths E. porrecta or Eugenia bleeseri may be dominant over a variable understory including Grevillea Tristonia, Acacia and Persoonia with mainly perennial grasses.</td>
</tr>
</tbody>
</table>
### MOOKINU LAND SYSTEM - continued

<table>
<thead>
<tr>
<th>Unit</th>
<th>Area</th>
<th>Landforms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>40%</td>
<td>Gently undulating terrain, slopes generally less than 2%, occasionally to 5%</td>
<td>Deep sandy red massive earths and red earthy sands; gradational loamy sand to sandy clay loam, well drained; uniform loamy sand to sandy loam, excessively well drained.</td>
<td>Low open shrubland to low open woodland. In sandy red earth areas E. nesophila saplings, Grevillea pteridifolia, Persoonia falcata and Acacia oncincarpae are present with mainly perennial grasses Eulalia mackinlayi, Eriachne avenacea, Eriachne triseta. In areas of red earthy sands Syzygium sp, Calytrix extistipulata and Buchanania obovata also occur and annual grass species are more prevalent.</td>
</tr>
<tr>
<td>4.</td>
<td>20%</td>
<td>Seasonally wet and ponded areas. (remain wet from 4 to 6 months of the year), soils surface frequently gravelly, slopes less than 1%</td>
<td>Deep sandy apedal mottled yellow duplex soils (Lateritic podzolics); loamy sand to heavy clay, and gradational mottled yellow massive earths; sandy loam to gravelly light clay, imperfectly to poorly drained.</td>
<td>Tall open shrubland to low woodland. Grevillea pteridifolia frequently dominant with Tristania lactiflua, Acacia dimidiata, Banksia dentata and occasionally Petalostigma, Pandanus and Livistona. Melaleuca viridiflora dominant in low woodland areas. Both perennial and annual grasses, Sorghum Eriachne, Eulalia and sedges Cyperus spp Fimbrityllis spp.</td>
</tr>
</tbody>
</table>
### MOONKINU LAND SYSTEM - continued

<table>
<thead>
<tr>
<th>Unit</th>
<th>Area</th>
<th>Landforms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>5-10%</td>
<td>Creeklines, springs and associated drainage flats.</td>
<td>Deep sandy apedal mottled yellow duplex soils; organic loam to mottled sandy clay loam; and deep friable pedal gley duplex soils; duplex sandy loam to mottled light clay; poorly drained.</td>
<td>Grassland (wet) with tall open shrubland patches: Tree species include Grevillea pteridifolia, Tristania, and scattered clumps of Pandanus, Melaleuca and Eugenia bleeseri, mainly dense perennial grasses, Eulalia mackinlayi, Ericachne burkitti and Ectrosia sp.</td>
</tr>
</tbody>
</table>
(10) **Littoral Land System** (255 sq. Km.)

Level tidal flats, saltwater mangrove areas and coastal sand dune areas.

Geology: Quaternary deposits, saliferous organic mud and silt in tidal flat and mangrove areas; quartzose sand, shell and coralline debris in dune areas.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Area</th>
<th>Landforms</th>
<th>Soils</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (LU: 8a)</td>
<td>98%</td>
<td>Tidal flats, coastal and riverine mangrove areas subject to daily tidal flooding, slopes less than 1%.</td>
<td>Dominantly unconsolidated saline muds and saline clays, poorly drained.</td>
<td>Low closed forest of saltwater mangrove species.</td>
</tr>
<tr>
<td>2.</td>
<td>2%</td>
<td>Coastal dune and beach complex</td>
<td>Dune sands (siliceous sands); uniformly well drained.</td>
<td></td>
</tr>
</tbody>
</table>
3. SOILS

A summary description and classification of soils in the survey area is shown in Table 1. The soils have been described in as factual a manner as possible, largely in accordance with Northcote et al (1975). Factual key notations (Northcote 1971), and approximate equivalent soil names according to Stace et al (1968) are given to enable correlation with soils of other areas which may be classified in that manner. Soil family names are not included since it is considered that some confusion has arisen in the past as a result of misinterpretation and the application of such names over too great an area.

The soils have been described from profiles taken with a 10cm diameter hand auger to a depth of 150cm (where possible). Each profile was described in terms of its depth, horizonation, colour, texture, structure, fabric and reaction (pH). Surface and profile accumulations of gravel were recorded and drainage and permeability ratings were assessed. The criteria and terms used to describe soil morphology are those of the Soil Survey Manual (USDA, 1951) and Northcote (1971).

