THE PASTORAL LAND RESOURCES
OF MOUNT SKINNER STATION

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ALICE SPRINGS NT 5750

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SUMMARY

This report documents the land resources of Mount Skinner Station, occupying an area of 3038 sq km, 160 km north of Alice Springs, for the purpose of assisting with land management decision-making on the property. Forty types of country (land units) have been mapped on the station, and each is described in terms of landform, soils and vegetation. The pastoral land management implications of these attributes are indicated for each land type.

The landscape of the study area consists of a mosaic of low sandstone ranges, plains of low relief on various lateritic or freshly-weathered substrates, relict and active alluvial deposits, beds of calcrete and aeolian sandplain. The most productive pastoral land consists of pediment plains on granite, gneiss or sandstone supporting annual grasses, swamps with northern bluebush and neverfail, and a small gilgaied plain with neverfail and desert bluegrass. The majority of landscapes have only a slight to moderate erosion potential, the most erodible soils restricted to drainage floors in granite plains near White Rock Dam.

ACKNOWLEDGEMENTS

The co-operation and hospitality of Mr and Mrs Bob Barber of Mount Skinner Station during the conduct of the field work for this survey is gratefully acknowledged.

Mr Trevor Filmer provided dedicated technical support throughout the field work and compilation of the map and report.
THE PASTORAL LAND RESOURCES OF MT SKINNER STATION

SECTION ONE: INTRODUCTION

A detailed knowledge of the different types of country on a station and their reaction to grazing 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 complement 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 Mt Skinner Station, located 160 km north of Alice Springs, and occupying an area of 3038 sq km. It was initiated by Mr Bob Barber, the lessee of Mt Skinner, who requested a land inventory map with sufficient detail to provide a suitable basis for the planning of further development on the station. To meet his requirements, the station has been mapped into land units with pastorally-different attributes (soil and vegetation type, grazing characteristics, stocking capacity and erosion hazard) at a scale of 1:100,000. This report provides an account of the physical environment of the station and describes in detail each land unit and its pastoral management features.
SECTION TWO: THE PHYSICAL ENVIRONMENT - MOUNT SKINNER STATION

A. PREVIOUS SURVEYS

The land resources of Mt Skinner have been previously described at a reconnaissance level only by Perry et al (1962), who identified fourteen land systems at a regional mapping scale of 1:1,000,000. A land system is a descriptive grouping of related land units, which define "an area, or groups of areas, throughout which there is a recurring pattern of topography, soils and vegetation" (Christian and Stewart, 1953).

The land systems mapped on Mt Skinner in this original survey include the following:

Krichauff Land System - bold sandstone plateaux with spinifex in the central part of the station, together with the Spring Range.

Ilbumric Land System - low sandstone ridges with snappy gum, mulga and spinifex flanking the plateaux.

Hann Land System - quartzite strike ranges, usually as single ridges, mapped in the vicinity of Kunoth Knob.

Tomahawk Land System - low sandstone plateaux with witchetty bush and gidyea comprising the Tomahawk Range.

Boen Land System - gently undulating plains with mulga, usually flanking the ranges.

Ryan Land System - Stony granite plains with sparse shrubs and annual grasses, mapped in the White Rock area.

Alcoota Land System - plains on gneiss and granite, with sparse mulga over annual grasses, north of Adnera Waterhole.

Bushy Park Land System - broad alluvial plains with mulga, throughout the central and southern parts of the station.
Adnera Land System - sandy alluvial plains with mulga, recorded adjacent to the sandstone plateaux.

Woodduck Land System - sandy floodouts with shrubs over kerosene grass or spinifex, mapped adjacent to the ranges in the north-western part of the station.

McGrath Land System - river plains lacking large drainage channels, with sparse low trees and perennial grasses, occurring east of New Bore.

Sandover Land System - comprising the sandy floodplains along the Sandover River.

Utopia Land System - bluebush swamps, including Tomahawk Swamp.

Singleton Land System - sandplain with spinifex, occurring throughout the northern part of the station.

While this land system mapping is suitable for the purposes of regional planning and assessment, it provides insufficient detail to assist with pastoral management, and was not intended for this application. For station management purposes, mapping at a larger scale based on simple land units, each with uniform pastoral characteristics, is required. Land systems, on the other hand, are compound units, each encompassing several unmapped types of country.
B. GEOLOGY

The geology of the study area is described by Shaw and Warren (1975) south of latitude 22°00', and by Smith and Milligan (1964) to the north of this latitude.

The study area lies on the south-western margin of the Georgina Basin, a major sedimentary unit, where it abuts the outcropping Arunta Block, the metamorphic shield which underlies the southern half of the Northern Territory.

The Arunta Complex is poorly represented as outcrop on Mt Skinner, although minor exposures of deeply weathered gneiss and schist are recorded surrounding the tantalum deposit east of Skinner Bore. These rocks mostly date from the main episode of regional metamorphism which occurred about 1700 million years ago (m.y.a.), and granites are thought to have intruded at about this time. The Woodgreen Granite Complex from the White Rock area is the most extensive igneous unit, consisting of massive porphyritic biotite gneissic granite.

A long period of uplift and erosion followed the last metamorphic event, but subsequent subsidence resulted in the incursion of the sea and sedimentation onto the basement rocks. The Grant Bluff Formation consists mainly of white and grey quartz-feldspar sandstone and quartzite, probably laid down as a shoreline deposit in a calm shallow sea, and comprises bold relief in the Kunoth Knob-Mt Skinner vicinity.

With continuing surface subsidence in the early Cambium (570 m.y.a.), the Central Mt Stuart Beds were deposited over the Grant Bluff Formation and ridges in the Arunta Complex basement. These beds consist of red and white quartz or lithic sandstone with siltstone and minor tillite (glacial material), probably deposited in shoreline deltas. They comprise upland terrain from Mt Skinner to beyond Mt Octy, as well as the Spring Range, Mt Dixon and Mollie Bluff.

The shallow sea in the Georgina Basin contracted northwards in the mid-Cambrian, but subsequent renewal of surface subsidence led to the
deposition of the Tomahawk Beds in a near-shore marine environment in the early Ordovician (approx 500 m.y.a.) These beds consist of quartz sandstone and glauconite quartz sandstone, and outcrop on the station as the Tomahawk Range.

There is no further evidence of sedimentation until the early Tertiary (60 m.y.a.), suggesting a long period of gentle uplift and erosion. The early Tertiary is associated with widespread peneplanation and deep weathering of land surfaces in a tropical environment, and the development of a laterite profile.

A laterite profile, consisting of a nodular ironstone layer capping soft kaolinized material grading into weathered bedrock underlies most of the plains on the station. Where the laterite profile remains intact, soils of very low inherent fertility predominate, but where underlying substrates such as partially-weathered rock have been exposed by subsequent geologic dissection, soils support productive pastures.

The deeply-weathered surface was buried by fluviatile (stream bed) and lacustrine (lake bed) sediments in the early Pliocene (about 5 m.y.a.) within a basin (the Waite Basin) extending from Goofy Bore southwards to Harts Range. These sediments, known as the Waite Formation, consist of chalcedonic limestone overlying sandstone and mudstone, and are evident as low plateaus east of Goofy Bore. The calcrites forming the limestone plains at Buggy Camp Bore and from Kooldunda Well to beyond Wood Duck Swamp were formed through the precipitation of calcium carbonate from high groundwater tables as the climate subsequently became more arid.

Sandplains buried the northern and eastern parts of the station during arid phases of the Pleistocene (1.5 m.y.a. - 10,000 years ago), encroaching from sand sources in the south-east. Northward flowing drainage systems, now abandoned, were active during wet interludes of this period, but the floodplains along present-day creeklines have probably been deposited in the Holocene (10,000 y.a. - present)
The Laterite Profile

The profile consists of a red earth soil overlying a ferruginous zone of cemented ironstone, grading into a pallid zone of white kaolinized clay. Bleached, weathered parent rock is visible at the base of the profile. Most of the mulga country on Mt Skinner occurs on an intact laterite profile.
C. LANDFORMS

The landforms of Mt Skinner Station have developed from two old lateritic land surfaces (Hays, 1967).

The oldest and more elevated surface, the Ashburton Surface, persists only as the crests of plateaux of Proterozoic or Paleozoic sandstones, and was dissected prior to the Cretaceous (140 m.y.a.). The younger surface, the Tennant Creek surface, consists of lowland plains throughout the remainder of the station, termed a peneplain in this report. A peneplain is simply a featureless, nearly level surface resulting from a long cycle of geologic erosion. On Mt Skinner it is characterized by the presence of an intact laterite profile and sheet flow drainage systems.

