THE LAND RESOURCES OF NARWIETOOMA STATION

A.J. BOWMAN and R.J. VILLIGER
February, 1995

Natural Resources Division
Department of Lands Planning and Environment
P.O. Box 1512
Alice Springs NT 0871
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SUMMARY

This report documents the land resources of Narwietooma Station, occupying an area of 2725 sq.km, 142km north-west of Alice Springs. Twenty-seven land units have been identified and mapped on the station for the purpose of assisting with land management decision-making on the property. Each land unit is provided with a detailed description in terms of its landform, soil and vegetation characteristics and includes the pastoral land management implications of these attributes.

The most productive country from a pastoral point of view is the range frontage clay plains, most of which occur in the south-eastern section of the station below the Mt. Chappel range and to the south side of Redbank Hill. The limestone plains along the northern boundary of the station together with range frontage fans, floodplains, floodouts and relict alluvial plains, which form a large part of the station, all have areas that are considered to be good productive country. The remainder of the station has a relatively low pastoral value and consists largely of spinifex sandplains and sand dunes with some mulga plains.

The potential for soil erosion on the property is generally low. The limestone plains and areas of the floodplains, floodouts and alluvial units are more susceptible to erosion and care must be taken in the management of these areas. The inappropriate siting and construction of graded vehicle tracks and fencelines presents the greatest erosion hazard.
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SECTION ONE: INTRODUCTION

A. BACKGROUND TO THIS SURVEY

A detailed knowledge of the different types of country on a station and their reaction to pastoral use is an essential precursor to good land husbandry, grazing management and property development. Most pastoralists gain a comprehensive first-hand appreciation of the land attributes of their station through living and working in that particular environment, observing the way in which stock use pastures and the response of the country to season.

A land resource inventory can compliment this local knowledge by formally documenting the types of country on the station, accurately mapping their distribution, and indicating the potential productivity and land management hazards associated with each. As such it provides a tangible basis for making property management and development decisions. Besides the station manager, land resource information is especially valuable to Government advisers in the fields of soil conservation, pasture management and livestock husbandry as well as land administrators.

This land resource survey documents the pastorally-different land types of Narwietooma Station, located 142km north-west of Alice Springs and occupying an area of 2725 sq km. The survey was requested by Mr. Chris Connellan, the lessee of the station. To meet his requirements the station was mapped into land units with pastorally different attributes at a scale of 1:100,000. Each land unit therefore defines areas having uniform soils, vegetation type, grazing characteristics, stocking capacity and erosion hazard. This report provides a detailed description of each land unit and its pastoral management features.

B. PREVIOUS SURVEYS

The Land resources of Narwietooma station were first mapped at a scale of 1:1,000,000 by Perry et. al. (1962). These authors identified the following land systems on the station:

**Harts Land System** - rugged mountain ranges of crystalline rocks with sparse shrubs over spinifex, in the southern part of the station.

**Hamilton Land System** - mulga or treeless plains on the northern flank of the MacDonnell Ranges.

**Bushy Park Land System** - mulga plains with red earth soils in the southern/central part of the station.

**Undippa Land System** - mitchell grass plains on the northern flank of the Mt Chapple range.

**Singleton Land System** - spinifex sandplain in the northern part of the station.

**Titra Land System** - sandy limestone plains and saline tracts on the northern boundary of the station.
Land system mapping at this regional scale lacks sufficient resolution for the purpose of planning pastoral property development or management. Therefore, during the 1970's the original land system classification was refined and remapped at a scale of 1:100,000 by the Land Conservation Unit to better suit management purposes. This approach, however, did not overcome the lack of resolution of individual land types associated with the original broad land system classification and lacked field verification.

The land system approach is based on the description of compound map units. Each land system may therefore include several unmapped pasture types with widely differing management characteristics and occurring in varying proportions. The variability within land systems therefore reduces the value of this type of mapping for planning property management. For instance, a particular land system may vary in the proportion of a highly productive pasture type from paddock to paddock. Importantly, land types with specific management requirements may be mapped with other pastures within the one land system.

In this survey, the mapping has been based on the identification of simple units, each of which defines areas of uniform pastoral characteristics within the resolution of the map scale. Consequently the land types within individual management areas (e.g. Paddocks, bore areas) are specifically described on the map permitting better planning decisions at this level.

C. SURVEY METHODOLOGY

A land unit is an area of land which has relatively uniform landform, soil and vegetation characteristics. Narwietooma has been mapped into twenty seven land units at a scale of 1:100,000 on the basis of the stereo-interpretation of aerial photographs and extensive on-ground survey.

The aerial photo cover consisted of 1:50,000 scale colour contact prints, flown over the southern part of the station in 1987 and over the northern area in 1989. Tentative land unit boundaries were mapped on to the photographs prior to the conduct of a ground survey and suitable sites for field examination were identified according to this preliminary classification. Field survey work occupied approximately six weeks between March and June 1992. The field survey consisted of vehicle traverses between recording sites, which were selected at an average intensity of 6 sites per 100 sq km. Access was good throughout the station as well maintained tracks and fencelines occur in most areas.

At each recording site landform, soil and vegetation characteristics were documented according to the criteria of McDonald et al (1984) and representative areas photographed. Soil profiles were generally described using soil pits excavated by hand to a depth of up to 1m, although, a backhoe was used in some instances, evacuating to a depth of about 2m. Exposures in creek banks and gullies were used to describe soil profiles where suitable.

Seasonal conditions up to and including the survey period were drier than normal and lacked good summer rains. Areas on the station were less vegetated than in average to good seasons and the ground layer vegetation consisted of more forbs than grasses. Pasture descriptions in this report may therefore overlook some summer growing species.
Final amendments to land unit boundaries were made during a comprehensive re-examination of the aerial photography subsequent to the field survey. A base map was produced using global positioning system data and Auslig 1:100,000 digital contour and drainage information and checked against orthophoto maps. Land unit boundaries were then compiled onto the base map. The mapping was scanned and entered onto the Commission’s ARC/INFO GIS system and site information is held on an INFO database.
### TABLE 1
**GEOLOGICAL TIME SCALE**

<table>
<thead>
<tr>
<th>EON</th>
<th>ERA</th>
<th>PERIOD</th>
<th>EPOCH</th>
<th>YEARS BEFORE PRESENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHANEROZOIC</strong></td>
<td><strong>Cainozoic</strong></td>
<td>Quaternary</td>
<td>Holocene</td>
<td>10 000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pleistocene</td>
<td>1.6 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>65 m</td>
</tr>
<tr>
<td></td>
<td><strong>Mesozoic</strong></td>
<td>Cretaceous</td>
<td></td>
<td>135 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jurassics</td>
<td>205 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Triassic</td>
<td>250 m</td>
</tr>
<tr>
<td></td>
<td><strong>Palaeozoic</strong></td>
<td>Permian</td>
<td></td>
<td>290 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Carboniferous</td>
<td>355 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Devonian</td>
<td>410 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Silurian</td>
<td>435 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ordovician</td>
<td>510 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cambrian</td>
<td>570 m</td>
</tr>
<tr>
<td><strong>PROTEROZOIC</strong></td>
<td><strong>Neo</strong></td>
<td></td>
<td></td>
<td>1000 m</td>
</tr>
<tr>
<td></td>
<td><strong>Meso</strong></td>
<td></td>
<td></td>
<td>1600 m</td>
</tr>
<tr>
<td></td>
<td><strong>Palaeo</strong></td>
<td></td>
<td></td>
<td>2500 m</td>
</tr>
</tbody>
</table>
SECTION TWO: GUIDE TO INTERPRETATION OF SURVEY INFORMATION

This report describes each land unit of Narwietooma Station in terms of its geology, landform, soils, vegetation and management requirements. The format of each description includes a general outline of the main landscape features, a summary of management issues and a representative photograph on the left-hand page. This level of detail will suit the needs of many report users. A more detailed description of geology, landform, soils and vegetation is provided on the right-hand page for users requiring a greater depth of technical information.

In this section technical aspects of the geology, landform, soils and vegetation descriptions are explained in order to assist non-expert users in interpreting the more detailed information provided.

A. GEOLOGY

The description of the geology of each land unit in this report is based on the interpretation of existing 1:250,000 scale or 1:100,000 scale mapping. This mapping is often generalised in areas lacking rock outcrop and the geology indicated in this report may be inferred from other evidence. A geological time scale is indicated in Table 1.

B. LANDFORMS

The landform classification adopted in this report is based on an interpretation of landform pattern together with a description of land surface attributes such as slope, relief and drainage pattern (see MacDonald et al, 1990).

The landform pattern is largely inferred from the stereo-interpretation of aerial photographs and classifies terrain according to its overall morphology and processes of formation. The following landform patterns commonly comprise central Australian landscapes.

Hill - terrain with high relief (90-300m) and gently inclined to precipitous slopes.

Low hill - uplands with low relief (30-90m) and gentle to steep slopes.

Rise - terrain with very low relief (9-30m) and gentle to steep slopes.

Plain - level to undulating terrain with relief of less than 9m.

Pediment - plains with low relief developed on bedrock.

Paleoplain - plains formed over a very long period of geological time on highly weathered rocks.

Fan - outwash areas, usually where a watercourse exits uplands, having gently inclined slopes away from distributary channels.

Floodplain - alluvial plains characterised by active deposition and erosion by overbank flow from creek or river channels.
Drainage floor - depressions carrying concentrated run-off flows, but lacking channel features.

Floodout - outwash areas at the terminal end of a stream channel where runoff and sediment accumulates.

Swamp - frequently inundated closed depressions that accumulate sediment and runoff flows.

Sandplain - level or gently undulating terrain with coarse textured surfaces modified by wind action during prior arid climates.

Dunefield - terrain with low relief consisting of dunes and interdune flats formed by wind action during prior arid climates.

C. SOILS

i) SOIL CHARACTERISTICS

Soils have certain physical and chemical properties which are governed by the type of parent material from which they formed, the landform on which they occur and the climatic environment under which they developed. In this report, soils are described in terms of texture, colour, reaction trend, the presence of calcium carbonate, structure, fabric, coarse fragments and strength. On the basis of these characteristics, they are classified into their Australian Great Soil Group (Stace et al, 1968), Principle Profile Form (Northcote, 1979) and Australian Soil Classification (Isbell, 1993).

Horizons

Change that occurs with increasing depth down a soil profile is described in terms of horizons. A horizon is a soil layer or level parallel to the land surface that has characteristics differing from those above and below. The development of horizons results from biological and sediment transport processes near the soil surface and the movement of clays and soluble substances with moisture at depth. Horizons are mainly defined by soil texture, structure grade and colour.

Horizons are designated according to a long-established and widely used notation. A-horizons include the "topsoil" which may be sandier, less structured and darker in colour than the underlying B-horizon or "subsoil". A C-horizon of partly weathered rock may be present beneath the B-horizon. D-horizons consist of unidentified underlying material, while R-horizons include massive rock. Individual horizons are usually subdivided, the sub-horizons numbered in a consecutive sequence from top downward. Buried soils are identified by a horizon prefix.

Texture

Soil texture describes the proportion of sand, silt and clay in the soil. It is indicated in the field by the behaviour of a moistened soil sample. Texture affects soil cohesion, permeability and moisture-holding capacity. It is therefore an important factor in determining the erodibility of a soil. Soil fertility is also influenced by texture as most plant nutrients are bound to clay minerals. In central Australia texture is therefore a major determinant of the type of native pasture that grows on a particular area.
The most common soil textures encountered in central Australia are: loamy sands (5% clay), sandy loams (10-20% clay), sandy clay loams (20-30% clay), clay loams (30-35% clay), light clays (35-40% clay), light medium clays (40-45% clay), medium clays (45-55% clay), medium heavy and heavy clays (more than 50% clay).

**Colour**

The colour of moist and dry soil is assessed in the field using a standard Munsell colour chart. This forms the basis of colour names used in this report which refers to moist soil only. Soil colour assists in the recognition of soil horizons and is useful for comparing soils of different areas. Colour can also indicate soil age and other properties such as drainage and organic matter content.

**Soil Reaction**

The acidity or alkalinity of soil material is indicated by a pH value. A pH value of 7.0 is neutral, while less than 7.0 indicates acidity and greater than 7.0 signifies alkalinity. In general, under alkaline soil conditions (pH 8.0 or greater) phosphorus and most micronutrients become less available to plants and deficiencies may develop. Alkalinity may also result from a high level of sodium (sodicity) which results in poor soil stability. High acidity (pH less than 5.5) also reduces the availability of soil nutrients to plants and consequently affects potential pasture productivity.

**Soil Structure**

Structure is a distinctive property determined by the occurrence of natural soil aggregates (or peds) within the soil profile. Soil structure influences moisture infiltration, drainage and the ease of root penetration. Soils without distinct peds may be massive and cohesive or have single-grain structure (e.g. dune sand). Pedal soils are described in terms of the size, shape and distinctness of the individual peds. Strongly pedal soils have distinct aggregates readily observable in an undisturbed profile while weak pedality may be evident only as a pattern of cracks in dry soil material.

**Fabric**

The characteristic arrangement of particles in the soil material is described in terms of soil fabric. The exposed faces of massive soils have a porous, dusty appearance termed earthy fabric whereas single-grain structure has a sandy fabric. Pedal soils have fabric characterised by either smooth or rough-faced aggregates.

**Calcium Carbonate**

Nodules and fine particles of calcium carbonate (or lime) are a common component of many arid zone soils. In abundance, calcium carbonate strongly influences the type of plants that can grow on a particular soil as it increases alkalinity and interacts with micronutrients. It also predisposes soils to the formation of bulldust under heavy trafficking by stock or vehicles.
Coarse Fragments

The presence of grit, gravel and larger rocks is recorded as it provides clues to the origin of the soil and influences plant growth by affecting moisture holding capacity and root penetration. Fragments are described in terms of their size, shape and rock type.

Strength

An assessment of soil strength is performed during the field description of soils. This assessment can detect hardpans that affect moisture penetration and plant growth.

(ii) SOIL CLASSIFICATIONS

In this report, soils are classified according to three different classification systems widely used throughout Australia:

(a) Great Soil Groups (Stace et al, 1968) - This classification is now superseded but relatively easy for non-professionals to use. The following Great Soil Groups were recorded on the station.

Red Earths - These are medium-textured soils, red in colour, with a massive structure and earthy fabric. There is a gradual increase in clay content with soil depth.

Alluvial Soils - These are brown sandy soils associated with floodplains, floodouts and range frontage fans.

Lithosols - Shallow gravelly soils such as occur on rocky hillslopes.