The distribution of soils in land systems is shown in Table 2.
<table>
<thead>
<tr>
<th>Major Group</th>
<th>Soil Description (Northcote et al 1975)</th>
<th>Factual Key Notation (Northcote 1971)</th>
<th>Approximate equivalent soil names (Stace et al 1968)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform coarse textured soils with no pedological organization.</td>
<td>Siliceous beach sands Shallow red or brown skeletal soils</td>
<td>Uc1.21 Uc1.43</td>
<td>Siliceous Sands Lithosols</td>
</tr>
<tr>
<td>Uniform coarse textured soils with pedological organization.</td>
<td>Pale sands with a colour B horizon (Yellow earthy sands) Brownish sands Red earthy sands Sandy organic soils</td>
<td>Uc4.21 Uc5.11 Uc5.21 Uc ?</td>
<td>Earthy Sands Siliceous Sands Earthy Sands</td>
</tr>
<tr>
<td>Uniform fine textured non cracking clays</td>
<td>Mottled sandy clay with minimal development. Saline clays.</td>
<td>Uf1.41 Uf1.41</td>
<td>Solonchaks</td>
</tr>
<tr>
<td>Uniform medium textured soils</td>
<td>Saline muds</td>
<td>Um1</td>
<td>?</td>
</tr>
<tr>
<td>Gradational soils non-calcareous with earthy fabric in B horizon</td>
<td>Loamy red massive earths Loamy yellow mottled massive earth Sandy red massive earths Sandy yellow massive earths Gravelly red massive earths Gravelly yellow massive earths</td>
<td>Gn2.11,14 Gn2.64 Gn2.11,14 Gn2.24 Gn2,11,24 Gn2.24</td>
<td>Red Earths Yellow Earths Red Earths Yellow Earths Red Earths Yellow Earths</td>
</tr>
<tr>
<td>Yellow &amp; yellow grey duplex soils</td>
<td>Sandy apedal mottled yellow duplex soils</td>
<td>Dy5.61</td>
<td>Podzolics</td>
</tr>
<tr>
<td>Gley duplex soils</td>
<td>Friable pedal gley duplex soils</td>
<td>Dg4.51</td>
<td>Gleyed Podzolics</td>
</tr>
</tbody>
</table>
Table 2 - Distribution Of Soils In Land Systems

<table>
<thead>
<tr>
<th>Soils</th>
<th>V</th>
<th>R</th>
<th>D</th>
<th>T</th>
<th>P</th>
<th>Rf</th>
<th>C</th>
<th>M</th>
<th>Mo</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siliceous beach sands</td>
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<td></td>
<td></td>
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<tr>
<td>Skeletal soils</td>
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<td></td>
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<tr>
<td>Yellow earthy sands</td>
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<td>+</td>
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<tr>
<td>Brownish sands</td>
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<tr>
<td>Red earthy sands</td>
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<td></td>
<td></td>
<td>++</td>
<td>+</td>
<td>++</td>
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<tr>
<td>Sandy organic soils</td>
<td></td>
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<td>+++</td>
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</tr>
<tr>
<td>Non cracking clays</td>
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<tr>
<td>Saline clays</td>
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<td>+++</td>
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<tr>
<td>Saline muds</td>
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<td>+++</td>
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<tr>
<td>Loamy red earths</td>
<td>++</td>
<td>+++</td>
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<tr>
<td>Loamy yellow earths (mottled)</td>
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<tr>
<td>Sandy red earths</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
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<td></td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td>Sandy mottled yellow earths</td>
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<td>++</td>
<td>++</td>
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<td></td>
<td></td>
<td></td>
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<td>+</td>
</tr>
<tr>
<td>Gravelly red earths</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
<td></td>
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<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Gravelly yellow earths</td>
<td>++</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Sandy yellow duplex soils</td>
<td>+</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Gley duplex soils</td>
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<td></td>
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<td>+</td>
</tr>
</tbody>
</table>

+++ = Dominant  ++ = Sub dominant  + = Minor
DESCRIPTION OF SOILS

1. **Siliceous Sands** (Uc1.21)

Deep siliceous sands occur in recent dune and beach ridge formations around the coastal margins of the survey area. Extensive beaches were found to occur in the northern survey area between Cape Van Diemen and Purumpinelli Point, and on either side of Karslake Peninsula. Significantly large dune deposits were found to occur at Cape Van Diemen and between Piper Head and St. Asaph Bay. These sands are dominantly quartzose and exhibit a general absence of horizon differentiation except for a darker A1 resulting from some accumulation of organic matter. This horizon is absent where the sands are not fixed by vegetation and hence frequently moved by wind, as on the crests of beach dunes. The siliceous sands are excessively well drained, and the materials below the A1 horizon are either loose or only weakly coherent when moderately moist and are not calcareous.