Only very subtle changes in topography indicate areas where the peneplain has been stripped or dissected, but significant changes in soil characteristics and vegetation are always evident. Bedrock plains, termed pediments, occur where the laterite profile of the peneplain has been completely stripped, revealing the freshly-weathered parent rock. The plains surrounding White Rock Dam, for instance, are pediment surfaces on granite.

A broad depression within the peneplain drains the south-western part of the station through Woodduck Swamp and eventually into the Hanson River system to the north-west. Plains of calcrete occupy the floor of the depression, together with relict floodout deposits of prior drainage systems that flowed from Harts Range, 90 km to the south.

In the south-eastern part of Mt Skinner, drainage systems tributary to the Sandover River have stripped the laterite profile, developing a pediment in the White Rock area. The north-eastern area drains into a north-west trending depression, partly delineated by the Buggy Camp Swamps, but mostly buried by aeolian sand. Calcrete deposits north of Buggy Camp probably precipitated where the groundwater table was close to the surface of this depression at a time when the climate was turning towards aridity. The orientation of relict stream deposits near
Tomahawk Swamp suggest that the depression may once have carried flow from the Sandover River catchment.

Alluvial fans mantle the plains where watercourses spill out from the ranges and deposit sandy sediment. Most fans in the study area are of small extent, reflecting the limited size of catchments in the sandstone ranges, or burial by aeolian sands. Floodout deposits along many watercourses comprise a shallow alluvial veneer overlying a stripped laterite profile. Small alluvial fans of cobble-sized rocks occur adjacent to the ranges in two locations, the result of massive slope failures and wasting processes.

The aeolian landforms of the study area consist mainly of level sandplains which vary according to the depth of the sand deposit and their clay content. On the western part of the station, they probably developed from the wind modification of relict floodout deposits, but in the north-east the origin of the sand is not clear. The small longitudinal dunefields near the Spring Range are notable for their average relief 19m above the surrounding sandplains, and their steep, parabolic leeward faces.

D. SOILS

Soil properties reflect the geology of the parent material from which they are formed, the landform on which they occur, and the climatic regime that prevailed during their period of development. Many soils on Mt Skinner have developed on highly weathered materials and consequently have a low abundance of the freshly-weathered minerals that confer soil fertility. They developed in a moist climate which prevailed before the onset of increasing aridity and sand movement 25,000 years ago. Under the present arid climate, erosion rates exceed the rate of soil formation on slopes in excess of about 3%, so these carry a very shallow soil cover.

In this report, the soils of Mt Skinner are described in terms of their texture, colour, pH, fabric and structure, and are classified according to their Australian Great Soil Group (Stace et al., 1968) and Principal Profile Form (Northcote, 1979).
i) **Soil Characteristics**

Texture is a property determined by the proportion of sand, silt and clay particles within the soil matrix, and is indicated by the behaviour of a moistened soil sample. Because most soils on Mt Skinner are derived from highly weathered parent materials, they have a very low silt content (less than 10%). The range of soil textures found on the property include clayey sands (5-10% clay), sandy loams (10-15% clay), sandy clay loams (20-30% clay), sandy clays (35-40% clay), light clay (35-40% clay, up to 25% silt) and medium clay (45-55% clay).

Texture determines soil permeability and moisture-holding capacity, and influences fertility as most plant nutrients are bound to clay minerals. It is a major determinant of the type of pasture that grows on a particular area.

Soil colour is assessed in the field using a standard Munsell colour chart, which forms the basis of the colour names used in this report. The soils of Mt Skinner are predominantly red due to pigmentation of the iron mineral haematite, derived from the weathering of iron-rich materials.

Soil pH indicates the acidity or alkalinity of the soil. A neutral soil has a pH value of 7.0, and a lower pH indicates acidity, a higher pH alkalinity. Most soils on Mt Skinner have a neutral reaction trend, with a surface value of between pH 5.0 and pH 8.0, and the deep subsoil a value between pH 6.5 and pH 8.0.

Soil fabric refers to the arrangement of individual particles within the soil material. An earthy fabric is characterized by a porous appearance of the soil matrix and the absence of peds (soil aggregates which are distinctly separate). A sandy fabric has closely packed grains with few if any peds. When peds are present, they may have a porous, rough-faced fabric, or smooth, lustrous surfaces.
Soil structure is determined by the size, shape and abundance of peds. Coherent soils with no distinct peds are considered to have massive structure, while highly pedal soils such as the cracking clays of mitchell grass plains are strongly structured.

ii) Soil Types

The soils of Mt Skinner have been classified according to the Australian Great Soil Groups (Stace et al, 1968) in this report.

Red earths, the most common soil type on the station, vary considerably according to the nature of their parent material. Deep red earths with low fertility are associated with lateriteic substrates and old alluviums, while shallow, mineral-rich soils occur on freshly-weathered granite, gneiss and sandstone. They are medium-textured soils, red in colour with massive structure and an earthy fabric. Profiles feature a gradual increase in clay content with depth.

Duplex (or solodic) soils are present on drainage floors in granite country. They are characterized by an abrupt boundary between a sandy A-horizon which is massive, earthy and about 0.25 m deep, and a heavy textured pedal B-horizon. These soils are highly erodible and often saline.

Red calcareous soils are shallow soils, usually medium-textured, massive and highly alkaline, which have developed directly from underlying calcrete. They are localized in the study area.

Brown clays occur in the Tomahawk and Buggy Camp Swamps. They are deep, heavy-textured soils, strongly-structured and drying with deep surface cracks, which have formed from alluvial sediments. Red clays are also heavy-textured but are less pedal, exhibit crabhole gilgai micro-relief, and have generally developed on weathered sandstones (Stuart Bluff Formation).

Alluvial soils simply consist of layers of Holocene sediments in which soil characteristics have yet to fully develop. On Mt Skinner these
soils are sandy loam in texture and massive with a sandy or slightly earthy fabric. Profiles are often interbedded with lenses of creek gravels.

**Earthy sands** are similar to red earths, but have developed from Pleistocene aeolian materials on sandplain areas. They have deep, uniform profiles, usually clayey sand or sandy loam in texture, with little increase in clay content with depth. They are red in colour, with massive structure and an earthy fabric.

Shallow, gravelly soils, termed **lithosols**, predominate on slopes in excess of about 3% where natural erosion is active enough to prevent soil development.

### (iii) Soil Erodibility

The potential for a soil to erode is termed its erodibility, and is influenced by the nature of its parent material and the landform on which it occurs as well as inherent soil factors. The latter may include texture, salinity, ease of dispersion (sodicity) and the presence or absence of surface crusts and gravels.

In general, only soils with textures of sandy loam or lighter are likely to experience significant wind erosion on Mount Skinner. Water erosion is unlikely to affect very light-textured porous soils or clays, but can damage sandy loam or sandy clay loam surfaces. Saline or sodic soil materials (such as the B-horizon of solodic soils) are susceptible to scalding or shallow gullying.

Deep gullying is usually restricted to alluvial landforms, and is often initiated where the sheet flow of runoff is concentrated by a linear surface feature such as a graded line. Soils that have developed directly on the pallid zone of a partially-stripped deep-weathering profile are particularly susceptible to shallow gullying and scalding, possibly as a result of slightly saline or sodic conditions.
E. VEGETATION

The distribution, composition and pastoral value of the various vegetation types on Mt Skinner directly reflect the geological, landform and soil factors outlined in the preceding pages through their effect on plant nutrient and water availability. Within each vegetation type, the actual composition of pastures can vary according to the effects of fire, seasonal rainfall pattern and grazing.

In terms of pastoral land use, the vegetation types can be categorized into several broad pasture groups.

i) Annual grass pastures

Annual grass pastures consisting predominantly of oat, woollyoat, mulga, eight day and limestone oat grasses grow on relatively shallow soils, usually with sandy clay loam surface textures, which have developed on freshly-weathered rocks or stripped laterite materials. They have high palatability and feed value, mainly due to the abundance of oat and woollyoat grasses. Mulga grass is quite acceptable to stock when young, but palatability and nutritional value declines with maturity. Eight-day grass together with button grass, is highly palatable and nutritious white green, but its value is limited by low bulk and poor persistence. Limestone oat grass, which occurs on red calcareous soils, has both low palatability and feed value.

The topfeeds associated with annual pastures are generally palatable to stock, and valuable perennial grasses such as umbrellas and curly windmill grasses often grow as scattered tussocks beneath the topfeed canopy.

Since these pastures attract selective grazing pressures, and their viability is subject to annual seed setting, they are susceptible to change in composition with grazing use.
ii) Kerosene grass pastures

Kerosene grass pastures grow on alluvial soils with sandy loam surface textures, and also on some earthy sands as a recovery phase following the burning of spinifex. Although palatable when green, the acceptability and feed value of kerosene grass declines with maturity and haying off. Much of the productivity of these pastures is therefore derived from minor components such as oat grass and herbage species, which are selectively grazed.

iii) Perennial tussock grass pastures

These consist of tall growing perennial grasses such as desert bluegrass, silky browntop, Queensland bluegrass, kangaroo grass and neverfail and grow on medium to heavy-textured soils, principally the brown and red clays and some red earths, particularly on landforms where runoff collects.

