LAND RESOURCES OF
POINT STUART STATION

by

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1973
INTRODUCTION

At the request of the lessee the Land Conservation Section undertook to map the land resources of the two Point Stuart leases P.L.'s 785 and 786. The field survey work was carried out in the 1972 dry season and mapping and report writing during the first half of 1973.

In carrying out this assignment we have relied heavily on the work of Story et al. (1969) who conducted the Land System survey of the Adelaide-Alligator area. The land units we have mapped correspond in general to those described in their report with certain obvious differences. Many units they described were not applicable to the Point Stuart area; others we have described were not described by them.

There are two important differences between the two surveys. The first concerns the distribution of Queue and Kay land systems. We found that the bulk of the presumed Queue land system on the western salient was in fact Kay and the bulk of the presumed Kay land system on the eastern salient was in fact Queue.

The second concerns the presumed Kosher land system on the western salient. A considerable proportion of this area was found to be rocky and in places (e.g. Shady Camp) relatively rugged. Furthermore the rocks outcropping were quartzitic and of the lower Proterozoic Mount Partridge formation. Because of this, these areas, characterised by low scrub, were mapped by us as units of Bend land system.

In outlining the agricultural and pastoral potential of the area we must stress that we have been guided by the principles of soil conservation. Other members of this Branch are far better qualified to advise on what to grow and how to manage it. Our main conclusions are: 1) more intensive development should take place on land units Queue 1 and Kay 1, at least initially, 2) great care should be exercised over any sloping areas, particularly sandy wash slopes, and 3) certain hazardous areas, particularly seepage zones and spring lines should be totally protected from grazing.

* The reader should note that it will be very difficult to directly compare the land units described within this report with those mapped more recently for Wildman River Station to the south, although maps for both areas have been produced at the same scale (1:50,000). Mapping of land units on the Point Stuart leases took place prior to the establishment of a mapping system that would stand independently of the previous CSIRO land system mapping. As a result, this mapping should be regarded more as a reconnaissance survey with some units encompassing considerably more variation than those delineated for Wildman River.

Correlation of map units between the two areas will thus have to be made by reference to survey and air photo records held by the Land Conservation Unit.
LAND UNIT DESCRIPTIONS

Land Unit : Bend 1. (Be 1)
Form : Strike oriented erosional remnants occurring as low hills. Sandstone and quartzite outcropping frequently. Slopes to 10%, commonly less than 5%; relief to 15m. Rare seepage points low in unit.
Soils : Skeletal with some locally derived depositional sands.
Vegetation : Dense low scrub to mixed woodland. Calytrix, Acacia and Jacksonia dominant. Grasses short and sparse.
Limitations : Rocky; steep slopes.

Land Unit : Bend 2. (Be 2)
Form : Colluvial gravelly and sandy wash areas and slopes. Infrequent sandstone and quartzite outcrops and exposures of laterite. Some areas with surface veneer of rock fragments. Slopes up to 5%; relief to 10m. Infrequent seepage areas.
Soils : Skeletal and sandy soils codominant. Giles, Koolpinyah, Bowen are found where limited profile development has occurred.
Vegetation : Predominantly dense low Calytrix scrub which merges into mixed woodland dominated by E. miniata. Areas of short grassland or Pandanus scrub occur on fringes of the plains. Rare open woodland dominated by E. tectifica (SW of Jimmy's Creek).
Limitations : Stony; steep erodible slopes; very droughty.

Land Unit : Bend 5. (Be 5)
Form : Gently domed to almost level raised areas of weathering sandstone and quartzite. Rare rock outcrops. Slopes less than 5%; relief to 7m.
Soils : Skeletal and shallow sandy soils with a minimum of profile development. (Bowen, Giles and rare Koolpinyah).
Vegetation : Predominantly dense low Calytrix scrub but ranges from almost open country to variable thicket-type communities.
Limitations : Stony; droughty.
Land Unit: Kosher 1. (Kh 1)

Form: Gently domed areas including low relief sandy wash slopes, occurring as peninsulars of upland country on the clay plain. Slopes generally less than 5%; relief to 10m.