2. **Skeletal Soils** (Uc1.43)

Shallow red or brown skeletal soils occur on ridges and slopes in rugged hilly terrain in which rock outcrops are usually prominent. Such areas occur within Rugged and Callemondah land systems in heavily dissected rugged terrain or slopes beneath the Van Diemen plateau surface. An exception is a small area of shallow gravelly soil occurring on the Van Diemen plateau surface approximately 7 Km south east of Garden Point where the Van Diemen sandstone occurs close to the surface.

These soils have coarse textured profiles showing little or no pedological organization apart from some accumulation of organic matter at the surface. They are usually less than 60cm deep and often gravelly throughout. These soils are usually derived in situ from lateritized sediments. They are highly permeable, excessively well drained soils with an inherent low fertility.

A typical profile is:

-40-
<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Profile Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A11</td>
<td>Dark brown (10YR4/3) sandy loam with gravel; dry slightly hard; massive and earthy; 20% ironstone gravels; pH 6.0</td>
</tr>
<tr>
<td>10-30</td>
<td>A12</td>
<td>Yellowish red (5YR4/6) heavy sandy loam with gravel; dry hard; massive and earthy; 60% ironstone gravels; pH 6.0</td>
</tr>
<tr>
<td>30+</td>
<td>C</td>
<td>Dense gravel and stone.</td>
</tr>
</tbody>
</table>
3. **Yellow Earthy Sands.** (Pale sands with a colour B horizon; Uc4.21)

These soils occur in limited areas within the flat sand plain country north of Garden Point and also within the gently undulating non-timbered terrain on the 17 mile plain. They have uniform coarse textured profiles with pale, but not bleached, A2 horizons overlying colour B horizons which are either loose or weakly coherent and porous. The parent material for these soils is colluvium derived from sandstone. The soils are well drained in the northern sand plain areas but are only moderately well drained in the 17 mile plain region where they occur in more low lying situations close to drainage lines.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Profile Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>A1</td>
<td>Very dark greyish brown (10YR3/2); organic loamy sand; dry slightly hard; massive and earthy; pH 6.0.</td>
</tr>
<tr>
<td>15-30</td>
<td>A2</td>
<td>Yellowish brown (10YR5/4), loamy sand; slightly moist friable; massive and earthy; pH 6.0.</td>
</tr>
<tr>
<td>30-80</td>
<td>B1</td>
<td>Brownish yellow (10YR6/6), loamy sand; moist friable; massive and earthy; pH 5.5; few faint yellow brown, grey and red brown mottles.</td>
</tr>
<tr>
<td>80-100</td>
<td>B2</td>
<td>Brownish yellow (10YR6/6), clayey sand; moist friable; massive and earthy; pH 5.5; common red and red brown mottles.</td>
</tr>
<tr>
<td>100-150</td>
<td>B3</td>
<td>Red (2.5YR5/8), clayey sand; moist friable massive and earthy; pH 6.5; common yellow brown mottling.</td>
</tr>
</tbody>
</table>
4. **Brownish Sands (Uc5.11)**

Brownish sands occur within the sand plain country north of Garden Point (Piper). They occur most frequently towards the coastal margins of the land system. The soils have deep, uniform coarse textured profiles that show weak pedological organization in the form of slight changes in colour and texture with depth. The loose sands are highly permeable and excessively well drained. Their low coherence renders them highly erodible particularly if surface vegetation is removed. The parent material is colluvium derived from sandstone.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Profile Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>A1</td>
<td>Dark brown (7.5YR3/2) sand; dry loose; massive; single grain fabric; pH 6.0.</td>
</tr>
<tr>
<td>15-60</td>
<td>B1</td>
<td>Dark reddish brown (5YR3/3) sand; dry loose; massive; single grain fabric; pH 6.0.</td>
</tr>
<tr>
<td>60-110</td>
<td>B21</td>
<td>Dark reddish brown (2.5YR3/4) sand to loamy sand; slightly moist friable; massive and earthy; pH 6.0.</td>
</tr>
<tr>
<td>110-150</td>
<td>B22</td>
<td>Red (2.5YR4/6) sand to loamy sand; slightly moist friable; massive and earthy; pH 6.0.</td>
</tr>
</tbody>
</table>
5. **Red Earthy Sands** (Uc5.21)

These are the dominant soils of the northern sand plains (Piper). They also occur within large areas of Callemondah, Moonkinu, Tiwi and Rugged land systems. Minor areas of the soil also occur within Mirikau land system. Within Callemondah and Tiwi they occur on colluvial slopes that lie adjacent to the sand plains of Piper land system. Red earthy sands are widespread over the 17 mile plain area (Moonkinu and Mirikau), but are more prevalent towards the coastal areas around the Bremer river. Within Rugged land system these soils are found on the lower slopes which border onto the 17 mile plain.