These pastures produce a large bulk of feed which is palatable and nutritious while green and shooting, but acceptability and protein levels decline as growth becomes rank and dries off. If tussocks are maintained in a closely-cropped condition, they will continue to produce green shoots and remain attractive to stock.

The composition of these pastures remains relatively stable under grazing use.

iv) Wire grass pastures

Wire grass pastures grow on infertile deep red earths developed on highly weathered substrates including laterite. The pastoral productivity of these pastures is negligible. Wire grass is virtually inedible to stock, and the associated topfeed, usually mulga, is also unacceptable. Minor pasture components such as woollybutt and mulga mitchell grasses may provide sparse, opportunistic grazing.
v) Spinifex

Hummock grasslands of spinifex grow mainly on earthy sands of aeolian origin, but also on certain lithosols and calcareous soils. On sandplain areas hard spinifex occurs in association with a range of shrub or mallee communities, seemingly in accord with the depth of aeolian material overlying underlying substrates. The calcareous soils support buck spinifex.

Spinifex country has very limited pastoral value except during seasons when parakeelya is abundant. However, burning can induce short-term desireable changes in plant composition, including an initial phase of kerosene grass and herbage growth given suitable seasonal conditions. This response varies according to soil type, and is not-evident in buck spinifex country.

Additional information concerning the feed value and response to grazing of pasture species can be found in the Central Australian Range Herbarium (McColl and Ulyatt, 1982).
SECTION THREE - LAND UNITS OF MOUNT SKINNER STATION

A. SURVEY METHODOLOGY

Mount Skinner has been mapped into forty 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 available aerial photography included a complete coverage of black and white contact prints, both at 1:80,000 scale flown in 1983, and 1:25,000 scale, flown 1980-82. Colour 1:25,000 scale photography, flown in 1982, was available for the extreme southern part of the station. Tentative land unit boundaries were mapped on the 1:80,000 scale photography 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 four weeks in October 1985, and consisted of vehicle traverses between recording sites, which were selected at an average intensity of 7.4 sites per 100 sq. km. Since the north-eastern portion of the station is undeveloped, access presented a major constraint to ground survey. Cross-country travel through dense mulga was necessary to record site information in the Adnera Creek - Spring Range area, and along range frontage south of Mount Octy.

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 examined using a Jarret hand auger, usually sampling to a depth of about 0.6 m, below which the dry condition of the soil rendered further penetration impractical. Soil pits were excavated by hand at numerous sites.

Final amendments to land unit boundaries were made during a comprehensive re-examination of the aerial photography subsequent to the field survey. This included interpretation of the large (1:25,000) scale photography over areas where the 1:80,000 scale prints provided poor definition of the unit boundaries, such as the Mt Dixon-Adnera Bore
area. The boundaries were collated onto 1:100,000 scale orthophoto maps using a Bausch and Lomb zoom transferscope, and then directly transferred to a base map at this scale.

B. LAND UNITS

Each land unit described in this report delineates areas with relatively uniform landform, soil and vegetation attributes, which are reflected in its stocking capacity, response to grazing, attractiveness to cattle and erosion potential. Slight variability will be evident within each unit, consistent with the degree of resolution possible at a mapping scale of 1:100,000. The units have been grouped according to the following landform categories:

1. Range and hill country
2. Peneplain
3. Partially-striped peneplain
4. Pediment
5. Limestone plains
6. Colluvial Pans
7. Floodplains and floodouts
8. Swamps
9. Dunefields and sandplain

The description of each unit is structured according to the following format:

GENERAL DESCRIPTION - a brief statement of the main features of the landscape.

GEOLOGY - an indication of surface geology.

LANDFORM - a description of the terrain in terms of the landform pattern (eg. floodplain, dunefield) and its relief, slope and drainage features.

SOILS - includes Great Soil Group classification (Stace et al., 1968) and Principal Profile Form (Northcote, 1979). The profile description
covers horizon boundaries, field texture, Munsell colour name and notation of the moist soil, fabric, structure, pH, the presence or absence of calcium carbonate and the occurrence of gravel and surface features.

VEGETATION - an outline of the structure of the vegetation community (e.g., open woodland, grassland) with a listing of the main species present. Where the original vegetation has been altered, both the existing and former components are indicated.

LAND MANAGEMENT - a comment on any land management problems likely to be encountered with pastoral use of the land unit, including susceptibility to erosion and pasture degradation, and its grazing potential. Desirable land management practices are indicated where applicable.
1. RANGE AND HILL COUNTRY

The land units of this group are characterized by moderate to strong relief and slopes of greater than 3%, with a shallow, stony soil cover. Runoff rates are high, but the erosion potential is moderated by the stoniness of the land surface. Grazing potential is negligible or very limited.

Land Unit - I.1

GENERAL DESCRIPTION - Low, boulder-strewn hills of granite and outcrops of gneiss; bare or with sparse mulga, low shrubs and annual grasses.

GEOLOGY - Proterozoic granites and gneissic granites (Woodgreen Granite Complex), with minor gneiss and schist.

LANDFORM - Hills with low relief and moderate slopes, often as isolated outcrops. On granite or gneissic granite, they feature a mass of large, rounded boulders (tors), whereas in the case of gneiss and schist a reef outcrop is usual.

SOILS - Absent, or as shallow, gravelly medium-textured lithosols (Um 5.5).

VEGETATION - A sparse cover of low shrubs, mainly silver indigo, together with annual grasses including woolly oat, oat and mulga grasses. Trees and large shrubs are generally absent from the granite outcrops, with the exception of solitary native figs. The outcrops of gneiss and schist usually support sparse witchetty bush.

LAND MANAGEMENT - These hills are of limited area and negligible pastoral value.
Land Unit - 1.2

GENERAL DESCRIPTION - Residuals of deeply-weathered rock; mulga, fuschia bush and sparse grasses.

GEOLOGY - Tertiary deeply-weathered rocks.

LANDFORM - Low rocky hill terrain, often capped with a flat, duricrusted surface. These outcrops are residuals of a deeply-weathered land surface that has been extensively stripped. Slopes are steep, with relief up to 15 m.

SOILS - Absent, or as pockets of shallow gravelly lithosol (Um 5.5).

VEGETATION - A sparse cover of mulga, witchetty bush and fuschia bush in association with tussocks of mountain wanderrie and woollyoat grass.

LAND MANAGEMENT - This unit is of very limited area and negligible pastoral value.

Land Unit - 1.3

GENERAL DESCRIPTION - Sandstone strike ridges; mulga, fuschia bush and sparse grasses and ferns.

GEOLOGY - Late Proterozoic quartz feldspar sandstone, quartz sandstone and quartzite (Grant Bluff Formation).

LANDFORM - Mountainous terrain with bold relief to 100 m and steep slopes, usually consisting of steeply-dipping strike ridges. Also includes areas such as the south-western face of Mt Skinner, which lacks bedding features.

SOILS - Absent, or as shallow, medium-textured lithosols (Um 5.5) amongst rock outcrop. Soil colour is characteristically red.
VEGETATION - A shrubland of mulga, sparse on steep rocky slopes, with fuschia bush and occasionally ghost gum, over mainly mountain wanderrie grass and rock ferns.

LAND MANAGEMENT - This unit has negligible pastoral value. In some cases, it may act as a barrier to the movement of stock.

Land Unit - 1.4

GENERAL DESCRIPTION - Sandstone ranges, usually as slightly dipping plateaux; sparse acacias and spinifex.

GEOLOGY - Level or slightly tilted beds of Late Proterozoic or Paleozoic quartz sandstone, lithic sandstone and siltstone (Central Mt Stuart Beds).

LANDFORM - Upland terrain with relief to over 100 m, featuring gently-sloping plateau surfaces with bevelled ridge crests and spurs, deeply dissected by an open network of narrow creeklines.

SOILS - Absent, or as shallow, stony lithosols (Um 5.5).

VEGETATION - A hummock grassland of hard spinifex and sparse acacias, mainly sandhill wattle.

LAND MANAGEMENT - These ranges have negligible pastoral value. When supporting a heavy fuel load of spinifex, lightning is likely to initiate wildfires, but spread to adjacent land units usually will be limited by natural features. The unit imposes a major constraint on access to the northern part of the station.
Land Unit 1.3
The bold quartzite outcrops of this unit are a prominent landscape feature. Gentler slopes support a shrubland of mulga.