Soils: Ramil and Woolner co-dominant.

Vegetation: Monsoon thicket to rainforest. Emergent trees (Metrosideros, E. papuana) up to 30m high. Dense undergrowth often dominated by Strychnos with open short grass areas.

Limitations: Heavy buffalo concentrations are causing obvious erosion.

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Land Unit: Kosher 2. (Kh 2)

Form: Gravelly wash slopes to 700m. wide above the margin of the clay plain, with infrequent depositional sandy inclusions. Slopes to 5%; relief to 10m.

Soils: Predominantly Koolpinyah but frequently skeletal over quartzite-like material or detrital lateritic gravels. Shallow Woolner, Hotham and Irgul occur infrequently.

Vegetation: Mixed Eucalypt woodland (E. miniata, E. papuana) often with dense Acacia undergrowth, intimately mixed with thickets of Tristania, Melaleuca, Parinari and Lantboatemon giving way to grassland with clumps of Pandanus and scattered large trees on the fringes of the upland areas. Grasses mid-height and sparse throughout (Eriachne triseta, Panicum mindanense) with common Hyptis and Cassia obtusifolia.

Limitations: Stony and gravelly; highly erodible; this would be aggravated by any reduction of vegetative cover; droughty.

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Land Unit: Kosher 2P. (Kh 2P)

Form: In general a more senescent variation of the Kosher 2 unit.

Soil: Relief is lower and there is some, although limited, evidence of greater profile development. Slope less than 3%; relief to 3m.

Vegetation: Dense Pandanus scrub with short grasses and Hyptis.

Limitations: Similar to Kosher 2 with the added limitation of dense Pandanus. This requires considerable time and money to clear. Stock mustering problems as result of the thickets.
Land Unit: Kosher 3. (Kh 3)

Form: Gravelly wash slopes and gently domed crest situations. Slopes generally less than 5%; relief to 2m.

Soils: Similar to those in Kosher 2 but in general profile development is more advanced. Woollner soils common; Notham infrequent; frequent occurrence of skeletal soils (Irgul and Giles), rock outcrop and laterite exposures.

Vegetation: Mixed Eucalypt woodland with dense Calytrix and Jacksionia undergrowth. Mid-height grasses and Hyptis.

Limitations: Marginally less erodible than Kosher 2; stony and gravelly;

Land Unit: Kosher 4. (Kh 4)

Form: Lower sandy wash slopes adjacent to clay plain. Generally occurs above Cyperus Land System (c.f. Pinwinkle 3 as marginal unit above Copeman Land System). Rare rock outcrop and laterite pavement exposure. Slopes to 3%; relief commonly 2 to 3m; less than 100m wide.

Soils: Predominantly depositional. Murrabibbi and Baroalba are common; Koolpinyah occurs less frequently.

Vegetation: Short grassland with rare Pandanus thickets.

Limitations: Erodible by nature of generally shallow soils and slope. Areas of buffalo concentration.

Land Unit: Kosher 5. (Kh 5)

Form: Sandy wash slopes in situations where seepage from the higher, sandy uplands begins to flow as creeks. Water is discharged for the greater part of the year at least. Slopes to 4%; relief to 10m. Some gullying occurs on the more open areas.

Soils: Decaying leaf litter has resulted in medium to highly organic soil surface textures but soils are basically depositional sands. There is some evidence of illuviation. Soils are mainly Howard with less frequent occurrence of Corndorl. Kapalga and Baroalba also occur.

Vegetation: Open short grassland (Ectrosia, Eriachne spp.) with scattered tall trees (E. alba var. australasica, Metrosideros, Melaleuca). Clumps of Pandanus.

Limitations: Highly erodible. Spring lines and seepage areas.

Land Unit: Kosher 6. (Kh 6)

Form: Well stabilized depositional areas.