Siliceous Sands - These occur as red dune soils with less than 5% clay content, single grain structure and a sandy fabric.

Earthy Sands - These soils are found in sandplain areas. They have deep, uniform profiles with little increase in clay content with depth, massive structure, earthy fabric and are red in colour.

Red Calcareous Soils - These soils are shallow, medium-textured and highly alkaline. They have developed directly from underlying calcareous rocks or calcrete.

Brown and Red Clays - Deep, heavy-textured soils that are strongly structured. These soils may present deep cracking when dry and often display gilgai micro-relief.

Solonized Brown Soils - These soils are characterised by large amounts of calcareous material in the profile, increasing in concentration with depth.

Red-Brown Earths - These soils are characterised by an abrupt boundary between a sandy topsoil and a heavy textured subsoil. They are often highly erodible, saline, and calcareous at depth.

Non-calcic Brown Soils - These soils are very similar to red-brown earths, although generally shallower, and carbonate free.
(b) **Principal Profile Form** (Northcote 1979) is a classification based on a key defined by physical characteristics. The main divisions and sub-divisions are as follows.

**Uniform** - Profiles with uniform texture throughout  
Uc - coarse textures  
Um - medium textures  
Uf - fine textures, non cracking  
Ug - fine textures, cracking

**Gradational** - Profiles increase in clay content with depth  
Gc - calcareous throughout  
Gn - non calcareous throughout

**Duplex** - Profiles have an abrupt texture boundary between the topsoil and the subsoil  
Dr - red clay subsoil  
Db - brown clay subsoil  
Dy - yellow-grey subsoil  
Dd - dark clay subsoil  
Dg - grey clay subsoil

**Organic** - These soils are not found in central Australia

This classification is accompanied by a numerical code that specifies diagnostic characteristics of the individual profiles, as defined in Northcote (1979).

(e) **The Australian Soil Classification System - 3rd Approximation** (Isbell 1993) is a key based on both soil characteristics and laboratory data. It includes thirteen main soil orders. Each order has a series of keys that are used to classify the suborder, great group, subgroup and family classes. The main soil orders found in central Australia are as follows.

**Calcarosols (CA)** - soils are normally calcareous throughout the profile (often highly calcareous).

**Chromosols (CH)** - these soils have a strong texture contrast between the A and B horizons, are weakly acid and are non-sodic.

**Dermosols (DE)** - soils lacking strong texture contrast between the A horizon and the structured B horizon. This order is diverse.

**Ferrosols (FE)** - The structured B horizons of these soils are high in free iron oxide, and lack strong texture contrast between the A and B horizons.

**Kandosols (KA)** - These soils lack strong texture contrast, B horizons are massive or weakly structured and the profile is not calcareous throughout. These soils are a widespread group in central Australia, and occur locally in large areas.
Rudosols (RU) - Soils in this order have little if any pedological organisation. They are usually young soils that vary widely in terms of texture and depth. These soils may be stratified and some may be highly saline.

Tenosols (TE) - This order is made up of a diverse range of soils, with generally weak pedological organisation, apart from the A horizons.

Vertosols (VE) - These are clay soils that exhibit strong cracking tendencies when dry due to swell-shrink properties. Slickensides and/or lenticular peds appear at depth.

(iii) SOIL ERODIBILITY

Erodibility is the potential of the soil to erode. This is influenced by inherent soil factors, the nature of the parent material and the landform on which it occurs. Inherent soil factors include texture, salinity, ease of dispersion (sodicity) and the presence or absence of surface crusts or gravels.

Generally, soils with sandy loam or lighter are likely to experience wind erosion. Water erosion is unlikely to affect very light-textured porous soils or clays and sandy loam or sandy clay loam surfaces will be affected. Saline or sodic soil materials (the latter having high levels of sodium) are susceptible to the formation of strong surface crusts (scalding) and shallow gULLying.

When sheet runoff flows are concentrated into a channel by linear surface features, eg. grader windrow or stock pad, gULLying can be initiated. Deep gULLying generally occurs only on alluvial landforms, while sheet erosion and rilling occur mainly on pediment or peneplain surfaces. Soils that have developed from partially striped deeply-weathered rocks (the pallid zone of laterite profiles) are particularly susceptible to shallow gULLying or scalding, possibly the result of slightly saline conditions.
D. VEGETATION

The vegetation community (or pasture type) is the principal aspect of the land resource affecting pastoral activities. The land units described in this report, although also defined in terms of landforms and soils, are most easily recognised as pasture types.

Technical descriptions of vegetation usually define the community structure as well as listing the species present or floristics (see MacDonald *et al.*, 1990).

Structure

Vegetation communities usually consist of distinct layers or strata of various growth forms (e.g. trees, shrubs, grasses) having different heights. Communities are usually named according to the structure of the tallest stratum present, but there may also be a mid-stratum (understorey) and lower stratum (ground layer) present. Very sparse individuals taller than the upper stratum are termed emergent.

The structure of a stratum is defined in terms of the height (e.g. tall, mid-high, low), spacing (e.g. open, sparse) and growth form (e.g. woodland, shrubland, grassland) of the plants present. For example, the structural formation of thick mulga country may be a mid-high woodland, whereas open flats may support a low open woodland. The criteria used to define height and spacing are indicated in Tables 3-5 (from MacDonald *et al* 1990). Note that tree and shrub spacing is defined in terms of canopy size relative to the separation of canopies (crown separation ratio).

Floristics

In this report, vegetation descriptions indicate the characteristic or 'indicator' tree, shrub and pasture species present within a land unit. It should be noted that the species composition of pastures can vary considerably in response to seasonal conditions, grazing history and the incidence of fire. Fire also influences tree and shrub cover on most land types. The vegetation descriptions provided are based on the plants recorded at the time of survey. However, on Narwietooma, poor seasonal conditions during the conduct of field work hampered the assessment of pasture composition. Therefore, where possible the principal pasture species likely to be present following adequate summer rains on areas in good condition and unaffected by recent fires has been indicated as well as species actually present.

The common names used in this report generally follow the nomenclature compiled by Strong (1987) and are listed with their botanical names in the Appendix.
### TABLE 2
FORMATION CLASSES OF WOODY PLANTS*

<table>
<thead>
<tr>
<th>Crown Separation</th>
<th>D Closed or Dense</th>
<th>M Mid-dense</th>
<th>S Sparse</th>
<th>V Very sparse</th>
<th>I Isolated plants</th>
<th>L Isolated Clumps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field criteria</td>
<td>Touching-overlap</td>
<td>Touching-slight separation</td>
<td>Clearly separated</td>
<td>Well separated</td>
<td>Isolated</td>
<td>Isolated</td>
</tr>
<tr>
<td>Crown separation ratio</td>
<td>&lt;0</td>
<td>0-0.25</td>
<td>0.25-1</td>
<td>1-20</td>
<td>&gt;20</td>
<td>&gt;20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Growth Form</th>
<th>Structural formation classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Tree</td>
<td>Closed forest</td>
</tr>
<tr>
<td>M Tree mallee</td>
<td>Closed mallee forest</td>
</tr>
<tr>
<td>S Shrub</td>
<td>Closed shrubland</td>
</tr>
<tr>
<td>Y Mallee shrub</td>
<td>Closed mallee shrubland</td>
</tr>
<tr>
<td>Z Heath shrub</td>
<td>Closed heathland</td>
</tr>
<tr>
<td>C Chenopod shrub</td>
<td>Closed chenopod shrubland</td>
</tr>
</tbody>
</table>

*Tables from McDonald et al (1990)
TABLE 3
FORMATION CLASSES FOR GROUNDCOVERS*

<table>
<thead>
<tr>
<th>Crown Class</th>
<th>D</th>
<th>M</th>
<th>S</th>
<th>V</th>
<th>I</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Closed or Dense</td>
<td>Mid-dense</td>
<td>Sparse</td>
<td>Very sparse</td>
<td>Isolated plants</td>
<td>Isolated Clumps</td>
</tr>
<tr>
<td>Foliage cover</td>
<td>&gt;70</td>
<td>30-70</td>
<td>10-30</td>
<td>&lt;10</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Growth Form

<table>
<thead>
<tr>
<th>Structural formation classes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G Tussock grass</strong></td>
</tr>
<tr>
<td><strong>H Hummock grass</strong></td>
</tr>
<tr>
<td><strong>D Sod grass</strong></td>
</tr>
<tr>
<td><strong>V Sedge</strong></td>
</tr>
<tr>
<td><strong>R Rush</strong></td>
</tr>
<tr>
<td><strong>F Forb</strong></td>
</tr>
<tr>
<td><strong>E Fern</strong></td>
</tr>
<tr>
<td><strong>O Moss</strong></td>
</tr>
<tr>
<td><strong>L Vine</strong></td>
</tr>
</tbody>
</table>

* Tables from McDonald et al (1990)
### TABLE 4
HEIGHT CLASSES FOR VARIOUS GROWTH FORMS*

<table>
<thead>
<tr>
<th>Class</th>
<th>Height (m)</th>
<th>Trees, vines, palms</th>
<th>Shrubs, heath shrubs, chenopod shrubs, mallee (tree or shrub form), cycads</th>
<th>Tussock and hummock grasses, forbs, rushes, sedges, ferns, <em>Xanthorrhoea</em></th>
<th>Sod grasses, mosses, lichens, liverworts</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>&gt;36.01</td>
<td>Extremely tall</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>8</td>
<td>20.01-35</td>
<td>Very tall</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>7</td>
<td>12.01-20</td>
<td>Tall</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>6.01-12</td>
<td>Mid-high</td>
<td>Extremely tall</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>3.01-6</td>
<td>Low</td>
<td>Very tall</td>
<td>Extremely tall</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>1.01-3</td>
<td>Dwarf</td>
<td>Tall</td>
<td>Very tall</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>0.51-1</td>
<td>NA</td>
<td>Mid-high</td>
<td>Tall</td>
<td>Extremely tall</td>
</tr>
<tr>
<td>2</td>
<td>0.26-.5</td>
<td>NA</td>
<td>Low</td>
<td>Mid-high</td>
<td>Tall</td>
</tr>
<tr>
<td>1</td>
<td>&lt;.25</td>
<td>NA</td>
<td>Dwarf</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

* Table and Figure from McDonald *et al* (1990)

![Figure A showing upper, mid and lower strata](image)

**FIGURE A SHOWING UPPER, MID AND LOWER STRATUMS**

* Table and Figure from McDonald *et al* (1990)
SECTION THREE: THE LAND RESOURCES OF NARWIETOOMA

A. GEOLOGY AND LANDFORMS

The geology of Narwietooma has been mapped by Quinlan and Forman (1968) at 1:250,000 and by Glikson and Green (1983) at 1:100,000 scale. This mapping provides a detailed account of Proterozoic Arunta Complex rock types outcropping as uplands in the southern part of the station. However the extensive Quaternary plains throughout the remainder of the station are only described at a reconnaissance level.

Eight broad categories of geology and landform comprise the basis of the land classification used in this report. Each category encompasses several related units:

1) Hills and Mountains - This includes terrain ranging from low hills to Mt. Zeil, the highest mountain in the Northern Territory, occupying the southern portion of the station. These uplands have developed on Proterozoic metamorphic and igneous rocks of the Arunta Complex, mainly granulites (Mt. Zeil Granulite), granites (Teapot Granite) and gneisses (Redbank Hill Porphyroblastic Gneiss). The general character of the uplands includes moderate to steep slopes, abundant rock outcrop and colluvial deposits, a partial cover of shallow soils and a well-defined drainage network. The category has not been subdivided into land units.

2) Palaeoplains - Denudational palaeoplains (old land surfaces) are of limited extent on Narwietooma (see Land Unit 2.1). Generally, surfaces of this nature are buried beneath an extensive veneer of alluvial sediments. These surfaces mainly developed during the Tertiary Period on lateritic, deeply-weathered rocks or younger basin sediments, although these substrates are not exposed on the station. The plains are featureless and almost level, runoff dispersing as sheet flow which produces a distinct pattern of sandy microterraces visible as mulga groves.

3) Range Frontage Clay Plains - These plains have formed from alluvial fan sediments which are possibly of Late Tertiary age and derived from granulite rocks. The fans appear to have been extensively stripped to form a mosaic of erosional and depositional surfaces in the present landscape. The erosional surfaces include non-gilgaied (Unit 3.1) and gilgaied plains (Unit 3.2), the latter having calcareous soils. These shed runoff and fine sediment into depressions and alluvial plains (Unit 3.3) which feed a terminal swamp (Unit 3.4) near Paradigm Bore. Depressions with sandy-textured surfaces (Unit 3.5) occur south of Mt. Chappel.

4) Range Frontage Fans - Range frontage areas are also flanked by fans of colluvial gravel and extensive outwash plains. The gravelly fans occupy re-entrant areas at the foot of catchments in the Mt. Chappel range and consist of cobbly rock debris. The outwash plains (Unit 4.2) consist of sandy sediments deposited by low angle alluvial fans. These are fed by narrow creek channels which flood out and deposit sediment on lower slopes. Fans commonly consist of relatively old red earth soils which are partially or completely veneered by brown Holocene sediments associated with presently active fans.
5) **Floodplains and Floodouts** - This group of units is associated with major creek floodouts. It includes extensive fans or floodouts (Unit 5.1) of Holocene sediments which are constructed from the outwash of major creek channels. These channels have narrow active floodplains (Unit 5.2). The fans often partially cover an older, fine-textured surface (Unit 5.3) which was deposited prior to the Holocene. This surface is traversed by dunes in the Dashwood Creek floodout. The category also includes medium-textured sediments (Unit 5.4) which occur at the terminal end of some floodouts and fans.

6) **Relict Alluvial Plains** - These include fan and floodout deposits of presumed Pleistocene age which occupy an extension area of Narwietooma. The plains consist of a network of prior floodout features that coalesce to form a continuous surface with slight surface undulations (Unit 6.1). Some terminal floodout features (Unit 6.2) remain visible and often have prior bedload channels of coarse, gravelly alluvium. Broad drainage floors that carry present day drainage occupy low lying areas (Unit 6.3).

7) **Limestone Plains** - Plains of Quaternary travertine form a terrace surrounding the southern margin of the Napperby Lakes system. The plains consist of slightly undulating terrain (Unit 7.1) which has developed through the geologic stripping of an older surface which persists as low rises (Unit 7.2). The lower plains have highly calcareous soils while the soil of the rises is more weathered. Sinkholes and flat-floored depressions draining north towards the Napperby Lakes (Unit 7.3) form a significant component of these plains.