Land Units 1.4 and 1.5
The range country of these units generally has subdued relief. Unit 1.4 (horizon) supports spinifex and sparse shrubs, while the gentle slopes of Unit 1.5 support sparse mulga, low shrubs and annual grasses.
Land Unit - 1.5

GENERAL DESCRIPTION - Low sandstone hills with gentle slopes; sparse mulga, fuschia bush and annual grasses.

GEOLOGY - Steeply-dipping beds of Late Proterozoic or Paleozoic quartz sandstone, lithic sandstone and siltstone (Central Mt Stuart Beds).

LANDFORM - Hills with gentle slopes (2-6%) and relief to 50 m, drained by widely spaced, narrow creeklines. Hillslopes are stony but generally free of rock outcrop or other surface micro-relief.

SOILS - Medium-textured lithosols (Um 6.13). To a depth of 0.1 m, soils consist of a moderately pedal dark reddish brown sandy clay loam, pH 7.0, with up to 25% coarse gravel. Beneath this depth, the profile rapidly grades to weathered parent rock.

VEGETATION - Very sparse mulga, with fuschia bush, scattered blue or green-leaf cassias and smokebush. Groundcover consists predominantly of sparse tussocks of woollyoat grass. Burnt, dead mulga is common throughout the landscape.

LAND MANAGEMENT - Although sparse, the pasture species growing on these hills are palatable and stock are likely to regularly graze the lower slopes. Where soil disturbance associated with track or fence construction channels runoff downslope, minor gullying is likely to occur.

Land Unit - 1.6

GENERAL DESCRIPTION - Stony low sandstone hills of the Tomahawk Range; open gidyea with annual grasses.

GEOLOGY - Upper Cambrian to Lower Ordovician quartz sandstone with minor siltstone and dolomite (Tomahawk Beds).
LANDFORM - Low hills with relief to 50 m, moderate slopes (3-10%) and smooth, rounded crests, drained by widely-spaced narrow, linear drainage lines. Surfaces are very stony (at least 70% stone cover) but prominent rock outcrop is uncommon.

SOILS - Coarse-textured lithosols (Uc 5.21). Surface soils consist of a dark reddish brown light sandy clay loam, pH 8.5, with up to 70% coarse gravel and cobbles, and merge rapidly into weathered parent rock.

VEGETATION - An open woodland of *Georgina gidyea* with scattered fuschia bush, green-leaf cassia and ruby saltbush. Groundcover is sparse, consisting mainly of oat grass with eight-day and five-minute grasses, and occasionally cotton panic. Desert bluegrass is present along drainage lines.

LAND MANAGEMENT - The hilly terrain will discourage cattle from fully utilizing the sparse but palatable feed on this unit. Owing to the stoniness of the land surface, only minor wash should occur following earth-works for track or fence construction.
2. **PENEPLAIN**

A peneplain is a featureless, level or very slightly undulating surface, the end product of a long cycle of geologic erosion. Drainage features are poorly-defined or absent, and runoff is dispersed by sheet flow.

**Land Unit - 2.1**

**GENERAL DESCRIPTION** - Plains with deep red earth soils; dense groved mulga with wire and woollybutt grasses.

**GEOLOGY** - Cainozoic lateritic deep-weathering profile derived from crystalline basement rocks (Arunta Complex).

**LANDFORM** - Level or very gently undulating plains, with slopes of less than 1%. Runoff drains by sheet flow, and defined drainage channels are absent.

**SOILS** - Red earths (Um 5.52) Profiles have a sandy clay loam texture to a depth of 0.5 m, and grade in colour from dark red at the surface to red below about 0.2m. They are slightly acid (pH 6.0-6.5), massive and earthy. Gravel is absent, although fine laterite nodules may be present on the surface, which is weakly crusted. Termite mounds are abundant.

**VEGETATION** - Groved mulga woodland, usually with occasional witchetty bush, or less commonly, a groved shrubland of witchetty bush. Open areas support wire grass, woollybutt and lifesaver burr, with sparse mulga mitchell and woollyoat grasses. Cotton panic is usually present beneath the mulga canopy.

**LAND MANAGEMENT** - This landscape has a low potential for erosion. However, storm runoff is likely to initiate minor rilling where surface flows are concentrated by graded lines, tracks or similar earthworks. Pastures include very few palatable species and are avoided by stock even when feed is scarce elsewhere. Similar country is known to induce the pegleg phosphorus/protein deficiency syndrome in cows. Low intensity controlled burning may encourage the growth of more palatable pasture species such as mulga mitchell grass and woollybutt.
Land Unit 2.1

Pastures consist predominantly of wire grass, which becomes dense if the mulga is destroyed by a hot fire. This species is unpalatable and avoided by stock.
Land Unit - 2.2

GENERAL DESCRIPTION - Low-lying plains; open mulga and stunted coolibah with wire and kerosene grasses.

GEOLOGY - Cainozoic lateritic deep-weathering profile derived from crystalline basement rocks (Arunta Complex).

LANDFORM - Level or very gently sloping plains on the margins of Woodduck and Tomahawk Swamps. Drainage and other surface features are absent.

SOILS - Red earths (Um 5.52, Gn 2,12). Profiles have a sandy loam texture to a depth of at least 0.5 m, are slightly acid (pH 6.5) and are massive and earthy. Soil colour is a reddish brown at the surface, rapidly grading to a yellowish red in the upper 0.2 m. A weak surface crust is usually present, veneered with loose sandy deposits, and termite mounds are abundant on these soils, especially near Woodduck Swamp. Variants have sandy loam surfaces and gradational profiles with redder colours.

VEGETATION - An open woodland of stunted coolibah with mulga, witchetty bush and occasionally mallee broombush (tea-tree) over wire grass and woollybutt. Other pasture species present include kerosene and woollyoat grasses, hard spinifex, lifesaver burr and potato bush.

LAND MANAGEMENT - The coarse-textured surfaces adjacent to Tomahawk Swamp have a moderate wind erosion risk and will drift if denuded. The medium-textured soils have a slight wind and water erosion potential. Pastures are of poor quality and are unattractive to stock. The more palatable species, woollybutt and kerosene grass, will be lightly grazed when better feed is scarce elsewhere.
Land Unit 2.2

Termite mounds are abundant on this unit near Woodduck Swamp. Pastures here consist mainly of wire grass and have limited grazing potential.
Land Unit - 2.3

GENERAL DESCRIPTION - Plains with gravelly soils; open whitewood and corkwood with wire grass.

GEOLOGY - Cainozoic lateritic deep-weathering profile derived from crystalline basement rocks (Arunta Complex).

LANDFORM - Level or very gently undulating plains with slopes of less than 1%. Where Adnera Creek passes through this unit, it forms a deep narrow channel with semi-permanent waterholes (Adnera Waterhole). Otherwise drainage features are absent.

SOILS - Red earths (Gn 2.12). These grade in texture from a sandy loam at the surface to a sandy clay loam by 0.4 m. Surface colour is a dark reddish brown, turning red beneath a depth of about 0.1 m. Profiles have a neutral reaction trend (pH 6.5 throughout) and are massive and earthy. Surfaces often have a lag deposit of quartz gravel and laterite nodules, particularly on slightly stippled surfaces such as the slopes flanking Adnera Creek.

VEGETATION - Sparse long-leaved corkwood, whitewood, bloodwood and beefwood, commonly with clumps of blue-leaf cassia. Pastures consist mainly of wire and kerosene grasses, but other species present include eight-day, mulga and woollyoat grasses, lifesaver burr, cattle bush and isolated clumps of silky browntop.

LAND MANAGEMENT - This type of country has a slight wind erosion hazard but a low potential for water erosion. The slopes flanking Adnera Creek may be subject to gullying if disturbed, and elsewhere any earthworks which channel sheet runoff may initiate minor rilling.

Pastures have a very low grazing potential and will generally be avoided by stock. However, they include a greater proportion of palatable species than Unit 2.1.
Land Unit 2.3

The tree cover consists of sparse corkwood, bloodwood and whitewood, often with a sparse shrub cover of blue-leaf cassia (background). Pastures are dominated by unpalatable wire grass, but scattered tussocks of more acceptable species, such as silky browntop, occur throughout (foreground).
Land Unit - 2.4

GENERAL DESCRIPTION - Stony sandstone plains; groves of gidyea with neverfail and sparse annual grasses.

GEOLOGY - Cainozoic lateritic deep-weathering profile derived from Early Palaeozoic sandstones (Stuart Bluff Formation).

LANDFORM - Featureless plains with slopes of less than 1%. Drainage features are absent except where creek-lines encroach from adjacent upland land units and dissipate as poorly defined depressions. Runoff drains by sheet flow.