Soils: Basically sandy with considerable build-up of organic material.

Vegetation: Tall non-Eucalypt forest. (e.g. Boggy Springs).

Limitations: Poor trafficability; margins highly erodible.
Land Unit: Krokane 2. (Kk 2)

Form: Gently undulating, rarely level upland country and low erosional spurs, including minor wash slopes; infrequent exposures of laterite. Slopes to 3%; relief to 6m.

Soils: Variable, with Koolpinyah, Giles and Hotham predominating; infrequent areas of skeletal soils and rare occurrence of Ramil, Killuppa, and Baroalba.

Vegetation: Mixed Eucalypt woodland to open forest (E. miniata, E. tetrodonta, E. bleedaei with some E. polycarpa and E. papuana); often with dense mixed undergrowth (Acacia, Calytrix, Livistona, and Eugenia suborbicularis); a few thickets of Tristania; mid-height grasses and Hyptis common.

Limitations: Shallow soils; highly erodible.

Land Unit: Krokane 4. (Kk 4)

Form: Sandy spilway areas including depressions 50 to 400m across which are temporarily inundated for varying periods. Probably also includes ancient billabong sites which have been drained as a result of weathering of the landscape. Relief is less than 3m and slopes are almost negligible.

Soils: Sandy depositional soils, e.g. Baroalba and Bowen, are co-dominant with some Jim Jim. Soils with increasing pedological organization are found less frequently (Koolpinyah, with rare Hotham).

Vegetation: Most characteristic of this unit are thickets, often monospecific, of Melaleuca symphyocarpa, M. Nervosa, M. viridiflora or Tristania with a very sparse ground cover of mid-height grasses (Ectrosia, Eriachne triseta, Panicum mindanaense). Slightly drier areas have dense Acacia scrub. This thicket vegetation is found in or around billabongs many of which are seasonally dry and carry a short grassland dominated by water couch (Pseudoraphis). Permanent billabongs are often surrounded by tall E. alba var. australasica. More determinate drainage floors carry an open woodland (E. polycarpa, Ironwood and Pandanus) with mixed grassland dominated frequently by Eriachne burkittii. The unit also contains elements of the previous unit, mixed Eucalypt woodland with thickets - the thickets particularly Tristania being more common.

Limitations: Very weakly coherent and highly erodible soils towards the unit margins. Seasonal inundation and subsequent poor trafficability.
<table>
<thead>
<tr>
<th>Land Unit</th>
<th>Kay 1. (K 1)</th>
<th>Kay 2. (K 2)</th>
<th>Queue 1. (Q 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Level to gently undulating upland country over deeply weathered rock. Lateritic gravel present in varying amounts. Slopes to 2% but generally less; relief less than 6m.</td>
<td>Gravelly wash slopes up to 4%; relief to 10m but more commonly 5m. Commonly occurring on the margins of Kay 1 but also present as extensive areas of undulating to domed terrain.</td>
<td>Level to very gently undulating upland areas of sandy Red Earths. Soil is very permeable and these areas absorb considerable quantities of water which discharge from points in the marginal unit, Queue 2.</td>
</tr>
<tr>
<td>Soils</td>
<td>Predominantly lateritic sandy red earths varying from deep, relatively gravel free to shallow, very gravelly profiles. Woolner and Hotham are co-dominant with minor areas of Killuppa; Koolpinyah occurring less frequently.</td>
<td>Koolpinyah co-dominant with the lateritic red earths (Woolner and Hotham). Rare occurrence of Killuppa and Cornodial.</td>
<td>Almost entirely Killuppa; rare Hainl and very rare patches of shallow lateritic Red Earths.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>E. miniata – E. tetrodonta woodland to open forest with a variable amount of undergrowth (frequently dense Acacia) and mid-height grasses (pseudopogonatherum, Schizachyrium, Thaumastochloa, Briachi triiseta, Panicum mindanaense, Aristida sp.). Annual Sorghum is very rare (occurred once out of 22 sites). Taller open forest (up to 25m) is restricted to the small inclusions of deep sandy red earths. Drainage areas show an increase in some understorey species, notably Eugenia suborbicularis.</td>
<td>Same as last unit. None of the taller open forest. Occurrence of Hypeis frequent.</td>
<td>Open forest to tall open forest (up to 25m) dominated by E. miniata and E. tetrodonta. Undergrowth includes Grevillea heliosperma, Fetalostiigma sp., Eugenia suborbicularis, Acacia praelongata and Pandanus. Mainly mid-height grasses as for Kay 1 but some areas with annual Sorghum and Heteropogon triticeus.</td>
</tr>
<tr>
<td>Limitations</td>
<td>Moderate to high costs associated with clearing. Some areas of shallow stony soils near crest of unit. Erosion must be anticipated if clearing is undertaken.</td>
<td>Slopes, shallow soils, highly erodible.</td>
<td>High cost of clearing; erodible when disturbed.</td>
</tr>
</tbody>
</table>
Land Unit: Queue 2. (Q 2)