8) **Sandplains and Sand Dunes** - Throughout the northern part of Narwietooma the surfaces of the sandy alluvial plains have been modified by aeolian processes. The peak of this aeolian activity occurred during the last Glacial Period, 16,000-18,000 years ago. Differences between units in this category appear to correlate with slight variation in topographic position and substrate, but may also reflect the effects of several phases of aeolian activity. Vegetation patterns best express the variation. Unit 8.1 is the most widespread sandplain unit and is generally present in areas unaffected by major drainage systems. Unit 8.2 mainly occurs on the margins of the alluvial plains and has possibly been subjected to the least aeolian influence. Unit 8.3 occurs in association with major drainage systems in the eastern part of Narwietooma while Units 8.4 and 8.6 occur downslope of floodouts in the western half of the station. Unit 8.5 is found on the margin of the limestone plains and Unit 8.7 consists of relict sandy floodout lobes. The latter occur as low sandy rises which trend northwards in contrast to the north-west/south-east orientation of the dunes mapped as Unit 8.8.

The preceding categories and units form the basis for this description of the land resources of Narwietooma. Although the land units are based on landform criteria, they also accurately define soil distribution and consequently the vegetation pattern.
B. DESCRIPTION OF LAND UNITS

1 HILLS AND MOUNTAINS

LAND TYPE 1.1

Undulating rises to steep hills; lithosols to gravelly red earths; lower storey vegetation varies from weeping spinifex to annual and perennial grasses.

A detailed breakdown of units within this land type was not done at the owner's request.
2 PALAEOPLAINS WITH MULGA

LAND UNIT 2.1

GENERAL:

DESCRIPTION

Relatively thick mulga country with bands of open ground supporting mulga grass pastures after summer rainfalls.

MANAGEMENT IMPLICATIONS

This landscape has a low potential for erosion, but storm runoff may initiate minor rilling where surface flows are concentrated by flat graded tracks or similar earthworks. If possible new roads should be properly formed and planned on aerial photos to follow the contour and avoid low-lying areas where runoff flows will be greatest. Because of the low erosion potential this unit would be suitable for location of watering points.

The soils of this unit are of inherently low fertility due to prolonged weathering of parent material. Pastures include some palatable species and which will be selectively grazed and may decrease in abundance with excessive grazing pressure. Hot summer wildfires tend to promote a dense growth of unpalatable wiregrass, which has no grazing value. The unit is poorly suited to buffel grass establishment due to the inherently low soil fertility.
TECHNICAL:

DESCRIPTION

Level to slightly undulating plains; medium-textured red earths; groved low open woodland of mulga with bloodwood over sparse annual grasses, five-minute grass, wiregrass, and forbs.

GEOLOGY

Tertiary sediments or Tertiary deep-weathering profile derived from crystalline basement rocks.

LANDFORM

Level or very gently-sloping palaeoplains, usually with gradients of less than 1%. Runoff drains by sheet flow and defined drainage features are generally absent.

SOILS

Red earths (Um 5.52) Kandosol - KA,AA,AG,CD,BFLS. These are medium-textured slightly acidic soils usually with a crusted surface partly veneered by coarse sand. The ground surface distribution of vegetation may reflect a soil surface pattern of sandy microterraces which collect runoff and sediment.

Example: Site 21 (between Ned's Bore and Wrangler Dam is an intergrove area).

Surface: Surface crust present.

0.0-0.1m: A1 horizon: a sandy clay loam (coarse sand fraction); dark red (10.0R3/6); pH 6.5; weak platy rough-faced peds, 30mm in size; weak; moderately sticky; 2% subrounded to subangular 2-8mm fine gravel.

0.1-0.2m: B1 horizon: a clay loam (coarse sandy); dark red (10.0R3/6); pH 6.0; massive and earthy; weak and moderately sticky; 2% angular tabular to subangular 5-10mm fine gravel.

0.2-0.3m: B2 horizon: clay loam (coarse sandy); dark red (10.0R3/6); pH 6.5; massive and earthy; firm and moderately sticky; 2% subangular 3-5mm fine gravel.

0.3-0.5m: B2 horizon: clay loam (coarse sandy); dark red (10.0R3/6); pH 6.5; massive and earthy; firm; very sticky; 4% angular to angular tabular 2-7mm fine gravel

0.5-0.65m: B2 horizon: clay loam (coarse sandy); dark red (10.0R3/6); pH 7.0; massive and earthy; firm and very sticky; 2% angular tabular 3mm fine gravel

VEGETATION

A groved mulga woodland with groves consisting of a mid-high woodland of mulga with corkwood over sparse annual grasses (mulga and oat grasses) with five-minute grass, lifesaver burr and other forbs (such as munyeroo and cartwheel burr). The intergrove areas support a low open woodland of mulga with bloodwood over wiregrass, woollybutt and forbs (such as munyeroo and tickweed).
3 RANGE FRONTAGE CLAY PLAINS

LAND UNIT 3.1

GENERAL:

DESCRIPTION

Open clay plains supporting neverfail grass.

MANAGEMENT IMPLICATIONS

The heavy textures and low slopes of this unit mean that the soils have a low erosion hazard under pastoral use. However, the unit makes a poor site for road alignment due to the boggy nature of the soils when wet. Since the unit is moderately productive it would be best to locate watering points on adjacent stable areas to avoid sacrifice zone effects.

Pastures are moderately productive and resilient under average grazing management. Neverfail lacks palatability to stock and consequently has relatively low productivity under average conditions. However it produces a green pick under heavy grazing and withstands drought well. Research has shown that forage utilisation of about 30% maintains mitchell grass density. Higher levels of grazing result in a decline in mitchell grass abundance, but prolonged light grazing promotes the death of tussocks and limits the growth of annuals. Annual grasses and forbs provide much of the productivity after good summer rains.
TECHNICAL:

DESCRIPTION

Level to gently-sloping plains; red clays; low sparse tussock grassland of neverfail with some barley mitchell grass. Shrubs such as broombush and whitewood occur within the unit, but their occurrence is generally isolated. The area mid-way between EJ's and Harry's Bores intergrades with Unit 6.1, resulting in a denser upper storey.

GEOLOGY

Quaternary alluvium.

LANDFORM

Very gently inclined plains with slopes of 1% or less and very low surface relief. These plains are drained by a tributary network of shallow depressions.

SOILS

Red clays (Uf 6.31) Dermosol - DE,AA,AG,CD,BGNS. These soils are fine-textured but non-cracking and have strongly crusted surfaces. The shallow drainage depressions, however, feature seasonally cracking clays.
Example: Site 28 (3.5km east of Woody Bore)
Surface: Crusted and hard-setting.
0.0-0.1m: A1 Horizon: dark reddish brown (5.0YR3/4); light clay; pH 7.0; weak structure with 3mm angular blocky primary peds and 8mm angular blocky secondary peds (rough-faced); firm and very sticky.
0.1-0.2m: A1 Horizon: dark reddish brown (5.0YR3/3); light clay; pH 7.0; weak structure with 10mm angular blocky primary peds and 15mm subangular blocky secondary peds (rough-faced); firm and very sticky;
0.2-0.3m: A3 Horizon: dark reddish brown (5.0YR3/3); light clay (heavy); pH 7.0; weak structure with 7mm angular blocky primary peds and 10mm angular blocky secondary peds (rough-faced); firm and very sticky.
0.3-0.5m: B1 Horizon: dark reddish brown (2.5YR3/3); medium clay; pH 7.5; smooth-faced peds of moderate strength, 6mm subangular blocky primary peds, 9mm angular blocky secondary peds; very firm and very sticky.
0.5-0.65m: B1 Horizon: dark reddish brown (2.5YR3/4); medium clay; pH 7.5; strong smooth-faced peds, 6mm subangular blocky primary peds, 8mm angular blocky secondary peds; moderately strong and very sticky.
Some profiles are calcareous and others have a horizon of calcareous segregations.

VEGETATION

The upper stratum varies from a mid-high sparse shrubland of whitewood, broombush and dead finish to being absent. The lower stratum is comprised of a low sparse tussock grassland of neverfail and knottybutt neverfail with forbs including caltrop, munyeroo, buckbush and tar vine. Barley mitchell grass occurs in depressions throughout the unit.
LAND UNIT 3.2

GENERAL:

DESCRIPTION

Open downs-type country with gilgaied clay soils growing mainly barley mitchell grass.

MANAGEMENT IMPLICATIONS

Due to the heavy soil textures and low slopes this unit has a low erosion hazard under pastoral use. However, the unit makes a poor site for road alignment due to the boggy nature of the soils. The unit is also unsuitable for fencing and infrastructure due to the shrink-swell of the clay soils. Due to the productive nature of the unit it would be best to locate watering points on adjacent stable areas.

This unit has a high pastoral productivity, as the pastures produce a large bulk of feed, even though they are only of moderate palatability. Stock tend to utilise annuals first then perennial grasses when feed is in short supply. A decline in pasture condition in this unit would be indicated by an increase in feathertop wiregrass and forbs at the expense of palatable annuals and perennials. The pastures are responsive to occasional spelling after summer rains (until seed drop) and moderate levels of forage utilisation. Research has shown that forage utilisation of about 30% maintains mitchell grass abundance. Heavier use results in a decline of mitchell grass density but prolonged light grazing allows tussocks to become moribund.
**TECHNICAL:**

**DESCRIPTION**

Level plains to slightly undulating; calcareous red clays with some gilgais; a mid-high tussock grassland of barley mitchell grass with neverfail.

**GEOLOGY**

Quaternary alluvium.

**LANDFORM**

Level to slightly undulating plains with very low surface relief, and slopes of 1% or less. Crabhole gilgai occur throughout the area and drainage features are absent from most areas.

**SOILS**

Calcareous red clays (Uf 6.31) Dermosol - DE,AA,BC,CD,BFLS. They are deep fine-textured soils with well-developed structure, often with calcareous segregations at depth.

Example: Site 66 (2km south-east of EJ's Bore)

<table>
<thead>
<tr>
<th>Surface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-0.05m</td>
<td>A1 Horizon: a reddish brown (5.0YR4/4); clay loam; pH 9.0; massive and earthy; weak; very sticky; slightly calcareous; 4% calcareous nodules, 3mm in size; 5% angular to subangular coarse gravel, 2-3mm in size.</td>
</tr>
<tr>
<td>0.05-0.1m</td>
<td>A3 Horizon: a dark red (2.5YR3/6); clay loam; pH 8.5; moderately pedal, subangular blocky, rough-faced, 5mm primary peds and 25mm subangular blocky rough-faced secondary peds; firm and very sticky; highly calcareous, 1% calcareous nodules 3mm in size; 10% angular platy to angular tabular grit 1-2mm in size.</td>
</tr>
<tr>
<td>0.1-0.2m</td>
<td>B1 Horizon: a dark red (2.5YR3/6); light clay; pH 8.5; moderately pedal structure with rough-faced peds - 8mm subangular blocky primary, 40mm columnar secondary; very firm and very sticky; highly calcareous; 1% angular to subrounded 3-4mm coarse gravel.</td>
</tr>
<tr>
<td>0.2-0.3m</td>
<td>B1 Horizon: a dark reddish brown (2.5YR3/4); light clay; pH 8.5; strongly pedal, smooth-faced angular blocky primary peds (5mm), subangular blocky secondary (50mm); very firm and very sticky; 1% angular to subangular 3-4mm coarse gravel.</td>
</tr>
<tr>
<td>0.3-0.5m</td>
<td>B2 Horizon: a dark reddish brown (2.5YR3/4); light medium clay; pH 8.5; strongly pedal, 10mm angular blocky primary and 50mm angular blocky secondary smooth-faced peds; moderately strong and very sticky.</td>
</tr>
</tbody>
</table>

**VEGETATION**

Treeless plains with a mid-high sparse tussock grassland of barley mitchell grass with neverfail, red flinders grass, desert spurge, munyeroo, *Rhynchosia minima* and other minor forbs. Weeping mitchell grass is occasionally present.
LAND UNIT 3.3

GENERAL:

DESCRIPTION

Open downs-type country occurring as broad alluvial plains and drainage lines. This country has red cracking clays that carry barley mitchell grass pastures.

MANAGEMENT IMPLICATIONS

Due to the heavy soil textures and low slopes this unit has a low erosion hazard under pastoral use. Active stream migration is a normal process in this landscape, and results in the slumping of banks after creek flows. The unit is a poor site for roads and fencelines due to shrink-swell clays and bogginess when wet. Watering points would be better located in adjacent, less productive country.

This unit has a high pastoral productivity as the pastures are of moderate quality but high yield. They are also resilient under grazing pressure. However, prolonged heavy grazing pressure may result in an over utilisation of mitchell grass resulting in an increase of short-lived or unpalatable herbage species and feathertop wiregrass in the pasture. Mimosa is known to establish along drainage lines in this land type.
TECHNICAL:

DESCRIPTION

Alluvial plains; cracking red clays; mid-high open tussock grassland of barley mitchell grass with neverfail, knottybutt neverfail and forbs.

GEOLGY

Quaternary alluvium.

LANDFORM

Level alluvial plains dissected by meandering stream channels. Gilgais are generally not present but soils feature deep seasonal cracking.

SOILS

Cracking red clays (Ug 5.36) Vertosol - VE, AA, BH, CD, DQS. These fine-textured soils feature well-developed structure and deep seasonal cracking.

Example: Site 159 (2km north-east of Packer Dam)

0.0-0.02m: A11 Horizon: a reddish brown (5.0YR4/4); light clay; pH 8.0; weak rough-faced granular peds, 2mm primary and 5mm secondary; moderately weak and slightly sticky; slightly calcareous.

0.02-0.2m: A12 Horizon: a dark reddish brown (5.0YR3/4); medium clay; pH 9.0; moderately pedal with subangular blocky rough-faced peds - primary 4mm, secondary 12mm; moderately weak (in a moderately moist state); moderately sticky; slightly calcareous.

0.2-0.3m: A3 Horizon: a dark reddish brown (5.0YR3/4); medium clay; pH 9.0; strongly pedal rough-faced peds - subangular blocky primary 4mm, angular blocky 12mm; very firm and moderately sticky; slightly calcareous.

0.3-0.7m: B Horizon: a dark reddish brown (5.0YR3/4); medium clay; pH 9.0; strongly pedal subangular blocky smooth-faced peds - primary 5mm, secondary 30mm; very firm and moderately sticky; slightly calcareous.

0.7-1.5m: B Horizon: a dark reddish brown (5.0YR3/4); medium clay; pH 9.0; massive and earthy; very firm and moderately sticky; slightly calcareous.