SOILS - Red clays (Uf 6.12). Profiles are usually sand clay loam to light clay in texture to a depth of about 0.4 m, and have a moderately pedal structure. Soil colour tends from a dark reddish brown at the surface to red below a depth of 0.1 m. Soil reaction trend is either neutral, grading from pH 6.5 to pH 7.5 by 0.4 m, or slightly alkaline in soils with pH 8.0 at depth. Surfaces are usually weakly crusted and mantled with a lag deposit of laterite nodules, together with large platy cobbles of sandstone.

Sandy drift deposits are commonly associated with areas of tree cover. Medium-textured gradational soils (Gn 4.12) occur west of Mt Dixon and north-east of Mt Skinner homestead, while drainage areas east of Crossroads Bore are slightly saline.

VEGETATION - A woodland of gidyea, usually in well-defined groves, with scattered green-leaf cassia, wild currant, fuschia bush, spiny saltbush and ruby saltbush. Beneath the gidyea canopy, pastures consist mainly of curly windmill grass together with umbrella grass, sparse eight-day and woollyoat grasses, galvanized burr and buckbush.

The open areas between the groves of gidyea support tussocks of neverfail within crabhole depressions, but only a sparse cover of eight-day grass elsewhere. Desert blue-grass is present in minor depressions, and grey samphire occupies saline sites.
LAND MANAGEMENT - The soils of this unit have a low erosion potential due to their high clay content, lag gravel cover and very gently sloping surfaces. However, graded tracks that channel storm runoff flows will be subject to minor rilling in the absence of adequate drainage, and sandy drift deposits may be mobilized by wind erosion when bare of groundcover.

Although pasture growth is relatively sparse, it is highly palatable to stock. The eight-day grass produces a short-lived flush of feed after rain, while the woolly oat, curly windmill, neverfail and umbrella grasses provide a limited quantity of more substantial pasture over a longer period.
Land Unit - 2.5

GENERAL DESCRIPTION - Plains with little surface relief, usually on the lower slopes of Unit 2.1; dense gidyea with sparse annual grasses.

GEOLOGY - Cainozoic lateritic deep-weathering profile and possibly lacustrine deposits.

LANDFORM - Level or very gently-sloping plains with slopes of less than 0.5%. Drainage features absent or as poorly-defined flat floored depressions up to 100 m in width.

SOILS - Red earths (Gn 3.12). Profiles grade from a sandy clay loam A-horizon with an earthy fabric, pH 6.5, to a light clay B-horizon with a weakly pedal structure, pH 7.0, by a depth of 0.5 m. Soil colour is a dark reddish brown at the surface, turning red by a depth of 0.1 m. Surfaces are weakly crusted and veneered by loose gritty deposits, and accumulations of sandy drift material are occasionally present amongst tree cover.

VEGETATION - A woodland or open woodland of gidyea, usually with sparse blue-leaf and green-leaf cassia and spiny saltbush. Beneath the tree canopy, groundcover consists of scattered tussocks of curly windmill grass, while open areas are largely bare. Other species commonly occurring include eight-day and oat grasses, smokebush and galvanised burr.

LAND MANAGEMENT - These soils have a slight wind and water erosion hazard. When bare and disturbed, soils will be a source of dust and sandy deposits may be subject to minor drift. Rilling or shallow gullying is likely along graded tracks or fencelines that channel runoff along drainage depressions. Such earthworks should be sited away from these areas and adequately drained.

Although sparse, pastures are of moderate quality and resilient under grazing. The eight-day grass provides a short-lived flush of highly palatable growth after rain, while the curly windmill grass constitutes more substantial feed into dry periods.
Land Unit 2.5
This unit supports dense gidyea. Pastures are sparse and consist mainly of curly windmill grass.
3. **PARTIALLY STRIPPED PENEPLAIN**

These landscapes have developed as a consequence of the dissection or partial stripping of the peneplain surface by geologic erosion processes, exposing the pallid zone of the lateritic weathering profile. The soils of these units are derived from the pallid zone material.

**Land Unit 3.1**

**GENERAL DESCRIPTION** - Gently-sloping plains, often gravelly and dissected by minor watercourses; open gidyea and annual grasses.

**GEOLOGY** - Cainozoic laterized deep-weathering profile derived from crystalline basement rocks (Arunta Block).

**LANDFORM** - Plains with very gentle slopes (less than 1%) and negligible relief, drained by numerous shallow gutters into broad, flat-floored depressions. In the lower catchment of Adnera Creek, slopes are greater than 1% and the drainage network is more strongly incised.

**SOILS** - Duplex red earths (Dr 1.12). These have a dark red sandy loam A-horizon, 0.15 m deep, pH 6.5-7.0 which is massive and earthy. There is an abrupt boundary to a weakly pedal sandy clay B-horizon, red in colour with pH 7.0-8.0. Surfaces are weakly crusted and often feature a lag deposit of coarse quartz gravel and laterite nodules, and soils near White Rock Dam are slightly saline.

**VEGETATION** - Sparse gidyea with a scattered shrub cover of fuschia bush, green-leaf cassia and spiny saltbush. Curly windmill grass predominates under the gidyea canopy with ruby saltbush, but open areas support an annual pasture of woollyoat grass, some eight-day grass and occasional tussocks of desert bluegrass, umbrella grass and neverfail. Slightly saline soils near White Rock Dam support winged chloris, katoora, grey copper-burr and frankenia, and the Adnera Creek area features corridors of dense gidyea along well-defined watercourse channels.
LAND MANAGEMENT - This land type is subject to significant water erosion due to natural processes, and active scouring and deposition is common along minor drainage channels in response to storm runoff. In particular, areas with saline soils and a marked hard-pan exhibit some scalding, but other surfaces have gravelly lag deposits which slow the rate of erosion.

The loss of groundcover through the effect of grazing will intensify erosion processes and in particular, will increase soil loss from open areas supporting annual grasses. Open areas will also be subject to wind erosion when surfaces are bare, resulting the accumulation of drift amongst the gidyea.

Pastures are of good quality and high palatability. Prolonged heavy use, however, may result in a decline in the abundance of woollyoat grass and a predominance of eight-day grass and copperburr. In a degraded state, the feed will be short-lived and lack substance.

Land Unit 3.1
In the lower catchment of Adnera Creek slopes are greater than elsewhere on this unit, and natural erosion processes are more active. This is exemplified by the well-defined network of minor drainage channels, active deposition and scouring (left foreground) and an extensive lag deposit of quartz gravel and laterite nodules.
Land Unit - 3.2

GENERAL DESCRIPTION - Plains with gravelly gilgaied soils; treeless with desert bluegrass and neverfail.

GEOLoGY - Partially stripped Cainozoic laterized deep-weathering profile derived from sedimentary rocks (Stuart Bluff Formation).

LANDFORM - Plains with very gentle slopes (less than 1%) and without drainage features or other relief.

SOILS - Gilgaied red clays (Ug 6.6). Soil texture grades from a light clay at the surface to a medium clay at 0.3 m, with a trend in soil colour from reddish brown to a dark reddish brown. Profiles are moderately pedal throughout, and have a neutral reaction trend (pH 6.5-7.0). Surfaces are crabholed, strongly crusted and commonly mantled with sandstone gravel.

VEGETATION - A grassland of neverfail and desert blue-grass. Annual herbage species were absent at the time of survey, but are likely to be present in most seasons.

LAND MANAGEMENT - The soils of this unit have a very low erosion potential. They are subject to seasonal swelling and shrinkage and provide an unstable foundation for the construction of buildings, roads and fences.

Pastures are of moderate quality and have a high grazing capacity, but palatability declines markedly when feed becomes rank and dries off. Stock will fully utilize annual grasses and herbage species present, ignoring the perennial grasses unless bearing green shoots, even when feed is scarce.
Land Unit 3.2

Pastures consist mainly of desert bluegrass and neverfail. Neverfail is dominant within the crabhole depressions.
4. **PEDIMENT**

A pediment surface is a rock-floored plain characterized by very gentle slopes, low surface relief and few drainage features. Since soils develop directly from freshly-weathered parent rock, they have a superior mineral content and fertility to those derived from deeply weathered substrates. Typically, pediment surfaces occur in situations where geologic processes have completely stripped deeply-weathered substrate materials.

**Land Unit - 4.1**

**GENERAL DESCRIPTION** - Granite plains; sparse mulga with annual grasses, mainly mulga grass.

**GEOLOGY** - Proterozoic granites and gneissic granites (Woodgreen Granite Complex).

**LANDFORM** - Very gently undulating plains with slopes of less than 1% and relief of less than 5 m. Drainage features are usually absent, but creeks traversing the unit develop straight, narrow and relatively shallow channels. Plains near White Rock feature broad drainage floors and these are described as Unit 2.1. Granite outcrop up to 1.5 m in height commonly occurs throughout the unit.