Form: Sandy wash slopes to 5% with relief to 10m. Generally occurring as fringe to predominantly sandy upland plain areas (Unit Queue 1). Gullies to 2m deep are common, as is sheet washing.

Soils: Ramil and Baroalba co-dominant; Killuppa occurs less frequently, usually towards the upper margin of the unit; rare occurrence of Koolpinyah.

Vegetation: E. tetrodonta - Terminalia grandiflora woodland with associated Melaleuca nervosa, Tristania, Metrosideros, E. polycarpa, Pandanus, Calytrix and mid-height grasses (E. triseta) with some Vetiveria. This merges into Melaleuca nervosa and Tristania scrub on lower slopes or the open forest with Eugenia suborbicularis more typical of drainage situations in Kay 1 on drier areas. Ramil and Baroalba co-dominant; Killuppa occurs less frequently, usually towards the upper margin of the unit; rare occurrence of Koolpinyah.

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Land Unit: Knifehandle 3. (Kn 3)
Form: Alluvial flats and poorly defined channels, infrequently incised; seasonally inundated in parts. Includes creek surroundings. Slopes generally less than 2%; relief up to 3m.
Soils: Predominantly depositional soils. Barcalba common towards margin of unit with Jim-Jim frequently occurring on seasonally inundated areas. Rare Koolpinyah.
Vegetation: Open grassland with Sclerandrium, Eriachne burkittii, Vetiveria, sedges and many low annual forbs. Scattered low trees - Melaleuca nervosa, Pandanus or Tristania.
Limitations: Similar to Kosher 2. Water available for part of year and hence stock concentration and erosion of margins is likely.

Land Unit: Kysto 1. (Ks 1)
Form: Low, strike oriented parallel ridges. Less frequently occurring as non-linear low hills. Slope to 6% with relief to 15m.
Soils: Predominantly skeletal with rock outcrop; infrequent development of Hotham.
Vegetation: Essentially the same as Kay 2. Aerial photographs show distinct banding of the vegetation. This is not very apparent on the ground.
Limitations: Rocky; steep slopes; erodible; excessive run-off.

Land Unit: Littoral 1. (L 1)
Form: Tidal flats up to 1km wide along the coast. Scattered relict sand dunes occur within the unit and are most common in the vicinity of Point Stuart. Indistinct swales have formed between these dunes as a result of salt water intrusion.
Soils: Solonchaks (Carpentaria), and saline muds.
Vegetation: Samphire, sedge land or bare; short grass and scattered low trees (Pandanus) on dunes.
Limitations: Excessively saline soil; infrequently inundated; very poor seasonal accessibility.