VEGETATION

Treeless plains with a mid-high sparse tussock grassland of barley mitchell grass, with neverfail, desert spurge and Rhynchosia minima.
LAND UNIT 3.4

GENERAL:

DESCRIPTION

Bluebush country occurring as a large swamp east of Narwietooma homestead.

MANAGEMENT IMPLICATIONS

These soils have a low erosion hazard. They will remain untrafficable for a considerable period after wetting and because of their marked shrink-swell, are unsuitable for the foundation of structures, fences and roads.

Northern bluebush is a palatable and nutritious shrub which is complemented in these pastures by verbine, a high quality herbage species. Both can be eliminated by prolonged heavy grazing pressures. These highly productive areas need careful management, especially after prolonged flooding so that seedlings can re-establish. The fencing of this swamp may be warranted to permit the management of grazing pressure on the bluebush and to control access to surface water after big rains.
TECHNICAL:

DESCRIPTION

Low lying alluvial plain/swamp; cracking brown clays; northern bluebush with sparse neverfail.

GEOLOGY

Quaternary alluvium.

LANDFORM

A level low-lying alluvial plain or swamp, with minor tributary channels draining into the centre.

SOILS

Cracking brown clay (Ug 5.31) Vertosol - VE,AB,EL,CD,BPS. Fine-textured soils with very pronounced seasonal cracking occur in this unit. These are highly alkaline and may be calcareous at depth.

Example : Site 61 (near Bluebush Dam)

Surface: Soft, self-mulching to 10cm with periodic cracking and a surface crust.
0.0-0.1m: A1 Horizon: a light clay; brown (7.5YR4/4); pH 9.5; massive and earthy structure; very firm and very sticky; 40% 3mm ferruginous nodules.
0.1-0.2m: A1 Horizon: a light clay; brown (7.5YR4/4); pH 9.5; massive and earthy structure; very firm and very sticky; 10% 3mm ferruginous nodules.
0.2-0.3m: A3 Horizon: a light clay; brown (7.5YR4/4); pH 9.5; moderately pedal with 7mm subangular blocky rough-faced primary peds and 12mm angular blocky rough-faced secondary peds; very firm and very sticky; 10% 2mm ferruginous nodules.
0.3-0.5m: B1 Horizon: a heavy clay; brown (7.5YR4/4); pH 9.5; moderately pedal with 4mm subangular blocky rough-faced primary peds and 7mm subangular blocky rough-faced secondary peds; very firm and very sticky; 10% 4mm ferruginous nodules.
0.5-0.6m: B2 Horizon: a heavy clay; brown (7.5YR4/4); pH 9.5; moderately pedal with 3mm angular blocky rough-faced primary and 7mm angular blocky rough-faced secondary peds; moderately strong and very sticky.

VEGETATION

Treeless with a low sparse chenopod shrubland of northern bluebush with isolated neverfail and munyeroo. Under favourable seasonal conditions verbine is likely to be present together with a range of annual grasses and forbs.
LAND UNIT 3.5

GENERAL:

DESCRIPTION

Gently-sloping plains with cottonbush and eight-day grass pastures. Perennial grasses, such as curly windmill grass, are of scattered occurrence.

MANAGEMENT IMPLICATIONS

This unit has a high erosion susceptibility due to soils and slope. The texture-contrast soils are highly erodible, and the gently sloping nature of the surface means that any channelling of flow can result in rilling and gullying. It is best to locate tracks, fences and watering points elsewhere. Where tracks must be located on this unit they need to be carefully planned and constructed to avoid channelling run-off. Areas of high grazing pressure near watering points, such as Dad’s Dam, also present a high erosion hazard.

Although pastures are sparse, they are highly attractive to stock and thus require careful management. Summer spelling (over the summer growth period until the first frosts) might improve the vigour of annual and palatable perennial grasses. Increaser species on this unit include cartwheel and goathead burrs, buckbush and five-minute grass. These species may be prevalent due to seasonal conditions, but an overall increase can indicate overgrazing. The condition of the unit can also be judged on the abundance of palatable perennials, especially curly windmill and umbrella grasses.
**TECHNICAL:**

**DESCRIPTION**

Level to gently-sloping plains; red-brown earths; treeless with cottonbush, eight-day and curly windmill grasses.

**GEOLOGY**

Quaternary alluvium.

**LANDFORM**

Gently sloping plains with slopes up to 2%.

**SOILS**

Red-brown earth (Dr 4.53) Kandosol - KA,AA,AG,CD,BELOV. There is an abrupt texture boundary between the sandy A-horizon and clayey B-horizon in this unit. Calcareous segregations are present at depth.

Example: Site 79 (300m north-west of Dad's Dam)

Surface: Surface crust.
0.0-0.1m: A1 horizon: a reddish brown (5YR4/4) sandy loam; pH 8.0; massive and earthy; moderately firm and moderately sticky.
0.1-0.25m: B1 horizon: a brown (7.5YR4/3) clay loam (coarse sandy); pH 6.5; massive and earthy; very firm and moderately sticky; 6% 2-9mm subrounded to angular tabular gravel.
0.25-0.35m: B21 horizon: a dark reddish brown (2.5YR4/4) light clay (coarse sandy); pH 7.5; very firm and very sticky; 6% 2mm angular to angular tabular gravel.
0.35-0.5m: B22 horizon: a reddish brown (2.5YR4/4) clay loam sandy; pH 9.0; very firm and very sticky; 50% 1-3mm angular tabular gravel (size 1-3mm).

**VEGETATION**

Upper and mid strata are absent. The lower stratum consists of a mid-high sparse chenopod shrubland of cottonbush with eight-day, curly windmill grasses and goathead burr. Other species present include bladder saltbush and munyeroo. Under favourable seasonal conditions it is expected that a range of annual grasses and herbage species would be present.
4 RANGE FRONTAGE FANS

LAND UNIT 4.1

GENERAL:

DESCRIPTION
Gravelly, spinifex covered footslopes adjacent to the Mt Chapple range.

MANAGEMENT IMPLICATIONS

While the gravel surfaces remain intact erosion will be minimal. However, when clearing fencelines or access tracks, disturbance of surfaces should be minimised to limit the channelling of run-off onto more erodible units.

The unit has no pastoral value. Periodic patch burning may be worthwhile to reduce the possibility of wildfires caused by lightening strikes advancing onto productive areas.
**TECHNICAL:**

**DESCRIPTION**

Gently sloping colluvial fans; gravelly soils; scattered mulga and bloodwood over weeping spinifex.

**GEOLOGY**

Quaternary colluvial gravels.

**LANDFORM**

Fans of colluvial gravels, usually less than 500m in length, lying at the base of mountain slopes. Fan surfaces are extremely gravelly and have slopes of at least 4%. Narrow watercourse channels traverse the unit and flood-out downslope.

**SOILS**

Lithosols (Uc 1.23); (Leptic rudosols - RU,CY,DU,ZZ,HKT). Surfaces are of coarse gravel and little soil material is present. It consists of a dark reddish brown (2.5YR3/4) loamy sand; pH 7.0; with an earthy fabric.

**VEGETATION**

A tall open hummock grassland of weeping spinifex. The unit supports an emergent tree cover of mulga and bloodwood in association with blue mallee, umbrella bush, sandhill wattle, blunt-leaf and green-leaf cassias and native fuchsia.
LAND UNIT 4.2

GENERAL:

DESCRIPTION

Alluvial fans with whitewood and bloodwood, or mulga and witchetty bush, over mulga and woollyoat grasses and forbs.

MANAGEMENT IMPLICATIONS

The coarse soils of this unit have a slight wind erosion hazard and open areas will lose dust when bare and disturbed. Gully erosion can also occur if runoff is intercepted and channelled by stock pads or flat graded lines. Roads across this unit are best located upslope to minimise sheetflow disturbance and erosion potential. Ideally watering points and other improvements should be located away from this land type to minimise soil disturbance.

Pastures are of moderate productivity, and probably responsive to summer spelling. Dense shrub growth can establish on this type of country during a run of favourable seasons. Spelling will enable fuel build up so shrubs can be burnt.
TECHNICAL:

DESCRIPTION

Gently sloping alluvial fans; coarse to medium-textured red earths; low open woodland of whitewood and bloodwood or mulga and witchetty bush over mulga and woollyoat grasses and forbs.

GEOLOGY

Quaternary colluvial gravels and alluvium.

LANDFORM

Gently sloping alluvial footslope fans at the base of mountainous terrain. These fans generally butt directly onto hills, but occasionally occur downslope of Unit 4.1. Fan surfaces have slopes of 1-2% and feature numerous narrow distributary watercourse channels, most of which flood-out within the unit.

SOILS

Two soil types are present within this unit. Older fan surfaces are characterised by sandy red earths (Gn 2.12) Red Kandosol - KA,AA,AG,CD,BGKS.

Example: Site 56 (2km north of Doolittle Dam)
- Surface: Crusted with a sandy veneer.
- 0.0-0.1m: A1 Horizon: dark red (2.5YR3/6); sandy loam; pH 7.0; massive and earthy; weak and slightly sticky.
- 0.1-0.2m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive and earthy; weak and slightly sticky.
- 0.2-0.3m: A3 Horizon: dark red (2.5YR3/6); sandy loam (heavy); pH 7.5; massive and earthy; weak; moderately sticky.
- 0.3-0.5m: B Horizon: dark reddish brown (2.5YR3/4); sandy clay loam (light); pH 7.0; massive and earthy; weak; moderately sticky.
- 0.5-0.7m: B Horizon: dark red (2.5YR3/6); sandy clay loam (light); pH 7.0; massive and earthy; weak and moderately sticky.

Active alluvial fans are characterised by brown alluvial soils. They have gravelly surfaces, sandy loam textures and a massive and earthy structure. One or more buried soils are found in the profile.

VEGETATION

The upper stratum is a low open woodland consisting of mulga and witchetty bush on red earth soils to whitewood and bloodwood with some ironwood on more recent alluvial deposits. The mid stratum is a tall sparse shrubland of broom bush, dead finish, witchetty bush, mulga, juvenile whitewood and ironwood, and spiny saltbush. The lower stratum is comprised of a low sparse grassland of mulga, woollyoat and five-minute grasses. Other common species include woollybutt grass, climbing saltbush, caltrop and ruby saltbush. Creeklines contain species such as creek windmill and umbrella grasses and silky browntop.
5  FLOODPLAINS AND FLOODOUTS

LAND UNIT 5.1

GENERAL:

DESCRIPTION

Range frontage floodouts with whitewood, ironwood and bloodwood over woollybutt and five-minute grasses.

MANAGEMENT IMPLICATIONS

These areas have a minor wind erosion hazard and may experience raised dust and windsheeting will tend to drift when bare and disturbed. Gully erosion can also occur if runoff is intercepted and channelled by stock pads or flat graded lines with windrows. Ideally watering points and other improvements should be located away from this land type to minimise soil disturbance.

The pastoral productivity of this unit is moderate. The pastures have low to moderate palatability, and many of the species are grazed only when more palatable feed is unavailable. Heavy grazing pressures will selectively eliminate minor palatable species such as oat grass. The soils of this unit are favourable for buffel grass. A run of favourable seasons may cause dense shrub growth to establish. Burning soon after germination when shrubs are young will be most effective in controlling this problem.
TECHNICAL:

DESCRIPTION

Gently sloping alluvial fans and floodouts; coarse-textured red earths; low open woodland of whitewood, ironwood and bloodwood over woollybutt and five-minute grass.

GEOLOGY

Quaternary (probably Holocene) alluvium.

LANDFORM

Large fans or gently inclined floodouts with slopes up to 2%, usually associated with larger creek systems. Where the creek floodplains are narrow (100m or less) they are included as part of this unit, but where they are wider, and well defined by a terrace, they have been mapped as part of Unit 5.2.

SOILS

Red earths (Uc 5.21) Kandosol - KA,AA,AG,CD,BHKS. Profiles are often distinctly layered with lenses of coarse gravel and evidence of buried soils. Fan surfaces usually have brown soils of relatively fresh alluvium.

Example: Site 18 (2kms north-west of Biggles Bore on the floodout of Halleen Creek)

Surface: Surface crust.

0.0-0.1m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive and earthy; moderately weak; slightly sticky; 4% 5-10mm angular to angular tabular gravel.

0.1-0.2m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive and earthy; moderately weak; slightly sticky; 3% 3-5mm angular to angular tabular gravel.

0.2-0.3m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive and earthy; moderately weak; slightly sticky; 2% 3-5mm angular to angular tabular gravel.

0.3-0.5m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive and earthy; moderately weak; slightly sticky; 2% 3-5mm angular to angular tabular gravel.

0.5-0.7m: B Horizon: dark reddish brown (2.5YR3/4); sandy clay loam (light); pH 7.5; massive and earthy; moderately weak; slightly sticky; 1% 1mm subangular platy gravel.

VEGETATION

The upper stratum is a low open woodland of ironwood and whitewood with some bloodwood. The mid stratum consists of a tall sparse shrubland of juvenile ironwood, cassia, and dead finish with long-leaf corkwood and witchetty bush. A mid-high sparse grassland of woollybutt, five-minute grass and caltrop comprises the lower stratum. Creekline corridors grow silky browntop, creek windmill, desert bluegrass, cattle bush, tar vine, and oat grass.
LAND UNIT 5.2

GENERAL:

DESCRIPTION

Creek floodplains along major creeklines with river red gum, bloodwood and prickly wattle over woollybutt and kerosene grasses with seasonal herbage.

MANAGEMENT IMPLICATIONS

This unit has a high erosion hazard due to the coarse texture of the soils, and the likelihood of overland flow during floods from the creeklines that typify the unit. Graded lines or tracks may divert flood flows and scour out. Tracks would be best located on adjacent, more stable land types. The soils of this land unit are subject to wind erosion when bare and disturbed. The unit is unsuitable for watering points due to the flood risk.

The pastoral productivity of this unit is moderate. Much of the productivity is derived from minor species such as oat grass, verbine and other palatable herbage which are selectively grazed. Woollybutt and kerosene are of low palatability and prolonged heavy grazing can eliminate the most acceptable species from the pasture. Prickly wattle will increase during wet years but die out in subsequent dry times.
TECHNICAL:

DESCRIPTION

Floodplains along major creeklines; coarse-textured alluvial soils; low open woodland of river red gum, bloodwood, and prickly wattle over woollybutt, kerosene grass and forbs.

GEOLOGY

Holocene alluvium.