**SOILS** - Red earths (Gn 2.12). Profiles grade from a dark reddish brown sandy clay loam, pH 6.5, at the surface to a red light clay, pH 7.0, at a depth of 0.4 m. They are massive and earthy throughout. Surfaces are weakly crusted and usually veneered with grit or fine gravel. Lag deposits of coarse quartz gravel are sometimes present, and gravelly material is also common in the lower parts of most profiles. Variants within the Unit include shallow profiles with sandy loam surface horizons, and light clay surfaces associated with the crests of broad rises within Unit 2.1.
VEGETATION - Sparse mulga, witchetty bush, long-leaved corkwood and occasionally bloodwood over an annual pasture of mulga grass. Scattered shrubs, including blue-leaf cassia, dead finish and smokebush, are often present, and broombush occurs on sandy areas. Woollyoat, eight-day and wire grasses and lifesaver burr comprise a minor component of pastures, while curly windmill, umbrella and cotton panic grasses are present beneath the tree canopy. Tussocks of desert bluegrass, kangaroo grass and silky browntop grow in minor depressions, and nearfail is present on light clay soils.

LAND MANAGEMENT - The soils of this unit are moderately stable, but insidious sheet erosion can reduce productivity in the event of mismanagement. This erosion is marked by a gradual increase in the amount of fine grit on the soil surface and eventually results in areas of soil loss where pasture cover is weak or non-existent. The maintenance of a minimum level of pasture cover is therefore recommended. Graded tracks and fencelines that channel the flow of runoff are likely to suffer minor rilling during heavy rainfall. Serious wind erosion is unlikely on this unit.

Pastures are highly productive and attractive to stock. Excessive grazing pressure will result in a relative increase in the abundance of less productive species, particularly eight-day grass and herbage, so seasonal spelling is desirable.
Land Unit 4.1

These plains support a sparse but productive cover of mulga grass on gritty red earth soils. Low outcrops of granite and broad termite mounds to 1m in height are of common occurrence. The low granite hills (background) have been assigned to Unit 1.1.
Land Unit - 4.2

GENERAL DESCRIPTION - Drainage floors in Unit 4.1 with duplex soils; sparse annual grasses and copperburrs.

GEOLOGY - Proterozoic granites and gneissic granites (Woodgreen Granite Complex) with minor Quaternary calcrete and alluvium.

LANDFORM - Broad tributary drainage floors with slopes of 0.5% and little surface relief other than low rises of calcrete. Narrow gutters drain into shallow sandy creek channels in the lower reaches of the landscape.

SOILS - Duplex soils (Dr 1.56). The A-horizon consists of an earthy red sandyclay loam overlying a marked hardpan at 0.2 m associated with the upper B-horizon, a massive red sandyclay. Soil reaction trend is strongly alkaline, trending from pH 7.5 at the surface to pH 9.5 at 0.3 m, and some areas are moderately saline. Surfaces are weakly crusted and are often veneered with gritty material. Red calcareous soils are associated with beds of calcrete, but these are of minor extent.

VEGETATION - This unit is treeless other than the occurrence of prickly wattle on outcrops of calcrete. Pasture species present include sparse katoora, woollyoat grass, curly windmill grass and silky browntop with frankenia, caltrop and buckbush.

LAND MANAGEMENT - The maintenance of this unit in a stable condition under grazing use may be difficult. The soils are highly erodible, subject to scalding and minor rilling, and this risk is exacerbated by saline conditions which will hamper the revegetation of any bare areas. The effect of disturbance on these soils is visible at White Rock Dam where the bypass area has been badly stripped. Since limited areas of this soil type are intermixed with large tracts of relatively stable country (Unit 4.1), management options are limited. However, it is desirable that the unit be avoided for the siting of yards or additional watering points.
Pastures are not highly productive, but the limited quantity of palatable feed grown is likely to be highly attractive to stock.

**Land Unit 4.2**

Small bare areas are common throughout this unit and are a consequence of saline soil conditions. However, soils are erodible and scalding or minor gullying will rapidly develop in disturbed areas, especially if vegetative cover is lost. Prickly wattle (background right) occurs on minor deposits of calcrete.
Land Unit - 4.3

GENERAL DESCRIPTION - Gently-undulating plains on gneiss; sparse whitewood and mulga with annual grasses, mainly woollyoat grass.

GEOLOGY - Proterozoic gneiss and minor schist.

LANDFORM - Very gently undulating plains with slopes of 1% or less and relief of less than 5 m. Drainage features are absent.

SOILS - Red earths (Gn 2.12). Surface soils consist of a dark reddish brown light sandy clay loam, pH 6.5-7.0, grading to a dark red sandy clay, pH 7.0, by a depth of 0.3 m. Profiles are massive and earthy throughout. Soil surfaces are weakly crusted and often mantled with a lag deposit of quartz gravel. In some instances, profiles have a gravelly layer at 0.2 m.

VEGETATION - Sparse whitewood and occasional mulga, long-leaved corkwood and witchetty bush, usually with scattered broombush, green-leaf cassia and blue-leaf cassia, over pastures of mainly woollyoat grass. Other species present include mulga, eight-day, woollybutt and wire grasses, smokebush and galvanised burr. Silky browntop and desert bluegrass occur in minor depressions.

LAND MANAGEMENT - This land type has a slight erosion hazard. When groundcover is sparse soils are susceptible to minor rilling and sheet erosion as a result of heavy rainfall, the latter possibly unnoticeable until significant soil loss has occurred. Surface disturbances that collect and channel runoff diagonally across slopes, including grader cuts and well-defined stock pads, will be subject to minor rilling. Although bare disturbed surfaces will exhibit some surface movement, these soils have a relatively minor susceptibility to wind erosion.

Woollyoat grass pastures are highly productive and attractive to stock. Consequently they are often subject to concentrated grazing use, which may adversely affect productivity as the woollyoat grass can be grazed out. Declining pasture composition will be evidenced by an increase in the relative abundance of mulga, eight-day and wire grasses.
as well as herbage species. Seasonal spelling is likely to improve pasture vigour.

Woollyoat grass predominates throughout this unit, conferring high pastoral productivity. The erosion hazard is generally slight but the slow loss of soil due to sheet erosion may go unnoticed until significant damage has occurred. The exposure of gravels (foreground) sometimes indicate that soil loss has taken place.
Land Unit - 4.4

GENERAL DESCRIPTION - Etch plains along creek tracts with some alluvial soils; mainly treeless with annual grasses.

GEOLOGY - Stripped Cainozoic lateritic deep weathering profile and Quaternary alluvium. Surfaces are partly veneered with coarse-textured Recent alluvium.

LANDFORM - Plains up to 1.5 km in width associated with major creek channels and floodouts. These have slopes of less than 1% along the line of drainage, often with a cross-slope of 1% from the watercourse channel down towards the margin of the plain. Relief is generally less than 3 m. The creek channels are typically narrow-and incised to a depth of up to 3 m, usually slightly meandering in their lower reaches. They are flanked by deposits of coarse-textured alluvium, often as small floodout lobes or low banks marking prior stream lines, which partly veneer an erosional surface. This surface has developed as a result of past stream action stripping alluvium or a deeply-weathered profile and exposing underlying substrates, either relict stream bed deposits, pallid zone material, or partially-weathered granite.

SOILS - Two soil types are present. Alluvial soils (Uc 5.11) flank the creek channels and occur as low sandy banks throughout the unit. To a depth of 0.7 m they consist of a dark reddish brown sandy loam, pH 6.5-7.0, below which they grade to a sandy clay loam. Profiles are massive and earthy, with weakly-crusted surfaces veneered with loose sand.

Red earths (Gn 2.12) occur on the erosional surfaces. Profiles grade from a dark reddish brown sandy clay loam, pH 6.5, at the surface to a dark red sandy clay, pH 7.0, at about 0.5 m, and are massive and earthy throughout. Surfaces are crusted and often feature a veneer of grit and deposits of quartz or laterite gravel.

VEGETATION - The alluvial soils support sparse ironwood with occasional beefwood and scattered broombush over pastures dominated by kerosene grass. Other species present include woollybutt, eight-day and woollyoat grasses, with curly windmill grass beneath the ironwood canopy.
The red earths support very sparse whitewood or mulga over an annual pasture of mulga grass. Other species present include woollyoat, eight-day and wire grasses, lifesaver burr and scattered tussocks of umbrella grass, the latter occurring beneath the tree canopy.

LAND MANAGEMENT - The alluvial soils are susceptible to wind erosion when denuded, and although revegetation occurs readily after adequate rainfall, soil fertility is eventually depleted by this process, resulting in a decline in pastoral productivity.

The red earths are commonly subject to sheet erosion by runoff if pasture cover is poor, resulting in the expansion of areas with a marked surface crust which remain sparsely vegetated or bare. Eroded soils such as 5 km north-west of Skinner Bore are probably slightly saline, and ponding banks may prove to be the only effective method of reclamation.