These soils are similar to the brownish sands in that they have uniform coarse textured profiles that show weak pedological development of slight colour and texture changes. They differ from the brownish sands in being more coherent, having earthy, rather than single grained fabric. The soils are associated with highly siliceous parent materials (colluvium derived from sandstone) and are deep and well drained.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>A1</td>
<td>Dark brown (7.5YR3/2) sand; dry soft massive; earthy fabric. pH 6.0</td>
</tr>
<tr>
<td>20-60</td>
<td>B1</td>
<td>Dark reddish brown (5YR3/3) sand; dry soft; massive; earthy fabric. pH 6.0</td>
</tr>
<tr>
<td>60-100</td>
<td>B21</td>
<td>Dark reddish brown (5YR3/4) loamy sand; dry slightly hard; massive and earthy. pH 5.5</td>
</tr>
<tr>
<td>100-120</td>
<td>B22</td>
<td>Red (2.5YR4/6) loamy sand; dry slightly hard; massive and earthy. pH 5.5</td>
</tr>
<tr>
<td>120-150</td>
<td>B23</td>
<td>Red (2.5YR4/8); light sandy loam; slightly moist friable; massive and earthy. pH 5.5</td>
</tr>
</tbody>
</table>
6. Sandy Organic Soils

Sandy soils containing high amounts of organic matter (derived from vegetation litter), were found to occur on the fringes of areas of closed monsoonal rainforest. These soils would probably be classified as earthy sands but have been separated due to their high organic matter content and hence darker colour. The density of the rainforest itself and shortage of time during the survey prevented sampling of soils from any areas other than the margins of the Rainforest land system. Profile descriptions were not recorded from these peripheral sites as it was considered that this date would be unrepresentative of the dominant soil type within the land system.

7. Non Cracking Clay of Minimal Development

Deep mottled sandy clays with minimal profile development were found to occur on the margins of intermittent stream lines and channels within the broad, internally draining plains of Dundas land system. These soils have uniform fine textured profiles of deep non cracking clays and are poorly drained. They become untrafficable in the wet season as the water table rises.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Profile Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>A1</td>
<td>Very dark greyish brown (10YR3/2) sandy clay; moist friable, massive and earthy; pH 5.7</td>
</tr>
<tr>
<td>20-40</td>
<td>B1</td>
<td>Light grey (10YR7/2) sandy clay; wet non sticky, massive and earthy; pH 6.0, 5% gravel, few distinct red brown and yellow brown mottles.</td>
</tr>
<tr>
<td>40-70</td>
<td>B21</td>
<td>Very pale brown (10YR7/3) sandy clay; wet slightly sticky, massive and earthy; pH 5.7, 5% gravel, common distinct red brown and yellow brown mottles.</td>
</tr>
<tr>
<td>70-120</td>
<td>B22</td>
<td>White (10YR8/2) sandy clay; wet sticky; massive and earthy; pH 5.7, 5% gravels many distinct red brown mottles.</td>
</tr>
</tbody>
</table>
8. **Saline Clays** (Uf 1.41)

Saline non cracking clays occur on coastal tidal flats with slopes less than 0.5% and in places these soils are found over buried mangroves. They are subject to daily flooding from high tides or by a combination of high stream flow and high tides when they occur in deltas. These soils have uniform fine textured profiles that show little or no pedological organization. They are highly saline, very slowly permeable, and poorly drained.

9. **Saline Muds** (Um1)

Unconsolidated saline muds occur in conjunction with the saline clays in littoral areas that are subject to daily tidal flooding.

10. **Loamy Red Massive Earths** (Gn2.11,14)

Deep loamy red massive earths occur most commonly on the Van Diemen plateau surface and to a lesser extent within Dundas and Tiwi land systems which occur between that plateau and the lower lying northern sand plains (Piper). In general the red massive earths appear to become heavier in texture as one proceeds southward from Piper land system (Red earthy sands), through Tiwi land system (Sandy red earths), to Van Diemen and Dundas land systems (Loamy red earths) in the centre of the survey area. Within the plateau surface areas the heavier textured loamy soils tend to occur in the central areas, being flanked by sandy red earths which in turn give way to gravelly red earths on the peripheral areas.

These soils have gradational textured profiles that are non calcareous, and B horizons that have earthy fabric and are whole coloured red. The soils are massive, porous, and well drained. The parent material is Van Diemen sandstone.

A typical profile is:
<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
</tr>
<tr>
<td>10-30</td>
<td>A2</td>
</tr>
<tr>
<td>30-85</td>
<td>B1</td>
</tr>
<tr>
<td>85-150</td>
<td>B2</td>
</tr>
</tbody>
</table>

11. **Loamy Mottled Yellow Earths** (Gn 2.64)

Only minor areas of loamy yellow earths were found to occur within the survey area. These were within poorly drained depressions and seasonally inundated billabongs of Dundas land system.