LANDFORM

Major creek channels and the immediately adjacent floodplains have slopes of less than 1% and hummocky surfaces as a result of flood scour and deposition.

SOILS

Alluvial soils (Uc 5.21) Rudosol - RR,ER,BX,XX,BHJS. These are brown soils consisting of fresh sediments often with layers of coarse gravels or cobbles.

Example: Site 19 (3km south-east of Ned’s Bore)

Surface: Surface crusting.

0.0-0.1m: A Horizon: brown (7.5YR 4/3); sandy loam (light); pH 7.0; massive and earthy; moderately weak and slightly sticky; 4% 3-4mm subangular tabular to subangular platy gravel.

0.1-0.2m: A Horizon: brown (7.5YR 4/3); sandy loam; pH 7.5; massive and earthy; moderately weak and slightly sticky; 3% 3-6mm subrounded to angular platy gravel.

0.2-0.3m: A Horizon: brown (7.5YR 4/3); sandy loam (heavy); pH 7.5; massive; earthy; moderately weak and moderately sticky; 2% 3mm angular platy to subrounded tabular gravel.

0.3-0.5m: A Horizon: brown (7.5YR 4/4); loamy sand (heavy); pH 8.0; massive and earthy; moderately weak and moderately sticky; 2% 2-3mm angular tabular gravel.

0.5-0.75m: A Horizon: brown (7.5YR 4/4); loamy sand; pH 8.0; massive; earthy; very weak and slightly sticky; 1% 3mm angular tabular gravel.

VEGETATION

The upper stratum is a low open woodland of river red gum, bloodwood and prickly wattle, with occasional ironwood and whitewood, over a tall sparse shrubland of prickly wattle, dead finish, juvenile ironwood and cassia. The lower stratum is a low sparse grassland of woollybutt, five-minute and eight-day grasses with caltrop, climbing saltbush, and creek windmill grass. Kerosene grass is likely to be abundant following good summer rains, but was absent at the time of the survey.
LAND UNIT 5.3

GENERAL:

DESCRIPTION

Scaldy plains, either open or with scattered mulga or whitewood, growing sparse five-minute and eight-day grasses.

MANAGEMENT IMPLICATIONS

This unit has a moderate erosion hazard under pastoral use. Graded lines or tracks along the unit may divert sheet flood flows and scour out. To maximise trafficability and minimise erosion potential, tracks should be located on adjacent, more stable land types. The unit is subject to occasional flooding and watering points or other improvements would be better located elsewhere.

The unit has a low pastoral productivity. The development of a strong surface crust limits their pastoral productivity. Many bare scaldy areas occur throughout the unit and the existing pastures are of low yield but moderate palatability.
TECHNICAL:

DESCRIPTION

Alluvial plains; red clays; low open woodland of whitewood and mulga over five-minute, eight-day grasses and forbs, or bare scaldy areas.

GEOLOGY

Quaternary alluvium.

LANDFORM

Level alluvial plains (slopes less than 1%). These plains may be an older stripped floodplain surface mostly veneered by Units 5.1 and 5.2.

SOILS

Red clays (Uf 6.12) Dermosol - DE,AA,AG,CD,CGNS. These soils are characteristically fine-textured and structured. Vegetation cover is more abundant on low sandy banks mantling the surface crust.

Example: Site 13 (1.5km west of Biggles Bore)

Surface: Surface crust.

0.0-0.1m: A1 Horizon: reddish brown (5.0YR4/4); light clay; pH 6.5; moderately pedal, 4mm subangular blocky rough-faced primary and 7mm angular blocky rough-faced secondary peds; moderately firm and moderately sticky,

0.1-0.2m: A1 Horizon: reddish brown (5.0YR4/4); light clay; pH 6.5; moderately pedal, 5mm angular blocky rough-faced primary and 8mm platy rough-faced secondary peds; moderately firm and moderately sticky.

0.2-0.3m: A3 Horizon: reddish brown (5.0YR4/4); light clay; pH 7.0; moderately pedal, 8mm subangular blocky rough-faced primary and 10mm angular blocky rough-faced secondary peds; very firm and very sticky.

0.3-0.5m: A3 Horizon: dark reddish brown (5.0YR3/4); light clay; pH 7.0; moderately pedal, 4mm subangular blocky primary and 8mm subangular blocky secondary rough-faced peds; moderately strong and very sticky.

0.5-0.8m: B Horizon: yellowish red (5.0YR4/6); medium clay; pH 7.0; moderately pedal, 4mm subangular blocky primary and 10mm angular blocky secondary rough-faced peds; moderately strong and very sticky.

0.8-0.95m: B Horizon: red (2.5YR4/6); medium clay; pH 7.0; massive and earthy; moderately firm and very sticky.

VEGETATION

This unit supports a low sparse cover of annual grasses and herbs. The density of the tree and shrub layer varies and some areas are virtually treeless. Site 13, as an example, consists of a low open woodland of mulga and prickly wattle, with a mid stratum of a tall sparse shrubland of dead finish, juvenile whitewood, spiny saltbush, and cassias over a mid-high sparse grassland/forbland of tickweed, creek windmill grass, munyeroo, button grass, ruby saltbush, caltrop, caustic weed, and tar vine.
LAND UNIT 5.4

GENERAL:

DESCRIPTION

Floodouts with clayey soils supporting mulga, ironwood and whitewood.

MANAGEMENT IMPLICATIONS

The soils of this unit have a moderate water erosion hazard. Surface disturbances such as grader windrows which trap and channel sheet runoff flows across slopes may cause rilling. Imperceptible sheet erosion will occur if bare areas are subjected to storm runoff. This may only be evident through the development of gritty lag deposits on surfaces, wash features and areas of poor pasture growth, but can have a significant impact on productivity.

The pastoral productivity of this unit is moderate. The pasture has a good component of moderately palatable perennial grasses. Extended heavy grazing will reduce the carrying capacity as palatable species such as curly windmill and cotton panic grasses are replaced by less acceptable plants.
TECHNICAL:

DESCRIPTION

Gently sloping floodouts; medium-textured red earths; low open woodland of mulga, ironwood, whitewood and bloodwood over curly windmill and five-minute grasses and forbs.

GEOLOGY

Quaternary alluvium.

LANDFORM

Level alluvial plains and floodouts having slopes of 1% or less. These plains have featureless surfaces and drain by sheet flow.

SOILS

Red earths (Um 5.42) Kandosol - KA,AA,AG,CD,BFLS. Profiles are moderate to fine-textured and alkaline throughout. Surfaces have a well developed crust which is partially veneered by pale sandy material.

Example: Site 43 (2km south-west of Charlie's Dam).

Surface: Hard-setting surface crust with sandy veneer.

0.0-0.1m: A1 Horizon: dark reddish brown (5.0YR3/3); sandy clay loam; pH 7.0; massive and earthy; moderately weak and moderately sticky.

0.1-0.2m: B Horizon: dark reddish brown (5.0YR3/3); clay loam sandy (heavy); pH 8.5; massive and earthy; moderately weak and moderately sticky.

0.2-0.3m: B Horizon: dark reddish brown (5.0YR3/3); clay loam sandy (heavy); pH 8.5; massive and earthy; moderately firm and moderately sticky.

0.3-0.5m: B Horizon: dark reddish brown (5.0YR3/3); clay loam sandy (heavy); pH 8.5; massive and earthy; moderately firm and moderately sticky.

0.5-0.65m: B Horizon: dark reddish brown (5.0YR3/3); clay loam sandy (heavy); pH 8.5; massive and earthy; moderately firm and moderately sticky.

VEGETATION

The upper stratum consists of a mid-high open woodland dominated by mulga with bloodwood, ironwood and whitewood. The mid stratum is a tall sparse shrubland of juvenile mulga, dead finish, and spiny saltbush. Supplejack, prickly wattle and witchetty bush are commonly found throughout the unit. Pastures consist of a low sparse grassland of curly windmill grass, neverfail, five-minute grass and caltrop with tickweed, tar vine and cartwheel burr. Woollyoat and mulga grasses are probably abundant after favourable summer rains.
6 RELICT ALLUVIAL PLAINS

LAND UNIT 6.1

GENERAL:

DESCRIPTION

Plains with dense mulga, witchetty bush and whitewood over woollybutt, five-minute and mulga grasses.

MANAGEMENT IMPLICATIONS

Soils in this unit generally have a low erosion hazard due to the low slopes and permeable soils and dense shrub cover. However, minor gullying will occur where sheet runoff flows are channelled by surface disturbances such as tracks or stock pads. Flat grading of tracks and fencelines should be avoided, particularly where drainage flows may be intercepted.

Pastoral productivity is moderate, with pastures having a low to moderate palatability. The more palatable species will be grazed first, with progressively greater use of the coarser grasses. Favourable seasons may result in abundant shrub regeneration and an associated decline in pasture growth. Prescribed burning may be desirable to control this dense recruitment of shrub seedlings which may lead to woody weed problems.
TECHNICAL:

DESCRIPTION

Level to gently sloping plains; coarse to medium-textured red earths; low open woodland of mulga, witchetty bush and whitewood over woollybutt, five-minute and mulga grasses.

GEOLOGY

Quaternary alluvial deposits, probably of Pleistocene age.

LANDFORM

Relict alluvial outwash plains consisting of a prior distributary network of broad low linear floodout lobes evident as rises with relief to 1.5m.

SOILS

Red earths (Gn 2.15) Kandosol - KA,AA,AG,CD,DFJS. These plains are no longer fed by contemporary drainage systems. Slopes are generally less than 1% and drainage features are absent. There are highly weathered soils with sandy surfaces, clay content increasing gradually with depth.

Example: Site 157 (1.5km north of Biggles Bore)

0.0-0.02m: A1 Horizon: dark reddish brown (2.5YR3/4); loamy sand; pH 6.0; massive and earthy; very weak and slightly sticky.

0.02-0.1m: A2 Horizon: dusky red (10R3/4); sandy loam; pH 7.0; massive and earthy; very weak and slightly sticky.

0.1-0.2m: A3 Horizon: dusky red (10R3/4); sandy clay loam (light); pH 7.0; massive and earthy; very weak and slightly sticky.

0.2-0.3m: A3 Horizon: dusky red (10R3/4); sandy clay loam (light); pH 7.0; massive and earthy; very weak and slightly sticky.

0.3-0.5m: A3 Horizon: dusky red (10R3/4); sandy clay loam (light); pH 7.0; massive and earthy; moderately weak and slightly sticky.

0.5-0.7m: B1 Horizon: dusky red (10R3/3); sandy clay loam; pH 6.5; massive and earthy; moderately weak and slightly sticky.

0.7-1.0m: B1 Horizon: dark red (10R3/6); clay loam sandy (light); pH 6.0; massive and earthy; very firm and slightly sticky.

1.0-2.5m: B2 Horizon: dark red (10R3/6); clay loam sandy; pH 7.0; massive and earthy; very firm and slightly sticky; 7% 5-10mm angular to angular tabular gravel.

VEGETATION

The upper stratum consists of a low to mid-high open woodland of mulga with witchetty bush and whitewood, over a mid of tall sparse shrubland of witchetty bush, mulga, native fuchsia, silver cassia, and spiny saltbush. The lower stratum is a low sparse grassland of woollybutt, five-minute, and mulga grasses with cotton panic grass, silky bluebush, caltrop, and munyeroo.
LAND UNIT 6.2

GENERAL:

DESCRIPTION

Old floodouts with mulga, whitewood and ironwood over mulga, woollyoat and woollybutt grasses.

MANAGEMENT IMPLICATIONS

This unit has generally a low soil erosion hazard. The coarse-textured soils are susceptible to minor wind erosion if the vegetation cover is removed. Minor wash may occur with storm runoff, especially where tracks and fencelines have been flat graded.

The pastoral productivity of this unit is moderate. The most abundant grasses such as woollybutt are of low palatability, but productive annual grasses are also present and attract most grazing activity.
**TECHNICAL:**

**DESCRIPTION**

Level or gently sloping relict floodouts; coarse-textured red earths; low open woodland of mulga, whitewood and ironwood over mulga, woollyoat and woollybutt grasses.

**GEOLOGY**

Quaternary alluvial deposits, probably of Pleistocene age.

**LANDFORM**

Relict floodout deposits consisting of linear outwash features and terminal floodouts. These occur as low banks with relief of less than 2m, and slopes of up to 1%, often with a crest of coarse-textured bed load material evident on aerial photography.

**SOILS**

Red earths (Uc 5.21) Tenosol - TE,DS,AA,AR,BFKS. These soils have sandier, more uniform profiles than Unit 6.1. Bedload deposits of coarse gritty material are locally present on crests. Example: Site 22 (3km east of Ned's Bore)

0.0-0.1m: A1 Horizon: red (2.5YR4/6); sandy loam; pH 6.5; massive and earthy; moderately firm; moderately sticky; 2% 3mm angular platy to subangular tabular gravel.

0.1-0.2m: B1 Horizon: dark red (2.5YR3/6); sandy loam (heavy); pH 7.0; massive and earthy; moderately firm; moderately sticky; 2% 3mm subangular gravel.

0.2-0.3m: B2 Horizon: dark red (2.5YR3/6); sandy loam (heavy); pH 7.5; massive and earthy; moderately firm; moderately sticky; 1% 3mm subangular gravel.

0.3-0.5m: B2 Horizon: dark red (2.5YR3/6); sandy loam (heavy); pH 7.5; massive and earthy; moderately firm; moderately sticky; 1% 3mm subangular gravel.

0.5-0.7m: B2 Horizon: dark red (2.5YR3/6); sandy loam (heavy); pH 7.5; massive and earthy; moderately firm; moderately sticky; 1% 2mm subangular gravel.

**VEGETATION**

The abundance of whitewood, ironwood and supplejack distinguishes this unit from Unit 6.1. The upper stratum consists of a mid-high open woodland of mulga, whitewood, ironwood and witchetty bush, over a mid stratum of tall open shrubland of mulga, ironwood and witchetty bush. Native fuchsia, dead finish, juvenile bloodwood, cassias (broombush, oval-leaf and silver), supplejack and spiny saltbush are also found throughout the unit in the mid stratum. The lower stratum is a low sparse grassland of woollybutt, mulga, five-minute and woollyoat grasses. Other common species include caltrop, copper burr, ruby saltbush, tickweed and desert spurge.
LAND UNIT 6.3

GENERAL:

DESCRIPTION

Depressions supporting dense mulga over mulga, five-minute and woollyoat grasses.