Pastures are of moderate quality and are attractive to stock. Prolonged heavy grazing pressures will result in a decline in the relative abundance of woollyoat grass and other productive species, and an increase in less substantial species such as button, small-burr and five-minute grasses or herbage.

Land Unit 4.4
Creek bank near Buggy Camp Swamp, exposing a detrital laterite deposit overlying stripped pallid zone material and weathered rock. The associated plain (background) supports mulga grass pastures on red earth soils.
Land Unit - 4.5

GENERAL DESCRIPTION - Stony, gently-sloping sandstone plains; sparse mulga and fuschia bush with mainly woollyoat grass.

GEOLOGY - Late Proterozoic or Paleozoic quartz sandstone, lithic sandstone and siltstone (Central Mt. Stuart Beds). Minor calcrete.

LAND FORM - Plains with slopes of less than 1% and very low relief (less than 5m). Drainage features are absent other than minor water-courses with straight narrow and shallow channels spaced about 600 m apart.

SOILS - Red earths (Gn 2.12). Profiles are shallow and stony, consisting of a dark reddish brown sandy clay loam, pH 7.0, with up to 60% gravel by a depth of 0.6 m. Surfaces are gravelly and weakly crusted.

Red calcareous soils are associated with areas of calcrete outcrop.

VEGETATION - The red earths support sparse mulga with occasional bloodwood and witchetty bush in association with an open shrub cover of fuschia bush and green-leaf cassia. Pastures consist of woollyoat grass with oat, kerosene and woollybutt grasses, copperburr and common sida. The red calcareous soils carry sparse northern myall over mainly oat grass.

LAND MANAGEMENT - The soils of this unit have a slight wind erosion hazard and are moderately susceptible to water erosion, either as sheet loss or gullying. New tracks should be designed to avoid the concentration of runoff, following ridge lines where possible.

Excessive grazing pressure over a number of seasons will contribute to a decline in the relative abundance of selectively grazed productive pasture species such as woollyoat grass and an increase in less desirable species such as common sida. The calcareous soils are a favoured habitat of rabbits, which apply localised grazing pressure.
Land Unit 4.5

Areas of calcareous soils support northern myall over oat grass (foreground) and are a favoured habitat of rabbits. Most of the landscape features non-calcareous soils carrying mulga and fuschia bush (background).
5. **LIMESTONE PLAINS**

These units have developed on chalcedonic limestone and calcretes. The chalcedonic limestone was deposited as shallow lake bed deposits, while the calcretes are a 'limestone' consisting of mainly sandy material cemented by calcium carbonate. The carbonate is thought to have precipitated out of shallow groundwaters during a period when water tables were receding as climates became more arid. Soils are variable, depending on whether they have formed from the limestone or deposits of alluvial or wind-borne material burying the limestone.

**Land Unit - 5.1**

**GENERAL DESCRIPTION** - Low plateaux of chalcedony; sparse mulga and witchetty bush with oat or kerosene grass.

**GEOLOGY** - Tertiary chalcedonic limestone over siltstone and mudstone (Waite Formation).

**LAND FORM** - Low plateaux with relief to 10 m, having slightly sloping or level upper surfaces. Plateaux margins texture breakaways with slopes of 5-10%, dissected by minor drainage lines. Large areas of rock outcrop.

**SOILS** - Red calcareous soils (Gn 2.13). Profiles are gravelly and shallow, consisting of a dark reddish brown sandy loam, pH 7.0, and 30% medium gravel to a depth of 0.1 m, grading to a calcareous dark red sandy clay loam, pH 8.5, with 50% medium gravel, by a depth of 0.3 m. They are earthy throughout. Small areas have medium-textured surfaces.

**VEGETATION** - A sparse open shrubland of witchetty bush with occasional mulga, bloodwood and whitewood, together with silver cassia, broombush and fuschia bush. Pastures consist mainly of kerosene grass and woollybutt, with oat, eight-day and buck wanderrie grasses and common sida.

Where surface soils are medium-textured, pastures consist of oat and limestone oat grasses.
LAND MANAGEMENT - Surface soils are locally susceptible to wind erosion, but surface gravel provides some protection. Pastures are moderately productive. Declining pasture condition will be marked by the disappearance of oat grass and an increase in herbage growth. Rabbits may colonise this land type.

Land Unit -5.2

GENERAL DESCRIPTION - Gently rolling limestone plains; very sparse prickly wattle or witchetty bush with oat and limestone oat grasses.

GEOLOGY - Late Tertiary calcretes.

LANDFORM - Level or slightly undulating plains with relief of less than 3 m, drained by broad, poorly-defined depressions.

SOILS - Red calcareous soils (Um 5.11). Profiles are shallow, gravelly and calcareous throughout, carbonate content increasing with depth. The soil material is dark reddish brown, sandy clay loam in texture, pH 8.5-9.0, and earthy or weakly pedal throughout. Carbonate nodules comprise up to 25% of the soil material near the surface, and culminate in a calcrete hardpan by 0.3-0.5 m. Surfaces are gravelly and have a well developed crust.

VEGETATION - A sparse shrubland of witchetty bush with occasional bloodwoods and prickly wattle, over a groundcover of oat and limestone oat grasses.

LAND MANAGEMENT - These soils became powdery if disturbed when dry, and can be a source of dust in this state. Removal of fine material as dust, while not a major form of soil loss, contributes to the wind stripping of localised areas and consequent fertility decline. Bare soils are subject to insidious sheet erosion when exposed to storm runoff and tracks or pads that concentrate runoff may rill to expose the underlying calcrete.
The oat grass component of pastures is palatable and selectively grazed, but limestone oat grass is usually ignored by stock.

Rabbits favour this habitat and have had a significant impact on the regeneration of witchetty bush, as the seedling growth of this shrub is highly palatable and selectively destroyed. Consequently areas such as north of Buggy Camp Bore have a few old shrubs and dead timber, but little regrowth.

Land Unit - 5.2

This land unit is characteristically open, supporting annual pastures of oat and woollyoat grass. It is a favoured habitat for rabbits.
Land Unit - 5.3

GENERAL DESCRIPTION - Limestone plains broken by low rises; witchetty bush, prickly wattle and umbrella bush with mainly oat grass.

GEOLOGY - Late Tertiary calcretes and alluvium.

LANDFORM - Plains with slightly undulating surfaces consisting of low rises of calcrete with relief to 2 m spaced about 100 m apart. Defined drainage features are absent.

SOILS - Earthy sands (Uc 5.21). These have shallow profiles, usually to 0.3 m in depth, overlying calcrete. The soil material is dark red or dark reddish brown, sandy loam in texture, pH 6.5-7.0, non-calcareous and with an earthy fabric throughout. Surfaces are loose and strewn with cobbles of calcrete. Small areas of red calcareous soils are associated with outcrops of calcrete.

VEGETATION - A shrubland of witchetty bush with prickly wattle, umbrella bush, green-leaf cassia and broombush over kerosene grass and woollybutt. Other species present include the woollyoat grass and smokebush with wire grass present in depressions. Oat and limestone oat grasses are present on calcareous soils.

LAND MANAGEMENT - The coarse-textured soils of this unit are moderately susceptible to wind erosion, but surfaces are partially protected by their stoniness and the dense shrub cover they support. Their potential for water erosion is slight.

Pastures are of moderate quality. Kerosene and woollybutt grasses are only sparingly palatable to stock, and more acceptable species such as woollyoat grass may be eliminated by selective grazing pressure. Burning practices may assist in thinning shrub density and encourage pasture growth.
Land Unit - 5.3

An open shrub cover of witchetty bush, prickly wattle and umbrella bush occurs throughout this unit. Red earth soils predominate, carrying mainly kerosene grass and woollybutt.
Land Unit - 5.4

GENERAL DESCRIPTION - Limestone plains; sparse bloodwood and corkwood with buck spinifex.

GEOLOGY - Late Tertiary calcretes and possibly Quaternary aeolian deposits.

LANDFORM - Plains with level surfaces and relief of less than 3 m, drained by a poorly-defined network of shallow depressions.

SOILS - Shallow earthy sands (Uc 1.43). Soils overlie calcrete, and may be less than 0.1 m deep. They are dark reddish brown, sandy loam in texture, pH 8.5 and non-calcareous. Surfaces are gravelly and strongly crusted.

VEGETATION - An open hummock grassland of buck spinifex with sparse bloodwood, ghost gum, long-leaved corkwood, dogwood and sandhill wattle.

LAND MANAGEMENT - Soils are protected from wind erosion by surface gravel and strong crusting. The unit has negligible grazing value.
Land Unit 5.4
Buck spinifex occurs throughout these calcrete plains, and grazing value is negligible.
Land Unit 5.5

GENERAL DESCRIPTION - Narrow limestone rises; red mallee with buck spinifex.