Except for their yellow colour these soils are very similar to the loamy red earths being deep, massive, porous, earthy soils, with weak profile differentiation, gradual horizon boundaries and an acid to neutral reaction. They do however have a more pronounced increasing texture gradient down the profile and are imperfectly drained.

A typical profile is:
<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
<td>Very dark greyish brown (10YR3/2) sandy loam; dry slightly hard, massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>10-40</td>
<td>A2</td>
<td>Dark yellowish brown (10YR4/4) light sandy clay loam; dry slightly hard, massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>40-80</td>
<td>B1</td>
<td>Yellowish brown (10YR5/6) sandy clay loam; slightly moist friable; massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>80-110</td>
<td>B21</td>
<td>Yellowish brown (10YR5/6) sandy clay; slightly moist firm; massive and earthy; pH 6.0, few distinct red brown mottles</td>
</tr>
<tr>
<td>110-150</td>
<td>B22</td>
<td>Yellowish brown (10YR5/8) light clay with sand, slightly moist firm, massive and earthy; pH 6.0, many distinct red brown mottles</td>
</tr>
</tbody>
</table>

12. **Sandy Red Massive Earths** (Gn 2.11,14)

These are the most common soils found on the western half of the island. They are the dominant soil on the plateau surfaces (Van Diemen), the 17 mile plain areas (Moonkinu, Mirikau) and the gently sloping land between the plateau and the northern sand plains (Tiwi). These soils also occur commonly within gently sloping terrain of Dundas and Callemondah land systems.

The distinguishing characteristics of these soils are massive, predominantly sandy textured, porous and earthy soil materials, red brown to red colour, weak profile differentiation with gradual horizon boundaries and acid to neutral reaction. The sandy red earths are distinguished from the loamy variety by their light surface textures (sand to loamy sand, compared to sandy loam), and by the fact that their maximum B horizon texture is usually lighter than a clay loam, whereas loamy red earths are heavier. The sandy red massive earths are well drained. Their parent material is sandstone.

A typical profile is:
<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
<td>Dark reddish brown (5YR3/4) loamy sand; dry loose; massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>10-40</td>
<td>A2</td>
<td>Reddish brown (5YR4/4) sandy loam; dry soft; massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>40-105</td>
<td>B1</td>
<td>Red (2.5YR4/8) light sandy clay loam; slightly moist friable; massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>105-150</td>
<td>B2</td>
<td>Red (2.5YR4/8) sandy clay loam; moist friable; massive and earthy; pH 6.0</td>
</tr>
</tbody>
</table>
13. **Sandy Mottled Yellow Massive Earths** (Gn 2.64)

These soils occur in limited areas within the sand plain country (Piper), the gentle slopes between those plains and the plateau (Tiwi and Dundas), and within the plateau itself (Van Diemen). Small areas also occur within the 17 mile plain (Moonkinu). Generally these soils occur in imperfectly drained locations such as low lying depressions or run on areas.

Except for their yellow colour and slightly poorer drainage characteristics these soils are very similar to the sandy red massive earths. Sandy yellow earths are distinguished from loamy yellow earths using the same criteria (surface texture and maximum B horizon texture) as explained for the red massive earths. The parent material of the sandy mottled yellow earths is likely to be sandstone and they are generally moderately well to imperfectly drained.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
<td>Dark brown (10YR3/3) organic loamy sand; dry slightly hard, massive and earthy; pH 6.5</td>
</tr>
<tr>
<td>10-25</td>
<td>A2</td>
<td>Dark yellowish brown (10YR4/4) light sandy loam; dry slightly hard; massive and earthy; pH 6.0</td>
</tr>
<tr>
<td>25-70</td>
<td>A3</td>
<td>Brownish yellow (10YR6/8) sandy loam; slightly moist friable; massive and earthy; pH 5.5; few faint red brown and yellow brown mottles.</td>
</tr>
<tr>
<td>70-90</td>
<td>B1</td>
<td>Red (2.5YR5/8) light sandy clay loam; slightly moist friable; massive and earthy; pH 5.5; few faint yellow brown mottles.</td>
</tr>
<tr>
<td>90-150</td>
<td>B2</td>
<td>Red (2.5YR4/8) sandy clay loam; moist friable; massive and earthy; pH 5.5.</td>
</tr>
</tbody>
</table>
14. **Gravelly Red Massive Earths (Gn 2.11,14)**

Gravelly red massive earths are the dominant soils of the plateau sideslopes within Callemondah land system. They also commonly occur on the margins of the plateau surface (Van Diemen), the lesser slopes of Rugged land system, and within the undulating terrain of Mirikau land system. Minor areas of these soils also appear in Dundas, Tiwi and Moonkinu land systems.