MANAGEMENT IMPLICATIONS

This unit has a moderate water erosion hazard as it collects runoff flows, especially where it drains limestone country. Scouring is likely if surface disturbances such as grader windrows concentrate sheet runoff flows, and gully erosion may result.

The pastures are of moderate palatability but produce a relatively limited bulk of feed.
TECHNICAL:

DESCRIPTION

Depressions; medium to heavy-textured red earths; low woodland of mulga over mulga, five-minute and woollyoat grasses. This unit also includes mulga depressions which occur throughout the limestone plains in the north of the station.

GEOLOGY

Quaternary alluvial deposits, probably of Pleistocene age.

LANDFORM

Depressions and low-lying alluvial plains amongst relict outwash features, as well as active drainage floors in limestone plains. These plains have featureless, surfaces with slopes to 1% and very low relief.

SOILS

Red earths (Gn 3.12) Kandosol - KA,AA,AG,CD,BFLS. These soils have medium-textured surfaces with clay content increasing in the weakly structured B-horizon.

Example: Site 27 1km south of Tannin Bore

Surface: Surface crusts.

0.0-0.1m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy clay loam; pH 6.5; weak granular structure, 4mm primary and 10mm secondary rough-faced peds; moderately firm and moderately sticky; 2% 3-4mm angular to angular tabular gravel.

0.1-0.2m: A3 Horizon: reddish brown (2.5YR4/4) clay loam sandy; pH 6.5; massive and earthy; moderately firm and moderately sticky; 2% 2-3mm subangular tabular gravel.

0.2-0.3m: A3 Horizon: reddish brown (2.5YR4/4) clay loam sandy; pH 6.5; massive and earthy; moderately firm and moderately sticky; 2% 2mm subangular platy gravel.

0.3-0.5m: B1 Horizon: reddish brown (2.5YR4/4); clay loam sandy; pH 6.5; weakly pedal, 2mm granular smooth-faced primary and 12mm subangular blocky smooth-faced secondary peds; moderately firm; very sticky; 2% 1-3mm angular platy to subrounded tabular gravel.

0.5-0.7m: B2 Horizon: reddish brown (2.5YR4/4); clay loam sandy; pH 7.0; weakly pedal, 3mm subangular blocky smooth-faced primary and 10mm subangular blocky smooth-faced secondary peds; very firm; very sticky; 2% 2mm subangular tabular gravel.

VEGETATION

The upper stratum is a low woodland of mulga with some sites having witchetty bush and bloodwood. The mid stratum is a tall sparse shrubland of mulga with native fuchsia and witchetty bush. A low sparse grassland of mulga grass with five-minute, curly windmill and woollyoat grasses comprises the lower stratum. Other common species include cotton panic grass and munyeroo and sandier sites grow woollybutt, while heavier sites may have neverfail.
7 LIMESTONE PLAINS

LAND UNIT 7.1

GENERAL:

DESCRIPTION

Plains with numerous depressions carrying sparse witchetty bush and some inland teatree over oat, limestone oat and five-minute grasses.

MANAGEMENT IMPLICATIONS

The erosion potential of this unit is low. However, the unit drains by sheetflow and the grading of tracks or fencelines may cause minor gully ing through the concentration of runoff.

Pastoral productivity is moderate. Limestone oat grass is relatively unpalatable and heavy grazing can lead to an undesirable increase in this species, at the expense of the more palatable oat grass. Rabbits are present in this unit and can have a significant impact on pasture composition and yield. They also prevent the regeneration of witchetty bush which is a useful topfeed. Control measures should be timed to hit the rabbit population when numbers are low to have greatest impact. Warrens are present on the unit and ripping may be an effective control measure.
TECHNICAL:

DESCRIPTION

Level plains; shallow red calcareous soils; medium-high sparse shrubland of witchetty bush with some inland teatree over oat, limestone oat, and five-minute grasses; numerous depressions throughout the area.

GEOLOGY

Quaternary travertine limestone.

LANDFORM

Level plains with very low relief (to 1m), drained by sheetflow into Unit 7.3. Numerous small circular and elongate depressions (sinkholes) are present throughout. The sinkholes floors have the features of either Unit 6.3 or Unit 7.3.

SOILS

Shallow red calcareous earths (Um 5.61) Calcarosol - CA,CY,DZ,CP,ALS. These are shallow medium-textured soils developed directly from the underlying calcrete. Calcium carbonate is abundant in the soil material.

Example: Site 124 (5km north of Browse Bore)

Surface: 15% 5-10mm calcareous nodules.
0.0-0.1m: A Horizon: yellowish red (5.0YR4/6); sandy clay loam (heavy); pH 9.5; massive and earthy; moderately weak and moderate stickiness; very calcareous fine earth; 40% 5-12mm calcareous nodules.
0.1-0.2m: A Horizon: yellowish red (5.0YR4/6); sandy clay loam (heavy); pH 9.5; massive and earthy; loose and moderate stickiness; very calcareous fine earth; 60% 10mm calcareous nodules.

VEGETATION

A tall sparse shrubland of witchetty bush, with inland teatree, dead finish and cassias. The lower stratum is a low sparse grassland of five-minute, limestone oat and oat grasses with silky bluebush. Under favourable seasonal conditions, it is expected that areas in good condition would support some perennial grasses beneath the witchetty bush canopy.
LAND UNIT 7.2

GENERAL:

DESCRIPTION

Low rises of sparse witchetty bush, mulga, dead finish and other shrubs over five-minute, eight-day limestone oat and oat grasses.

MANAGEMENT IMPLICATIONS

This unit has a moderate erosion potential. The soils are subject to sheet erosion from storm runoff when bare and disturbed. The grading of tracks and fencelines can concentrate runoff and cause rilling.

Pastoral productivity is moderate, with a low fodder bulk. Heavy grazing may cause a decrease in the palatable grasses and an increase in limestone oat grass. Rabbits have a significant impact on this land type. Their effects include a decline in pasture quality and abundance as well as preventing topfeed regeneration. Warrens are of low abundance on the unit and rabbits probably seek refuge on Unit 7.1.
TECHNICAL:

DESCRIPTION

Low rises; medium-textured red earths overlying calcrete; tall sparse shrubland of witchetty bush, mulga, dead finish, silver cassia and native fuchsia over five-minute, eight-day, limestone oat and oat grasses and forbs.

GEOLOGY

Quaternary travertine limestone.

LANDFORM

Elongate or irregular low rises; with relief of up to 5m and slopes of less than 2%. Numerous small depressions occur throughout the unit although most drainage is by sheet flow into Unit 7.3.

SOILS

Red earths (Um 5.51) Kandosol - KA,AA,BC,CD,AGLU. These soils are deeper then those of Unit 7.1 and are calcareous only at depth.

Example: Site 112 (2km south-east of One Pound Jimmy)

Surface: 30% 100mm calcareous nodules.

0.0-0.1m: A1 Horizon: red (2.5YR 4/6); sandy clay loam; pH 8.5; massive and earthy; moderately firm; very sticky; 1% 5-10mm calcareous nodules.

0.1-0.2m: A1 Horizon: red (2.5YR 4/6); sandy clay loam; pH 8.5; massive and earthy; moderately firm and very sticky; 1% 6-15mm calcareous nodules.

0.2-0.3m: A1 Horizon: red (2.5YR 4/6); sandy clay loam; pH 8.5; massive and earthy; moderately firm and very sticky; 40% 7-15mm calcareous nodules.

0.3-0.4m: C Horizon: red (2.5YR 4/6); sandy clay loam; pH 8.5; massive and earthy; moderately firm and very sticky; 80% 20-30mm calcareous nodules; moderately calcareous fine earth.

VEGETATION

The upper stratum is comprised of a tall sparse shrubland of witchetty bush, mulga and dead finish with broombush, silver cassia, native fuchsia and spiny saltbush.

The lower stratum is a low sparse grassland of five-minute, eight-day, oat and limestone oat grasses. Curly windmill grass, ruby saltbush, button grass, munyeroo and silver tails are other common species.
LAND UNIT 7.3

GENERAL:

DESCRIPTION

Small depressions with either coolibah or inland teatree over neverfail, other perennial grasses and forbs.

MANAGEMENT IMPLICATIONS

Although some rilling may occur with storm run-off, the soils of this unit are generally stable.

This unit has a moderate pastoral productivity. Most of the grasses present are moderately to highly palatable, although the bulk of fodder produced is low. Small depressions support a range of palatable perennial grasses and are likely to be highly productive while actively growing.
**TECHNICAL:**

**DESCRIPTION**

Small depressions; calcareous red earths; low open woodland of coolibah and/or inland teatree over neverfail and other perennial grasses and forbs.

**GEOLOGY**

Quaternary travertine limestone and alluvium.

**LANDFORM**

These numerous small depressions occur throughout the limestone country in the north of the station. Many are too small to map, and those mappable tend to be linear flat floored depressions with a maximum width of 300m and length up to 2km. Some are associated with channels draining into the Napperby Lakes to the north. Small circular depressions are sinkhole features, formed by solution and are unrelated to broad surface drainage patterns.

**SOILS**

Calcareous red earths (Um5.62) Calcarosol - CA, CY, DZ, XX, BLS. These are relatively deep soils consisting of weathered alluvium derived from adjacent units. The soils are medium-textured, alkaline and calcareous at depth.

Example : 129 (2.5km west of One Pound Jimmy)

Surface: Crusting present.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Horizon</th>
<th>Color</th>
<th>Texture</th>
<th>pH</th>
<th>Calc content</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-0.3m</td>
<td>A1 Horizon:</td>
<td>brown</td>
<td>sandy clay loam</td>
<td>8.5</td>
<td>2%</td>
<td>2-4mm calcareous nodules</td>
</tr>
<tr>
<td>0.3-0.5m</td>
<td></td>
<td>yellowish</td>
<td>sandy clay loam</td>
<td>8.5</td>
<td>40%</td>
<td>3-15mm calcareous nodules; moderately calcareous fine earth</td>
</tr>
<tr>
<td>0.5-0.8m</td>
<td>B1 Horizon:</td>
<td>yellowish</td>
<td>clay loam sandy (coarse)</td>
<td>8.5</td>
<td>60%</td>
<td>3-15mm calcareous nodules; moderately calcareous fine earth</td>
</tr>
</tbody>
</table>

The soil was moderately moist at the time of testing.

**VEGETATION**

The vegetation of this unit is variable, with some depressions (with heavier-textured soils) being dominated by coolibah and neverfail, and others having mulga and inland teatree with sparse grasses. The latter is more common and consists of emergent inland teatree and mulga occur a mid stratum tall sparse shrubland of inland teatree, mulga, witchetty bush, prickly wattle and spiny saltbush. The lower stratum may be a low sparse grassland in open areas to isolated plants in areas with dense mid storey. Species include five-minute, oat, limestone oat and cotton panic grasses, ruby saltbush, tar vine, and silky bluebush. Small depressions contain perennial grasses such as curly windmill, umbrella grass, neverfail, and desert bluegrass.
8 SANDPLAINS AND SAND DUNES

LAND UNIT 8.1

GENERAL:

DESCRIPTION

Sandplain country with blue mallee and mulga over hard spinifex.

MANAGEMENT IMPLICATIONS

Soils in this type of country generally have a low erosion hazard. However, soils generate sufficient runoff to cause scour where natural flows are concentrated by windrows or other surface disturbances. The creation of windrows should be avoided when using earthmoving equipment along roads or fencelines. Dust and minor sand movement may result from loss of vegetation cover following fire.

The pastoral productivity of this type of country is limited in most seasons. Parakeelya can be abundant and highly productive following certain winter rains. Burning can increase the abundance of herbage and coarse grasses for a couple of years. Results are possibly best if soil moisture is present at the time of the fire.
TECHNICAL:

DESCRIPTION

Gently undulating sandplain; red earthy sands; tall sparse mallee shrubland of blue mallee and umbrella bush with mulga over hard spinifex with sparse woollybutt grass.

GEOLOGY

Quaternary aeolian surfaces developed on alluvium.

LANDFORM

Gently undulating sandplain with low relief and slopes of less than 1%. Runoff is slow due to moderate to high permeability and well drained soils.

SOILS

Red earthy sands (Uc 5.21) Rudosols - RU,DS,AR,ZZ,ELV. These are deep, sandy-textured soils with only minor change in clay content and colour with depth.

Example : Site 100 (located about 3 kms south of Alec's Bore)

Surface: Crusting present.

0.0-0.1m: A1 Horizon: reddish brown (2.5YR4/4); sandy loam; pH 6.0; massive; earthy; very weak and slightly sticky.

0.1-0.2m: A3 Horizon; dark red (2.5YR3/6); sandy loam; pH 6.5; massive; earthy; very weak and slightly sticky.

0.2-0.3m: A3 Horizon; dark red (2.5YR3/6); sandy loam; pH 6.5; massive; earthy; very weak and slightly sticky.

0.3-0.5m: A3 Horizon; dark red (2.5YR3/6); sandy loam; pH 6.5; massive; earthy; very weak and slightly sticky.

0.5-0.7m: A3 Horizon; dark red (2.5YR3/6); sandy loam; pH 6.5; massive; earthy; very weak and slightly sticky.

VEGETATION

A tall sparse mallee shrubland of blue mallee and umbrella bush with scattered mulga and witchetty bush. Bloodwood is often present as an emergent. The lower stratum consists of a mid high open hummock grassland of hard spinifex. Other species present include soft spinifex and woollybutt grass. Broad leaf parakeelya and other herbage species can be abundant after certain winter rains.
LAND UNIT 8.2

GENERAL:

DESCRIPTION

Sandplain country with sparse bloodwood, mulga and witchetty bush over hard spinifex.

MANAGEMENT IMPLICATIONS

Soils in this type of country generally have a low erosion hazard. However, soils generate sufficient runoff to cause scour where natural flows are concentrated by windrows or other surface disturbances. The creation of windrows should be avoided when using earthmoving equipment along roads or fencelines. Dust and minor sand movement may result from loss of vegetation cover following fire.

The pastoral productivity of this type of country is limited in most seasons. Parakeelya can be abundant and highly productive following certain winter rains. Burning can increase the abundance of herbage and coarse grasses for a couple of years. Results are possibly best if soil moisture is present at the time of the fire.
TECHNICAL:

DESCRIPTION

Slightly undulating sandplains; coarse to medium-textured red earths; emergent bloodwood over a tall sparse shrubland of mulga and witchetty bush with native fuchsia over hard spinifex with sparse woollybutt and wiregrass.

GEOLOGY

Quaternary aeolian surfaces developed on alluvium.