Land Unit: Littoral 2. (L 2)
Form: Tidally inundated areas of saline mud.
Vegetation: Mangrove scrub.
Limitations: Saline; tidal inundation.
<table>
<thead>
<tr>
<th>Land Unit</th>
<th>Littoral 4. (L 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Complex of dunes and swales in varying but basically advanced stages of stabilization. This unit is unique to the region and occurs where the upland salient most closely approaches the coastline near Point Stuart.</td>
</tr>
<tr>
<td>Soils</td>
<td>Predominantly dune sands. Some accumulation of clay material has occurred within the swales.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Woodland or semi-deciduous forest; variable, non-Eucalypt including Acacia, Pandanus, Abrus, Gyrocarpus, Morinda, Bauhinia hookeri and Caesalpinia bondoc.</td>
</tr>
<tr>
<td>Limitations</td>
<td>Unstable; seasonally inaccessible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Land Unit</th>
<th>Cyperus 1. (Cp 1) (d) indicates low relict beaches. (g) indicates prominent gilgai.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Seasonally inundated plain; drying out earlier than other clay plain units. Part of this unit is gilgai in the north-eastern portion of the Carmor Plain. Relict sand dunes are scattered across this unit near the coast.</td>
</tr>
<tr>
<td>Soils</td>
<td>Predominantly deeply cracking carbonate-rich clay (Carmor family) with less frequent occurrence of deeply cracking neutral clay (Wildman) where drainage is poorer.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Predominantly sedge land (Eleocharis and Cyperus) with areas of grassland or Sesbania (species observed include Malachra, Cardiospermum, Phyla, Eriochloa and Echinochloa colonum). Sand dunes with short grasses and Sida.</td>
</tr>
<tr>
<td>Limitations</td>
<td>Inundation and poor seasonal trafficability. Seasonal cracking; strongly alkaline; excessive soluble salts.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Land Unit</th>
<th>Cyperus 2. (Cp 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Lower and hence less well drained areas adjacent to Cyperus 1, including seasonally filled freshwater channels up to 200m wide. Narrow tidal channels occur closer to the coast.</td>
</tr>
<tr>
<td>Soils</td>
<td>Wildman soils were commonly found where conditions permitted sampling. A few Carmor family soils were found at the higher margins of the unit. Rare Cairncurry.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Herbaceous swamp vegetation (species observed included Eleocharis, Oryza, Hymenachne, Panicum effusum, Marsilea, Monochoria, Nymphoides).</td>
</tr>
<tr>
<td>Limitations</td>
<td>Inundated for a greater period than Cyperus 1 and some areas remain at least boggy for the greater part of the year. Poor trafficability and seasonal accessibility. High soluble salts.</td>
</tr>
<tr>
<td>Land Unit</td>
<td>Form</td>
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</tr>
<tr>
<td>Copeman 2. (Cm 2)</td>
<td>Broad areas restricted to the Mary River flood-plain including anastomosing narrow channels with scattered paperbark. This unit was not accessible but a dominantly freshwater regime was considered the most probable influencing factor.</td>
</tr>
</tbody>
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<tr>
<td>Copeman 4. (Cm 4)</td>
<td>Flooded paperbark swamps and open water to 400m across. Occurs on the plain adjacent to the upland areas and is the result of ponding of creeks and run-off. The margin on the coastward side of this unit dries out seasonally and the boundary with Cyperus 1 was delineated by the water level 7 months after the onset of the monsoon.</td>
<td>Acid peats (Dashwood) in vicinity of paperbark swamps; Wildman increasingly common where seasonal drying occurs. Counamoul found on raised areas near the high country margin.</td>
<td>Paperbark forest to woodland with patches of open water; ground surface almost bare with scattered Marsilea and Phyla.</td>
<td>Deep inundation; much of unit is not trafficable. Seasonally drier portions similar to Cyperus 2.</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>Pinwinkle 1. (Pw 1)</td>
<td>wooded swamps, flooded to 1 m or more, except along higher margins which dry out seasonally.</td>
<td>Mostly permanently wet gleyed cracking clays over estuarine muds.</td>
<td>Paperbark forest with Melaleuca viridiflora and Melaleuca leucadendron, occasional clumps of Barringtonia.</td>
<td>Deep inundation; much of unit is not trafficable.</td>
</tr>
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</tr>
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<tbody>
<tr>
<td>Pinwinkle 3. (Pw 3)</td>
<td>Margins of sandy wash slopes and the clay plain; generally fringing areas under freshwater influence (Copeman 4). Slopes to 5%; relief below 3m; commonly less than 80m across.</td>
<td>Burrabibbi; Counamoul.</td>
<td>Paperbark forest with E. papuana and E. alba var. australasica on the higher margins.</td>
<td>Grodillo; cropping.</td>
</tr>
</tbody>
</table>
SOILS DESCRIPTION