Morphologically, the gravelly red massive earths are very similar to the sandy red massive earths. The obvious difference is in the gravel content of the former which varies from 5 to 20% throughout the profile. These soils are formed on lateritized sandstone sediments and are well drained. Depth of these soils varies with slope gradient. Slopes less than 2% have generally moderately deep to deep soils, slopes between 2 and 5% have generally shallow soils or lithosols, and slopes in excess of 5% have very shallow lithosols only.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Horizon Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
<td>Reddish brown (5YR4/4) loamy sand with gravel; dry slightly hard; massive and earthy; pH 6.0; 10% gravels.</td>
</tr>
<tr>
<td>10-30</td>
<td>A2</td>
<td>Yellowish red (5YR4/6) light sandy loam with gravel; dry slightly hard; massive and earthy; pH 6.5; 10% gravels.</td>
</tr>
<tr>
<td>30-45</td>
<td>B1</td>
<td>Yellowish red (5YR4/8) sandy loam with gravel; dry slightly hard; massive and earthy; pH 6.5; 10% gravel.</td>
</tr>
<tr>
<td>45-90</td>
<td>B2</td>
<td>Red (2.5YR4/6) sandy clay loam with gravel; slightly moist friable; massive and earthy; pH 6.5; 15% gravels.</td>
</tr>
</tbody>
</table>
15. **Gravelly Yellow Massive Earths** (Gn 2.24)

These soils occur commonly within the deeply dissected terrain of Rugged land system and within the undulating non timbered terrain of Mirikau land system. Minor areas of this soil also occur upon the 17 mile plain (Moonkinu).

The gravelly yellow massive earths have gradational texture profiles that are non calcareous, and B horizons that have earthy fabric and are whole coloured yellow. They are generally similar to the sandy yellow earths except for their gravel content (varying from 5 to 20%).

Within these soils an underlying mottled gravel pan perches water and causes some drainage impedance. This is particularly prevalent in areas of the 17 mile plain (Moonkinu). The gravelly yellow earths are generally moderately deep and are derived from lateritized sandstone.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>A1</td>
<td>Very dark greyish brown (10YR3/2) sandy loam; dry slightly hard; pH 5.5; 5% ironstone nodules.</td>
</tr>
<tr>
<td>10-25</td>
<td>A2</td>
<td>Dark yellowish brown (10YR4/4) sandy loam; moist friable; pH 5.5; 5% ironstone nodules.</td>
</tr>
<tr>
<td>25-80</td>
<td>B1</td>
<td>Yellowish brown (10YR5/6) sandy clay loam; moist friable; pH 6.0; 5-20% ironstone nodules; weakly and strongly cemented.</td>
</tr>
<tr>
<td>80+</td>
<td>B/C</td>
<td>Mottled gravel hardpan.</td>
</tr>
</tbody>
</table>
16. Sandy Apedal Mottled Yellow Duplex Soils (Dy 5.61)

These soils occur in poorly drained areas within Rugged, Dundas, Callemondah, Mirikau and Moonkinu land systems. Generally they occur within creeks, springs and drainage line areas and their associated drainage flats.

These soils show a distinct texture contrast between soft (loose, sandy) A horizons, and massive or weakly pedal clayey B horizons in which the uppermost layer is mottled and dominantly yellow or yellow grey. Ironstone nodules occur throughout the profile in some areas. The parent material of these soils is most likely alluvium.

A typical profile is:

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Horizons</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>A1</td>
<td>Black (2.5Y 2/0) organic loam, moist slightly firm; pH 6.0; massive and earthy.</td>
</tr>
<tr>
<td>20-35</td>
<td>A2</td>
<td>Dark greyish brown (10YR4/2) organic sandy loam, moist slightly firm - friable; massive and earthy; pH 5.5, few faint yellow brown mottles.</td>
</tr>
<tr>
<td>35-70</td>
<td>B11</td>
<td>Yellowish brown (10YR5/8) sandy clay loam, moist friable, massive and earthy; pH 5.5, common distinct red brown mottles.</td>
</tr>
<tr>
<td>70-110+</td>
<td>B12</td>
<td>Brownish yellow (10YR6/6) sandy clay loam, non sticky, massive and earthy pH 5.5, many prominent red brown and common distinct yellow brown mottles.</td>
</tr>
</tbody>
</table>
17. Friable Pedal Gley Duplex Soils (Dg 4.51)

Gley duplex soils or gleyed podzolics, occur in poorly drained areas such as adjacent to springs, creeklines and their associated drainage flats. These soils occur mainly in the 17 mile plain area, within areas of Moonkinu, Mirikau and Rugged land systems.