LANDFORM

Slightly undulating sandplains generally occurring on the downslope margins of sandy alluvial plains (see Unit 6.1), with slopes of less than 1%. Drainage features are absent and runoff is slow due to the high permeability of soils.

SOILS

Red earths (Gn 2.12) Kandosols - KA,AA,AG,CD,BFJS. These soils have sandy surfaces but clay content increases gradually with depth. B-horizons are possibly buried soils.

Example: Site 83 (located just east of Biomass Bore)

Surface: Crusting present.
0.0-0.1m: A1 Horizon: reddish brown (2.5YR4/4); loamy sand; pH 6.0; massive; earthy; moderately weak and moderately sticky.
0.1-0.2m: A3 Horizon; reddish brown (2.5YR4/4); sandy loam; pH 6.0; massive; earthy; moderately weak and moderately sticky.
0.2-0.3m: A3 Horizon; reddish brown (2.5YR4/4); sandy loam; pH 6.0; massive; earthy; moderately weak and moderately sticky.
0.3-0.5m: A3 Horizon; reddish brown (2.5YR4/4); sandy loam; pH 6.0; massive; earthy; moderately weak and moderately sticky.
0.5-0.6m: B Horizon; dark red (10.0R3/6); sandy clay loam (light); pH 6.0; massive; earthy; moderately weak and moderately sticky.

VEGETATION

Emergent bloodwood over a tall sparse shrubland of mulga and witchetty bush with native fuchsia and cassia. The lower stratum is mid-high sparse grassland of hard spinifex with sparse woollybutt, wiregrass and cotton panic with forbs. Parakeelya occurs widely on this unit following certain winter rainfalls.
LAND UNIT 8.3

GENERAL:

DESCRIPTION
Spinifex sandplains with sparse bloodwood, ghost gums and fork-leaved corkwood over spinifex.

MANAGEMENT IMPLICATIONS
This type of country has a low water erosion risk. Although very sandy, soil surfaces can be weakly crusted which produces some runoff. Consequently earthworks that concentrate surface runoff flows can cause scouring. Because surfaces are very sandy, some wind erosion may occur if the spinifex cover is removed. Road surfaces may break up in this type of country.

The pastoral potential is low. Burning may increase the abundance of grasses and herbage although the response may be less than on units with heavier soils.
TECHNICAL:

DESCRIPTION

Level sandplains; earthy sands; emergent bloodwoods and ghost gums over a tall sparse shrubland of fork-leaved corkwood with sandhill wattle and mulga over hard spinifex.

GEOLOGY

Quaternary aeolian surfaces.

LANDFORM

Level sandplains generally associated with the lower reaches of floodouts in the eastern part of Narwietooma with slopes less than 1.5%. Drainage features are absent and runoff is slow as the soil is highly permeable and well drained.

SOILS

Earthy sands (Uc5.21) Rudosol - RU,DS,AR,ZZ,EKW. These soils are red and coarse-textured with little increase in clay content with depth.
Example: Site 163 (along the main road between Alf's and the homestead turnoff)
Surface: Crusting present.
0.0-0.05m: A1 Horizon: dark reddish brown (2.5YR3/4); loamy sand; pH 6.0; massive; earthy; moderately weak and slightly sticky.
0.05-0.2m: A2 Horizon: dusky red (10.0R3/4); loamy sand; pH 6.0; massive; earthy; very weak (moist) and moderately sticky.
0.2-0.3m: A2 Horizon: dusky red (10.0R3/4); loamy sand (heavy); pH 6.0; massive; earthy; very weak (moist) and moderately sticky.
0.3-0.5m: B Horizon: dark red (10.0R3/6); sandy loam (light); pH 6.0; massive; earthy; very weak (moist) and moderately sticky.

VEGETATION

Emergent bloodwood over an upper stratum consisting of a tall sparse shrubland of fork leaved corkwood, mulga and sandhill wattle, with minor sugar brother, dogwood and fuchsia bush. The lower stratum is a low to mid-high hummock grassland of hard spinifex with sparse wire, woollyoat, woollybutt grasses as well as forbs including ruby saltbush, tropical speedwell and cartwheel burr.
LAND UNIT 8.4

GENERAL:

DESCRIPTION

Spinifex sandplains with black gidgee, mulga, ironwood and blue mallee over spinifex.

MANAGEMENT IMPLICATIONS

This type of country has a low water erosion risk. Although very sandy, soil surfaces can be weakly crusted which produces some runoff. Consequently earthworks that concentrate surface runoff flows can cause scouring. Because surfaces are very sandy, some wind erosion may occur if the spinifex cover is removed. Road surfaces may break up in this type of country.

The pastoral potential is low. Burning may increase the abundance of grasses and herbage although the response may be less than on units with heavier soils.
**TECHNICAL:**

**DESCRIPTION**

Level sandplains; red earthy sands; low open woodland of black gidgee, mulga, ironwood and blue mallee over hard spinifex.

**GEOLOGY**

Quaternary aeolian surfaces developed on alluvium.

**LANDFORM**

Level sandplains generally occurring on the downslope margin of alluvial plains in the western part of Narwietooma with relief of less than 1m and slopes of less then 1%; Drainage features are absent as the highly permeable and well drained soils generate minimal runoff.

**SOILS**

Red earthy sands (Uc 5.21) Rudosol - RU,DS,AR,ZZ,EKW. Soils consist of deep loamy sands with very weak profile development.

Example: Site 135 (three kilometres south of Symbiotic Bore)

**Surface:** Crusting present.

- **0.0-0.1m:** A1 Horizon: red (2.5YR4/6); loamy sand; pH 6.0; massive; earthy; very weak and non sticky.
- **0.1-0.2m:** A3 Horizon: red (2.5YR4/8); loamy sand; pH 6.0; massive; earthy; very weak and non sticky.
- **0.2-0.3m:** A3 Horizon: red (2.5YR4/8); loamy sand; pH 6.0; massive; earthy; very weak and non sticky.
- **0.3-0.5m:** A3 Horizon: red (2.5YR4/8); loamy sand; pH 6.0; massive; earthy; very weak and non sticky.
- **0.5-1.0m:** B1 Horizon: red (2.5YR4/8); loamy sand (heavy); pH 6.0; massive; earthy; very weak and non sticky.

**VEGETATION**

A low open woodland of black gidgee, mulga, ironwood and blue mallee. The mid stratum is a tall sparse shrubland consisting of sand hill wattle, Maitland's wattle, cassia and fuchsia bush. The lower stratum is a mid-high hummock grassland of hard spinifex with sparse woollybutt grass and forbs including ruby saltbush.
LAND UNIT 8.5

GENERAL

DESCRIPTION

Sandplain on the margin of the limestone country with sparse bloodwoods, ghost gums, prickly wattle, inland teatree and other shrubs over both hard and soft spinifex.

MANAGEMENT IMPLICATIONS

Soils in this type of country generally have a low erosion hazard. However, soils generate sufficient runoff to cause scour where natural flows are concentrated by windrows or other surface disturbances. The creation of windrows should be avoided when using earthmoving equipment along roads or fencelines. Dust and minor sand movement may result from loss of vegetation cover following fire.

The pastoral productivity of this type of country is limited in most seasons. Parakeelya can be abundant and highly productive following certain winter rains. Burning can increase the abundance of herbage and coarse grasses for a couple of years. Results are possibly best if soil moisture is present at the time of the fire.
TECHNICAL:

DESCRIPTION

Level to undulating sandplains; red earthy sands; emergent bloodwoods and ghost gums over a
tall sparse shrubland of prickly wattle, umbrella bush and inland teatree over soft spinifex and
hard spinifex.

GEOLOGY

Quaternary aeolian surfaces developed on alluvium.

LANDFORM

Level to slightly undulating sandplains located on the margins of calcrete plains (Units 7.1-7.3).
The sandplains have slopes of less than 1% and relief of less than 1 metre. Soils are permeable
and well drained producing limited quantities of runoff which are dispersed as sheet flows.

SOILS

Red earthy sands (Uc 5.21) Rudosols - RU,DS,AR,ZZ,EKV. These soils have uniform coarse-
textured profiles with a neutral reaction. They may overlie calcretes at depth.
Example : Site 118 (about 5 km south of One Pound Jimmy)
Surface: Crusting present.
0.0-0.1m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 6.5; massive;
earthy; very weak and slightly sticky.
0.1-0.2m: A3 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 6.5; massive;
earthy; very weak; slightly sticky.
0.2-0.3m: A3 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 7.0; massive;
earthy; very weak; slightly sticky.
0.3-0.5m: A3 Horizon: dark red (2.5YR3/6); sandy loam; pH 7.0; massive; earthy;
moderately weak and slightly sticky.
0.5-0.8m: A3 Horizon: dark red (2.5YR3/6); sandy loam; pH 7.0; massive; earthy;
moderately weak and slightly sticky.

VEGETATION

Emergent bloodwood and/or ghost gum over a tall sparse shrubland consisting of prickly wattle,
umbrella bush and inland teatree. The lower stratum is a mid high sparse tussock grassland of
soft and hard spinifex, with sparse woollybutt grass, cotton panic and forbs including ruby
saltbush and caustic weed.
LAND UNIT 8.6

GENERAL:

DESCRIPTION

Sandplains with sparse desert oak, bloodwood, blue mallee and fuchsia bush over hard spinifex.

MANAGEMENT IMPLICATIONS

Soils in this type of country generally have a low erosion hazard. However, soils generate sufficient runoff to cause scour where natural flows are concentrated by windrows or other surface disturbances. The creation of windrows should be avoided when using earthmoving equipment along roads or fencelines. Dust and minor sand movement may result from loss of vegetation cover following fire.

The pastoral productivity of this type of country is limited in most seasons. Parakeelya can be abundant and highly productive following certain winter rains. Burning can increase the abundance of herbage and coarse grasses for a couple of years. Results are possibly best if soil moisture is present at the time of the fire.
TECHNICAL:

DESCRIPTION

Level to gently undulating sandplains; red earthy sands, emergent desert oaks and bloodwood over a tall sparse shrubland of desert oak, blue mallee, mulga and native fuchsia over hard spinifex.

GEOLOGY

Quaternary aeolian surfaces developed on alluvium.

LANDFORM

Level to gently undulating sandplains generally occurring in the north-west of Narwietooma, downslope of the Dashwood floodout with slopes of less than 0.5% and relief of less than 1m. This unit lacks surface drainage features. Minimal runoff is generated as soil surfaces are highly permeable and profiles are well drained.

SOILS

Earthy sands (Uc 5.21) Rudosol - RU,DS,AR,ZZ,ELV. They have deep profiles with sandy loam textures, massive structure and a slightly acid reaction.
Example : Site 126 (along the fence line from Browse Bore to the northern boundary)
Surface: Crusted with a sandy veneer.
0.0-0.1m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 6.0; massive; earthy; moderately weak and slightly sticky.
0.1-0.2m: A1 Horizon: dark reddish brown (2.5YR3/4); sandy loam; pH 6.0; massive; earthy; moderately weak and moderately sticky.
0.2-0.3m: A3 Horizon: dark red (2.5YR3/6); sandy loam; pH 6.5; massive and earthy; moderately weak and moderately sticky.
0.3-0.5m: A3 Horizon: dark red (2.5YR3/6); sandy loam; pH 6.5; massive; earthy; very weak; moderately sticky.
0.5-0.6m: B1 Horizon: dark red (2.5YR3/6); sandy loam; pH 6.5; massive and earthy; very weak; moderately sticky.

VEGETATION

Emergent desert oaks and bloodwood over a tall sparse shrubland of desert oak, blue mallee, mulga and native fuchsia. The lower stratum is a mid-high sparse tussock grassland of hard spinifex, with sparse kerosene, button and woollybutt grasses with forbs.
LAND UNIT 8.7

GENERAL:

DESCRIPTION

Sandplains and low rises with sparse desert grevillea, sandhill wattle and Maitland's wattle over hard spinifex.

MANAGEMENT IMPLICATIONS

The soils of this unit are relatively stable and have a low erosion hazard. If the spinifex cover is removed the soil will be susceptible to wind erosion.

This country has low pastoral productivity. Burning may promote a temporary increase in the abundance of coarse grasses and herbage.
TECHNICAL:

DESCRIPTION

Level plains to slight rises; coarse textured red earthy sands; tall sparse shrubland of desert grevillea, sandhill wattle and Maitland's wattle over hard spinifex.

GEOLOGY

Quaternary aeolian surfaces developed on coarse-textured alluvium.

LANDFORM

Slightly undulating sandplains or linier rises with relief to 2m and modal slopes of less than 1%. Only limited runoff is generated and this is dispersed by sheet flow. The landform is probably inherited from prior alluvial distributary lobes with surfaces modified by aeolian processes.

SOILS

Earthy sands (Uc 5.21) Rudosol - RU,DS,AR,EW. These are deep, sandy-textured soils with weak profile development.
Example: Site 105 (south east of Desert Bore)
Surface: Weakly crusted.
0.0-0.1m: A11 Horizon: dark reddish brown (2.5YR3/4); loamy sand; pH 6.0; massive; earthy; very weak and slightly sticky.
0.1-0.2m: A12 Horizon: dark red (10.0R3/6); loamy sand; pH 6.0; massive; earthy; very weak and slightly sticky.
0.2-0.3m: A3 Horizon: dark red (10.0R3/6); sandy loam (light); pH 6.0; massive; earthy; very weak and slightly sticky.
0.3-0.5m: A3 Horizon: dark red (10.0R3/6); sandy loam (light); pH 6.5; massive; earthy; very weak and slightly sticky.
0.5-0.7m: A3 Horizon: dark red (10.0R3/6); sandy loam (light); pH 6.5; massive; earthy; very weak and slightly sticky.
0.7-1.0m: B1 Horizon: dark red (10.0R3/6); sandy loam; pH 6.5; massive; earthy; very weak and slightly sticky.
Soils are highly permeable although surfaces are commonly weakly crusted.

VEGETATION

A tall sparse shrubland of desert grevillea, sandhill wattle, Maitland's wattle, and witchetty bush with occasional dogwood, corkwood and fork-leaved corkwood. The lower stratum is a mid-high open tussock grassland of hard spinifex with sparse wiregrass and forbs.
LAND UNIT 8.8

GENERAL:

DESCRIPTION

Low sand dunes with sparse shrubs over hard spinifex, kerosene grass and woollybutt grass.