1. Lithosols:
   Giles: Yellowish brown loamy sand over sandy loam with gravel and stone; less than 60 cm deep.
   Irgul: Dark brown to reddish brown loamy sand over sandy loam or light sandy clay loam with stone and gravel; less than 50 cm deep.

2. Siliceous Sands:
   Bowen: Brown, uniform or weakly gradational sand or loamy sand over sandy loam to light sandy clay loam. Also a gravelly, shallow phase.
   Baroalba: Grey to pinkish grey uniform or weakly gradational loamy sand over clayey sand or light sandy clay loam with red mottles. Also a gravelly, shallow phase.
   Kapalga: Uniform greyish brown sand (with some organic material) over pale brown sand or clayey sand.

3. Barthy sands:
   Corndoll: Nearly uniform dark greyish brown loamy sand over yellowish red to red sandy loam.

4. Solonchaks:
   Carpentaria: Uniform greyish brown medium clay over gleyed grey light clay. Cracking, self mulching surface crust.

5. Grey, Brown & Red Clays:
   Carmor: Strongly cracking; dark greyish brown medium to heavy clay over olive grey medium to heavy clay with calcium carbonate nodules and yellow and brown mottles. Strongly alkaline throughout.
   Wildman: Strongly cracking; black medium clay over dark grey to light olive grey medium clay with yellowish brown, rusty and olive mottles. Neutral pH.

Another Wildman series soil was seen in the vicinity of channels which possibly are saline for part of the year. This soil was more alkaline and had gleyed material low in the profile strongly suggesting marine influence.

   Cairncurry: Uniform, cracking, very dark grey organic light clay over grey medium to heavy clay. Profile characterised by gypsum crystals, bright yellow mottles and very acid pH lower in profile.
   Rushwood: Black medium clay over greyish brown light clay which is strongly acid (pH about 3.0).
Counamoul: Gradational black (organic) silty clay loam over grey light to medium clay with rusty mottles onto gravelly and/or gritty yellowish brown sandy light clay. Below this is mottled, weathering country rock.

6. Solonized brown soil:

Jim Jim: Duplex; dark greyish brown loamy sand to yellowish brown mottled clayey sand over pale brown sandy clay with abundant carbonate nodules; strongly alkaline.

7. Yellow Earths:

Howard: Gradational; dark grey to black silty or sandy loam over pale brown silty sandy clay or white sandy clay with red and rusty mottles.

Ramil: Gradational; dark greyish brown sandy loam over yellowish brown sandy clay loam. Also, phase exists with sandier surface texture.

Koolpinyah: Gradational; yellowish brown sandy loam over yellowish brown sandy clay loam with gravel. Shallower version intergrading to the Lithosol, Giles.

8. Red Earths:

Killuppa: Gradational; dark red sandy loam over red sandy clay loam. Phase was also observed which was loamy sand over light sandy clay loam.

Woolner: Gradational; dark greyish brown loamy sand with gravel over yellowish-red sandy clay loam with gravel; mottled red and grey.

Hotheam: Gradational; dark brown sandy loam with gravel over yellowish red sandy light clay with gravel and stone. Commonly less than 90cm deep; intergrading to the Lithosol, Irgul.