Gley duplex soils have a distinct texture contrast between soft Al horizons and moderately to strongly pedal clayey B horizons in which the uppermost layer is mottled and dominately gley. They are poorly drained acid soils with brownish grey sandy to loamy A horizons with a distinct paler A2, overlying grey and yellow-grey clay B horizons with coarse yellowish and some reddish mottles.

A 'gley' soil is usually grey in colour with yellow and brown mottling caused by partial oxidation and reduction of its constituent iron compounds, due to conditions of intermittent water saturation.
4. VEGETATION

The vegetation of Melville Is. follows the general pattern of the vegetation adjacent to the coast across the top of the Northern Territory - essentially open eucalypt forest interspersed with minor communities such as rainforest and sedgelands. On a superficial level the open forest on Melville Is. appears to be taller and to have a denser undergrowth than the equivalent communities on the mainland. Specific data on these differences were not collected though it is noteworthy that the rainforest patches yielded several species not yet found on the Northern Territory mainland. These include *Kissodendron australianum*, *Eugenia claviflorum*, *Acmena hemilampra*, *Selenodesmium obscurum* and *Taenitis blechnoides*. Melville Is. is also the only known locality in the Northern Territory of the mangrove palm, *Nypa fruticans*.

Though they are not endemics, two of the curiosities of the open forest are the palm *Gronophyllum ramsayi* and the bloodwood, *Eucalyptus nesophilus*. Gronophyllum is curious for the fact that it is found in one locality (Danyaru) as a co-dominant with *Eucalyptus tetrodonta*; elsewhere in the Territory it occurs sporadically in sandy country near the coast and around the fringes of the Arnhem Land escarpment. Melville Is. bloodwood (*E. nesophilus*) is one of the largest species on the island, occurring as a co-dominant in the open forest with *E. miniata*; other recorded localities are Cape York Peninsula and the Kimberleys, W.A.

Another feature of the vegetation not commonly seen on the mainland is the prolific suckering of many of the tree species. This phenomenon is a marked feature of the 17 mile plain; details of the species involved are reported in van Cuylenburg and Dunlop (1973).
The vegetation of the open-forest has been used in the past as an indicator to the good soils. Thus the plantations have mainly been established by clearing the good quality *Eucalyptus nesophila* - *E. miniata* open-forest and ignoring the obviously less productive areas which support smaller stands of eucalypts. These large eucalypt stands have not been intensively managed for wood production but hardwoods (*E. nesophila*, *E. tetrodonta*) and cypress pine have been cut on the island and marketed in Darwin (R. Hooper. pers. comm.)

In recent years, plots of *Pinus caribaea* have been planted on the edge of the 17 mile plain. If these trials prove successful the low establishment costs on the plain should make this a prime area for plantations.
REFERENCES

Aerial Photography: (1962) Bathurst Island RC9 Runs 2-5 25,000' alt. Scale 1:86,200

(1962) Melville Island RC9 Runs 2-4 25,000' alt. Scale 1:86,200


APPENDIX 1. GEOLOGY

The surface geology of the western half of Melville Island, after Hughes and Senior (1973), is shown in figure 2 overleaf. The information has been included to allow the reader to compare the land systems delineated with the underlying soil parent materials.
Fig. 2. Surface Geology of western half of Melville Island.

Quaternary
- Silt, fine sand, minor gravel alluvium
- Quartzose sand, shell and coralline debris
- Saliferous organic mud and silt
- Poorly consolidated sand and silt
- Red sandy soils, mottled grey and yellow
- Sandy soils overlies Van Diemen sandstone

Tertiary
- Van Diemen Sandstone — strongly weathered in outcrop

Lower to Upper Cretaceous
- Moonkinu Member — subaerial sandstone, siltstone and mudstone
APPENDIX 2  
CHECKLIST OF PLANT SPECIES