MANAGEMENT IMPLICATIONS

The dunes have a moderate wind erosion potential. Surfaces may drift if the spinifex cover is removed by fire. Scouring may occur at points where vehicle tracks or fencelines cross dune crests. In general surfaces are soft and loose forming an unsatisfactory road base. The pastoral potential of the unit is low. Burning of the spinifex cover may promote an increase in the abundance of coarse grasses and herbage.
**TECHNICAL:**

**DESCRIPTION**

Low sand dunes; red siliceous sands; medium-high sparse shrubland of umbrella bush, sandhill wattle and desert heath myrtle over hard spinifex with kerosene and woollybutt grasses.

**GEOLOGY**

Quaternary aeolian surfaces.

**LANDFORM**

Low linear sand dunes with gentle slopes and stable rounded crests. Individual dunes are commonly 2-3km in length and 300m in width, but chains of dunes are up to 10km long.

**SOILS**

Red siliceous sands (Uc 5.21) Rudosols - RU,DS,AR,ZZ,ELW. Dune soils have deep sandy profile with weak cohesion.

Example: Site 90 (1 km along the fence line south of Lignin Bore to Rex Bore)

Surface: Soft, loose surface.

0.0-0.1m: A11 Horizon: reddish brown (2.5YR4/4); loamy sand; pH 7.5; single grain and sandy; very weak and slightly sticky.

0.1-0.2m: A12 Horizon: reddish brown (2.5YR4/4); fine sandy loam; pH 6.0; massive; earthy; very weak and slightly sticky.

0.2-0.3m: A12 Horizon: reddish brown (2.5YR4/4); fine sandy loam; pH 7.5; massive; earthy; very weak and slightly sticky.

0.3-0.5m: A3 Horizon: red (2.5YR4/8); fine sandy loam; pH 7.5; massive; earthy; very weak and slightly sticky.

0.5-0.6m: A3 Horizon: red (2.5YR4/8); fine sandy loam; pH 7.5; massive; earthy; very weak and slightly sticky.

**VEGETATION**

A medium-high sparse shrubland of umbrella bush, sandhill wattle and desert heath myrtle over a lower stratum consisting of a mid high open tussock grassland of hard spinifex, with kerosene and woollybutt grasses with forbs.
REFERENCES


APPENDIX
PLANTS RECORDED DURING THE NARWIETOOMA SURVEY

Trees

Acacia aneura Mulga
Acacia estrophiolata Ironwood
Acacia pruinocarpa Black Gidgee
Allocasuarina decaisneana Desert Oak
Atalaya hemiglauca Whitewood
Callitris glaucophylla White Cypress Pine
Canthium latifolium Native Currant
Capparis mitchellii Native Orange
Capparis spinosa ssp. nummularia Caper Bush
Codonocarpus cotinifolius Desert Poplar
Erythrina vespertilio Bean Tree (Batwing Coral Tree)
Eucalyptus camaldulensis River Red Gum
Eucalyptus gamophylla Blue Mallee
Eucalyptus microtheca Coolibah
Eucalyptus opaca Bloodwood
Eucalyptus papuana Ghost Gum
Grevillea striata Beefwood
Hakea eyreana Fork-leaved Corkwood
Hakea leucoptera Needlewood
Hakea macrocarpa
Hakea sp.
Hakea suberea Long-leaved Corkwood
Ventilago viminalis Supplejack
<table>
<thead>
<tr>
<th>Shrub Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td>Acacia adsurgens</td>
<td>Sugar Brother</td>
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<tr>
<td>Acacia ancistrocarpa</td>
<td>Fitzroy Wattle</td>
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<tr>
<td>Acacia aneura</td>
<td>Mulga</td>
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<tr>
<td>Acacia coriacea</td>
<td>Dogwood</td>
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<td>Acacia dictyophleba</td>
<td>Sandhill Wattle</td>
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<td>Acacia farnesiana</td>
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<td>Acacia inaequilateralis</td>
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<td>Chenopodium auricomum</td>
<td>Northern Bluebush (Queensland Bluebush)</td>
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<tr>
<td>Eremophila christophori</td>
<td>Weeping Emu Bush</td>
</tr>
<tr>
<td>Eremophila gilesii</td>
<td>Sandhill Native Fuchsia</td>
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<tr>
<td>Eremophila latrobei</td>
<td>Desert Grevillea</td>
</tr>
<tr>
<td>Eremophila longifolia</td>
<td>Holly Grevillea</td>
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<tr>
<td>Eremophila willsii</td>
<td>Inland Teatree</td>
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<tr>
<td>Grevillea junctifolia</td>
<td>Weeping Pittosporum</td>
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<tr>
<td>Grevillea wickhamii</td>
<td>Berry Saltbush</td>
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<tr>
<td>Melaleuca glomerata</td>
<td>Spiny Saltbush</td>
</tr>
<tr>
<td>Pittosporum phylittaracoides</td>
<td>Plumbush</td>
</tr>
<tr>
<td>Rhagodia eremaea</td>
<td>Silver Cassia</td>
</tr>
<tr>
<td>Rhagodia parabolica</td>
<td>Broombush</td>
</tr>
<tr>
<td>Rhagodia spinescens</td>
<td>Blunt-leaf Cassia</td>
</tr>
<tr>
<td>Santalum lanceolatum</td>
<td>Green (Oval-leaf Cassia)</td>
</tr>
<tr>
<td>Senna artemisioides ssp. artemisioides</td>
<td>Dense Cassia</td>
</tr>
<tr>
<td>Senna artemisioides ssp filifolia</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna artemisioides ssp helmsii</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna artemisioides ssp oligophylla</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna artemisioides ssp petiolaris</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna artemisioides ssp platypoda</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna artemisioides ssp sturtii</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna glutinosa</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna glutinosa ssp. Glutinosa</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Senna pleurocarpa</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Stylobasium spathulatum</td>
<td>Fireburn</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td><em>Templetonia egena</em></td>
<td>Desert Broombush</td>
</tr>
<tr>
<td><em>Thryptomene maisonneurvi</em></td>
<td>Desert Heath Myrtle</td>
</tr>
</tbody>
</table>

**Sub Shrubs**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td><em>Atriplex vesicaria</em></td>
<td>Bladder Saltbush</td>
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<tr>
<td><em>Corchorus sidoides</em></td>
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</tr>
<tr>
<td><em>Dicrastylis lewellinii</em></td>
<td>Purple Sand-sage</td>
</tr>
<tr>
<td><em>Einadia nutans</em></td>
<td>Climbing Saltbush</td>
</tr>
<tr>
<td><em>Hibiscus brachysiphonius</em></td>
<td>Low Hibiscus</td>
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<tr>
<td><em>Hibiscus sturtii</em></td>
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</tr>
<tr>
<td><em>Lysiana sp.</em></td>
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</tr>
<tr>
<td><em>Maireana aphylla</em></td>
<td>Cottonbush</td>
</tr>
<tr>
<td><em>Maireana scleroptera</em></td>
<td></td>
</tr>
<tr>
<td><em>Maireana villosa</em></td>
<td>Silky Bluebush</td>
</tr>
<tr>
<td><em>Spartothamnella teucriflora</em></td>
<td></td>
</tr>
</tbody>
</table>
Forbs

Abutilon macrum  Slender Lantern Bush
Abutilon malvaefolium  Bastard Marshmallow
Abutilon otocarpum  Desert Chinese Lantern
Aeschynomene indica  Buddha Pea
Alternanthera angustifolia  Narrow-leaf Joyweed
Alternanthera nana  Hairy Joyweed
Alternanthera nodiflora  Common Joyweed
Bergia henshallii
Boerhavia coccinea  Tar Vine
Boerhavia diffusa
Boerhavia paludosa
Boerhavia schomburgkiana  Broad-leaf Parakeeyla
Calandrinia balonensis  Bogan Flea
Calotis hispidula  Desert Sneezeweed
Centapeda thespidiodes  Mulga Fern
Cheilanthes sieberi  Rock Fern
Cheilanthes tenuifolia  Colocynth
Citrullus colocynthis  Tickweed
Cleome viscosa  Wandering Jew
Commelina ensifolia
Convolvulus erubescens  Australian Birdweed
Crotalaria eremaea  Bluebush Pea
Crotalaria novae-hollandiae  New Holland Rattlepod
Cucumis sp.
Enchylaena tomentosa  Ruby Saltbush
Erodium sp.
Euphorbia drummondii  Caustic Saltbush
Euphorbia tannensis  Desert Spurge
Evolvulus alsinoides  Tropical Speedwell
Goodenia lunata  Hairy Goodenia
Goodenia sp.
Gossypium nelsonii
Gossypium sturtianum  Sturt's Desert Rose
Haloragis sp.
Helichrysum ambiguum  Hill Everlasting
Helichrysum apiculatum
Heliotropium flintii  Common Everlasting
Heliotropium tenuifolium
Helipterum floribundum  White Paper Daisy
Hibiscus leptocladus
Hybanthus aurantiacus
Indigofera colutea  Sticky Indigo
Indigofera linnaei  Birdsville Indigo
Ipomoea muelleri  Native Morning Glory
Ipomoea sp.
Leichhardtia australis  Bush Banana
Malvastrum americanum  Spiked Malvastrum
Mukia maderaspatana
Myriocephalus stuartii
Neptunia spp.
Phyllanthus maderaspatensis
Portulaca oleracea
Portulaca pilosa
Protasparagus racemosus
Pterocaulon sphacelatum
Ptilotus atriplicifolius
ssp. atriplicifolius
Ptilotus calostachyus
Ptilotus exaltatus
Ptilotus macrocephalus
Ptilotus obovatus ssp. obovatus
Rhyncharrhena linearis
Rulingia loxophylla
Rynchosia minima
Salsola kali
Scaevola collaris
Scaevola parvifolia
Scaevola sp.
Schoenoplectus dissachanthus
Sclerolaena bicornis
Sclerolaena cornishiana
Sclerolaena costata
Sclerolaena divaricata
Sclerolaena glabra
Sclerolaena johnsonii
Senecio magnificus
Sida everestiana
Sida platycalyx
Sida rohlenae
Solanum centrale
Solanum ellipticum
Solanum quadriloculatum
Stemodia florutenta
Streptoglossa adscendens
Streptoglossa cyclindriceps
Streptoglossa liatroides
Swainsona phacoides
Swainsona sp.
Tinospora smilacina
Triesthera triqueta
Tribulus terrestris
Trichodesma zeylanicum
Zaleya galericulata
Zygophyllum sp.

Poached Egg Daisy
Sensitive Plant
Munyeroo
Apple Bush
Crimson Foxtail
Weeping Mulla Mulla
Tall Mulla Mulla
Large Green Pussytail
Rhyncosia
Buckbush (Prickly Saltwort)
Goathead Burr
Cartwheel Burr
Johnson's Copper Burr
Tall Yellow Top
Lifesaver Burr
Shrub Sida
Desert Raisin
Potato Bush
Wild Tomato
Desert Daisy
Wertabona Daisy
Dwarf Swainsona
Snakevine
Red Spinach
Caltrop
Cattle Bush
Hogweed
Twin-leaf
Grasses

Aristida arida
Aristida biglandulosa
Aristida contorta

Aristida holathera
Aristida inaequiglumis
Aristida latifolia
Aristida nitidula
Aristida stringosa

Astrebla elymoides
Astrebla pectinata

Bothriochloa ewartiana

Brachiaria gilesii
Brachiaria miliformis

Cenchrus ciliaris

Chrysopogon fallax

Cymbopogon ambiguus
Cymbopogon obtectus

Dactyloctenium radulans
Dichanthium sericeum

Digitaria brownii
Digitaria coenicola

Diplachne fusca

Eleocharis pellata

Enneapogon avenaceus

Enneapogon cylindricus

Enneapogon oblongus
Enneapogon polyphyllus

Enteropogon acicularis
Enteropogon ramosus

Eragrostis deilsii
Eragrostis eriopoda
Eragrostis setifolia
Eragrostis xerophila

Eriachne helmsii

Eriachne mucronata

Eulalia fulva

Fimbristylis dichotoma
Iseilema vaginiflorum

Monachather paradoxa

Panicum decompositum
Panicum laevinode

Paraneurachne meulleri

Paspalidium basicladum

Paspalidium clementii

Paspalidium constrictum

Wire Grass (Two Gland Threeawn)
Mulga Grass (Bunched Kerosene Grass)
(Erect) Kerosene Grass
Wire Grass (Unequal Threeawn)
Feathertop Wiregrass
Flat-awned Threeawn
Rough Threeawn
Weeping (Hoop) Mitchell Grass
Barley Mitchell Grass
Desert Bluegrass
Hairy-edged Armgrass
Green Summer Grass
Buffel Grass
Golden Beard Grass
Lemon-scented Grass
Silkyheads
Button Grass
Queensland Bluegrass
Cotton Panic Grass
Umbrella Grass
Brown Beetle Grass
Pale Spike rush
Oat Grass (Bottlewashers)
Limestone Oatgrass (Jointed Nineawn)
Purplehead Nineawn
Woollyoat Grass (Leafy Nineawn)
Curly Windmill Grass
Creek Windmill Grass
Mallee Lovegrass
Woollybutt Grass
Narrow-leaf Neverfail
Knottybutt Neverfail
Woollybutt Wanderrie
Mountain Wanderrie
Silky Browntop
Eight Day Grass
Red Flinders Grass
Bandicoot Grass
Native Millet

Northern Mulga Grass
Clements Paspalidium
Knottybutt Paspalidium
<table>
<thead>
<tr>
<th>Latin Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagiosetum refractum</td>
<td>Bristle-brush Grass</td>
</tr>
<tr>
<td>Schoenoplectus dissachanthus</td>
<td>Australian Dropseed</td>
</tr>
<tr>
<td>Sporobolus australasicus</td>
<td>Fairy Grass</td>
</tr>
<tr>
<td>Sporobolus caroli</td>
<td>Kangaroo Grass</td>
</tr>
<tr>
<td>Themeda triandra</td>
<td>Mulga Mitchell Grass</td>
</tr>
<tr>
<td>Thyriodolepis mitchelliana</td>
<td>Small-burr Grass</td>
</tr>
<tr>
<td>Tragus australianus</td>
<td>Hard (Lobed) Spinifex</td>
</tr>
<tr>
<td>Triodia basedowii</td>
<td>Weeping Spinifex</td>
</tr>
<tr>
<td>Triodia clelandii</td>
<td>Soft (Gummy) Spinifex</td>
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<tr>
<td>Triodia pungens</td>
<td>Five-minute Grass</td>
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<tr>
<td>Tripogon loliiformis</td>
<td>Purple Plumegrass</td>
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<tr>
<td>Triraphis mollis</td>
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<tr>
<td>Yakirra australiensis</td>
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