9. Gleyed Podzolics:

Nurrabibbi: Gradational; dark grey to black loamy sand to sandy loam over grey to white gravelly, sandy clay, with strong red and rusty mottles.
The following discussion presupposes intended development of the property to a stage where all cattle and buffalo are controlled. The level of knowledge about the coastal plains environment is so scant that it is impossible to make absolute statements about the potential of different units. The intention here is to emphasize the conservation aspects of development and to indicate the problems likely to be met on each unit. To do this we have grouped the land units according to their potential (as we see it in the light of existing knowledge about pastures, crops and soils).

1. Areas capable of a high degree of pasture improvement, or cropping with a high soil conservation input. The only unit to be considered here is Queue 1. This has the initial limitation of high clearing costs. The soils (Killuppa) are highly detachable and thus potentially very erodible. However these areas are mainly very gently sloping. Total clearing of very large areas is not desirable. Cleared areas should not exceed about 50 ha. If cropping is considered this would have to be done on the contour with grass strips left according to branch recommendations. Cropping should not be considered at all on slopes greater than 1%.

2. Areas capable of a high degree of pasture improvement with only limited cropping potential. These are the units of Kay 1. Clearing costs will be high as with Queue 1. The soils are poorer, more gravelly and shallower. Drainage areas should be left uncleared or at least unploughed. The best method of development would be 50% clearing and 50% uncleared in strips 100m wide approximately on the contour. Cropping should be confined to small areas of Killuppa soil.

3. Areas capable of limited improvement with Townsville Stylo, with minimal clearing. Included in this group are Kay 2, Kosher 2, Kosher 3 and Knifehandle 1. All these have gravelly soils similar to Kay 1 but are more shallow. However these units are all developed on distinctly sloping country which makes them more prone to erosion. Most of these areas carry a dense layer of undergrowth which would require thinning to allow T.S. establishment and proper control of grazing. A certain amount of clearing is therefore necessary. This should either be on the contour and then only about 25% of the total, or undergrowth slashing amongst the bigger trees.

4. Areas suitable for low input T.S. improvement and careful control of grazing. The units are either rocky with shallow soils (Bend 2, Bend 5, Ky sto 1) or very erodible (Kosher 1, Kosher 6, Kosher 4, Krokane 4, Knifehandle 2, Knifehandle 3, Pinwinkle 3) or both (Krokane 2). Much of this country might appear to be cheaply improvable, particularly much of the "fringe" country, but problems associated with management could make such low-input pastures difficult to maintain. One such problem on much of the "fringe" country is weed invasion, particularly Hypixhs. The eradication of weeds is likely to be uneconomic and therefore the whole "improvement" exercise becomes meaningless. Bend 5 offers good potential for stock yard sites.

5. Steep and rocky areas suitable only for rough grazing. Only one unit, Bend 1, falls into this category and it is not extensive.

6. Extremely erodible areas that require total protection from grazing. These are Kosher 5, Kosher 6 and Queue 2. These are steeply sloping areas of very uncohesive sands which contain seepage points and spring lines. Many of these areas are already quite severely eroded and any further development in their vicinity will further reduce their stability.

7. Littoral areas of no pastoral value. Littoral 1 and Littoral 2 are mainly saline muds. Littoral 4, the unit at Point Stuart, is mainly old beach sands with little grass but supporting unusual plant communities. This unit is of scientific interest and is unique to the region.

8. Perannal swamps (Cassen 4 and Pinwinkle 1) are of very limited grazing value or potential. They have value as wildlife refuges and for tourist appeal.
9. Low-lying and seasonally deeply flooded black soil plains (Cyperus 2 and Copeman 2) afford good buffalo grazing. These are the areas where Hymenachne is found or where it could most likely be grown. Being so wet these areas present considerable management problems, particularly in fencing.

10. Black soil plains which are seasonally inundated to shallow depth (Cyperus 1); they are of little value in native state but probably offer good chance of improvement with Para grass. Seasonal inundation and deep cracking make fencing difficult. These areas offer the greatest potential for rice production.