Trees and Shrubs

<table>
<thead>
<tr>
<th>Acacia aulacocarpa</th>
<th>Casuarina equisetifolia</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. auriculiformis</td>
<td>Ceriops tagal</td>
</tr>
<tr>
<td>A. difficilis</td>
<td>Choriceras tricorne</td>
</tr>
<tr>
<td>A. dimidiata</td>
<td>Cochlospermum fraseri</td>
</tr>
<tr>
<td>A. gonocarpa</td>
<td>Coelospermum reticulatum</td>
</tr>
<tr>
<td>A. latescens</td>
<td>Cycas armstrongii</td>
</tr>
<tr>
<td>A. leptocarpa</td>
<td>Denhamia obscura</td>
</tr>
<tr>
<td>A. oncinocarpa</td>
<td>Distichostemon hispidulus</td>
</tr>
<tr>
<td>A. praelongata</td>
<td>Drypetes lasiogyna</td>
</tr>
<tr>
<td>Acmena hemilampra</td>
<td>Eucalyptus alba var. australasica</td>
</tr>
<tr>
<td>Aegialitis annulata</td>
<td>E. bleeseri</td>
</tr>
<tr>
<td>Aegiceras corniculatum</td>
<td>E. clavigera</td>
</tr>
<tr>
<td>Albizia procera</td>
<td>E. confertiflora</td>
</tr>
<tr>
<td>Alphitonia excelsa</td>
<td>E. foelscheana</td>
</tr>
<tr>
<td>Avicennia eucalyptifolia</td>
<td>E. latifolia</td>
</tr>
<tr>
<td>Banksia dentata</td>
<td>E. miniata</td>
</tr>
<tr>
<td>Bombax ceiba</td>
<td>E. nesophila</td>
</tr>
<tr>
<td>Boronia lanceolata</td>
<td>E. oligantheria</td>
</tr>
<tr>
<td>Brachychiton diversifolium</td>
<td>E. polycarpa</td>
</tr>
<tr>
<td>Brugiera gymnorrhiza</td>
<td>E. porrecta</td>
</tr>
<tr>
<td>Buchanania arborescens</td>
<td>E. ptychocarpa</td>
</tr>
<tr>
<td>B. obovata</td>
<td>E. tetrodonta</td>
</tr>
<tr>
<td>Callitris intratropica</td>
<td>Ervatamia orientalis</td>
</tr>
<tr>
<td>Calytrix arborescens</td>
<td>Erythrophleum chlorostachys</td>
</tr>
<tr>
<td>C. extipulata</td>
<td>Excoecaria agallocha</td>
</tr>
<tr>
<td>Canarium australianum</td>
<td>Exocarpus latifolius</td>
</tr>
<tr>
<td>Carallia brachiata</td>
<td>Eugenia bleeseri</td>
</tr>
</tbody>
</table>
Euodia elleryana
Ficus opposita
F. virens
Gardenia megasperma
Grevillea decurrens
G. dryandri
G. heliosperma
G. parallela
G. pteridifolia
G. sp.
Gronophyllum ramsayi
Helicia australasica
Jacksonia dilatata
Kissondendron australianum
Livistona humilis
Lumnitzera littorea
L. racemosa
Macaranga involucrata
Melaleuca leucadendron
M. nervosa
M. viridiflora
Nypa fruticans
Opilia amentacea
Osbeckia australiana
Osbornia octodonta
Pandanus spiralis
Parinari corymbosum
P. nonda
Persoonia falcata
Petalostigma pubescens
Pittosporum moluccanum
Planchonella pohlmanniana
Planchonia careya
Polyalthia holtzeana
Pouteria sericea
Scyphiphora hydrophyllacea
Sonneratia alba
Stenocarpus cunninghamii
Strychnos lucida
Syzygium fibrosum
S. rubiginosum
S. sp. aff. suborbiculare
S. suborbiculare
Tarenna dallachiana
Tephrosia sp.
Terminalia ferdinandiana
T. grandiflora
T. sericocarpa
Tristaniopsis lactiflua
Verticordia verticillata
Vitex glabrata
Wrightia saligna
Grasses, Forbs, sub-shrubs

Amorphophallus galbra
Aristida spp.
Blechnum orientale
Calochilus holtzei
Cheilanthes tenuifolia
Chrysopogon fallax
Clitoria australis
Coelorhachis rottboelllioides
Cymbopogon procura
Cyperus javanicus
C. pedunculatus
Drosera petiolaris
Drynaria quercifolia
Ectrosia leporina
Eriachne avenacea
E. burkittii
E. pallescens
E. squarrosa
E. triseta
Eriocaulon setaceum
Eulalia mackinlayi
Fimbristylis macassarensis
Geodorum pictum
Germainia grandiflora
Heteropogon contortus

H. triticeus
Imperata cylindrica
Isachne confusa
Leptocarpus spathaceus
Lycopodium cernuum
Mitrascme spp.
Pachynema complanatum
Petalostigma quadriloculare
Phyllanthus sp.
Pseudopogonatherum contortum
Ptilotus distans
Rhaphidophora australasica
Rottboellia formosa
Schizachryium fragile
Scleria levis
Selenodesmium obscurum
Setaria apiculata
Sorghum plumosum
Stenochlaena palustris
Stylidium spp.
Taenitis blechnoides
Thaumastochloa major
Themedia arguens
Trachymene didiscoides
Xyris complanata