GEOLOGY - Late Tertiary calcrete.

LANDFORM - Low, narrow platforms of calcrete with level surfaces and relief to 3 m above dissected areas. Drainage features absent.

SOILS - Red calcareous soils (Um 5.11), usually shallow and overlying calcrete at 0.5 m. The soil material consists of an earthy reddish brown sandy clay loam, pH 9.5 and calcareous throughout. Gravel is abundant on the surface, increasing with depth to about 50% at 0.4 m, consisting mainly of calcrete but also laterite nodules. A well developed surface crust is present.

VEGETATION - An open woodland of red mallee in association with buck spinifex. Sparse limestone oat grass occurs between the spinifex tussocks.

LAND MANAGEMENT - Minor rilling may result from earthworks on this landscape. The potential for grazing and its possible impact is negligible.

Land Unit 5.6

GENERAL DESCRIPTION - Broad, flat-floored drainage depressions; open mulga, bloodwood and ghost gum with mainly woolly oat grass and clumps of perennial grass.

GEOLOGY - Late Tertiary calcrete and mudstone with Quaternary alluvium.

LANDFORM - Flat-floored drainage depressions up to 500 m in width with slopes of less than 1%, draining Land Units 5.3 and 5.4.
SOILS - Red earths (Gn 2.12). Profiles grade from a dark reddish brown sandy clay loam, pH 6.5, at the surface to a dark red light clay, pH 6.5, at a depth of 0.5 m. They are a weakly pedal throughout and free of carbonate. Surfaces are weakly crusted and fine nodules of laterite are commonly present.

VEGETATION - A sparse woodland of bloodwood and ghost gum with mulga, witchetty bush, long-leaved corkwood and wild currant over pastures of woolly oat and mulga grass. Oat, kerosene and wire grasses, lifesaver burr and galvanised burr are also present. Low lying areas support dense clumps of silky browntop, kangaroo and umbrella grasses, the latter also occurring beneath the canopy of low growing trees.

LAND MANAGEMENT - This unit has a moderate water erosion hazard. Earthworks such as the grading of tracks may channel the sheet flow of runoff and initiate rilling. The unit supports highly productive pastures and is likely to attract heavy selective grazing pressures. Declining range condition will be primarily marked by a decrease in the abundance of umbrella grass.
Land Unit 5.6

Low lying areas support clumps of silky browntop and kangaroo grasses (foreground) while the remainder of this unit carries woollyoat and mulga grasses.
6. **COLLUVIAL FANS**

Colluvial fans of unconsolidated rock material occur at the base of mountainous terrain at two locations on Mt Skinner. The colluvium is derived from the mass-wasting of quartzite or sandstone, and consists of gravel or cobble-sized material.

**Land Unit 6.1**

**GENERAL DESCRIPTION** - Stony fan deposits adjacent to sandstone ranges; open mulga with wire grass.

**GEOLOGY** - Quaternary colluvium.

**LANDFORM** - Piedmont fans up to 1.5 km long with very gently sloping surfaces (slopes of less than 1%) and relief of up to 5 m where dissected by narrow creek channels.

**SOILS** - Red earths (Um 5.51) with shallow, stony profiles. The surface soil material consists of a dark reddish brown sandy clay loam, pH 6.5 and with 5% medium gravel, grading to dark red, pH 8.5–9.0 and 5-50% medium gravel by 0.4 m. Profiles are earthy and non-calcareous throughout. Surfaces are crusted and strewn with gravel and cobbles of quartzite or sandstone.

Red calcareous soils are present along the lower margin of the fan north of Wagon Gap.

**VEGETATION** - A sparse open woodland of mulga with witchetty bush, blue and green-leaf cassias and solitary ghost gums over wire grass. Other species present include sparse eight-day and woollyoat grasses, cotton panic, kerosene grass and lifesaver burr.

The red calcareous soils support open whitewood and bloodwood over oat grass pastures.

**LAND MANAGEMENT** - Surfaces are usually well protected by stone and gravel, but earthworks that channel sheet runoff flows may scour. The wire grass pastures are unattractive to stock and receive only light use.
Land Unit 6.1
Colluvial gravel and cobbles of quartzite at the foot of Mt Harper.
7. FLOODPLAINS AND FLOODOUTS

Alluvial deposits of various ages, including relict floodouts, comprise this group of units. The youngest soil, of Unit 7.1, has a moderate content of freshly weathered minerals and therefore relatively fertile, while Units 7.2 and 7.4 are favoured by run-on flows and a high moisture holding capacity. The soils of Unit 7.3 are highly weathered and infertile.

Land Unit 7.1

GENERAL DESCRIPTION - Sandy floodplains and floodouts; ironwood and whitewood with kerosene grass.

GEOLOGY - Quaternary alluvium.

LANDFORM - Sandy floodplains along the Sandover River, up to 1.5 km wide with relief to 5 m including levees and old flood channels, and also floodouts adjacent to ranges with level relief and slopes of less than 1%, fed by narrow creek channels.

SOILS - Alluvial soils (Uc 5.11). Profiles grade from a reddish brown sandy loam, pH 6.5-7.0, at the surface, to a red sandy loam, pH 7.0-7.5 by a depth of 0.6 m. Structure is massive with a sandy or slightly earthy fabric.

VEGETATION - A sparse open woodland of whitewood and ironwood with occasional bloodwood, ghost gum, supplejack and beefwood, together with sparse tall shrubs including prickly wattle, colony wattle and emu-bush. Pastures consist dominantly of kerosene grass, with woollybutt, oat, eight-day and wire grasses. Curly windmill and umbrella grasses grow beneath the tree canopy.

LAND MANAGEMENT - Soils with surface textures of sandy loam are prone to wind erosion, and the maintenance of groundcover should be a major criteria for managing this land type if drift is to be avoided.
The kerosene grass pastures are moderately productive. Much of this productivity is derived from minor species such as oat grass, which are selectively grazed, since kerosene grass is only sparingly palatable. Prolonged heavy grazing pressures can therefore eliminate the most acceptable species, but have little impact on the kerosene grass.

Land Unit 7.1
Pastures consist of kerosene grass and are moderately productive. A small proportion of highly palatable oat grass is usually present.

Land Unit 7.1
The soils of this unit are coarse textured with loose surfaces, and are consequently vulnerable to wind erosion. They readily re-vegetate after rain, but loss of fine material as dust eventually results in declining fertility.
Land Unit 7.2

GENERAL DESCRIPTION - Flat floored drainage depressions; dense mulga with silky browntop and annual grasses.

GEOLOGY - Quaternary alluvium.

LANDFORM - Flat-floored drainage depressions, usually 0.3-0.6 km wide, with slopes of less than 0.5% and no surface relief. Runoff drains as sheet flow.

SOILS - Red earths (Gn 2.12). Profiles grade from a dark reddish brown sandy clay loam, pH 6.5-7.0, at the surface to a red sandy clay, pH 7.0, by 0.5 m, and are weakly pedal. Surfaces are crusted and gravel is usually absent.

VEGETATION - A woodland or open woodland of mulga or occasionally witchetty bush with solitary ghost gums. Groundcover consists predominantly of woollyoat and mulga grasses, or eight-day grass where the mulga canopy is closed, together with silky browntop, neverfail, cotton panic and wire grasses, lifesaver burr and occasionally ferns in shaded situations.

LAND MANAGEMENT - Soil disturbance along the line of the depressions should be avoided. Graded tracks or fencelines that channel the sheet flow of runoff are likely to scour and may subsequently become choked with sandy sediment.

Pastures are of good quality and sustain green pick for longer than surrounding areas.

Land Unit - 7.3

GENERAL DESCRIPTION - Prior stream deposits as low sandy rises; open mulga and witchetty bush with wire grass.

GEOLOGY - Quaternary alluvium.
LANDFORM - Low, elongated and braided banks with relief of less than 2 m, and commonly 0.5 -1.0 km wide. These are prior stream deposits, relicts of an extensive alluvial system that operated under a former climatic regime.

SOILS - Red earths (Um 5.52). Representative profiles grade from a dark reddish brown sandy clay loam, pH 6.0, at the surface to a dark red sandy clay loam, pH 6.5, by a depth of 0.5 m. They are massive and earthy, with a well developed surface crust.

VEGETATION - A sparse open woodland of mulga with some witchetty bush over mainly wire grass. Other species present include woollybutt, cotton panic and lifesaver burr.

LAND MANAGEMENT - Minor rilling may occur along graded tracks of fencelines, but otherwise the erosion hazard is slight. Pastures are unattractive to stock and of negligible pastoral value.

Land Unit - 7.4

GENERAL DESCRIPTION - Drainage depressions; open whitewood with a dense growth of silky browntop.

GEOLOGY - Quaternary alluvium.

LANDFORM - Flat-floored drainage depressions, usually 0.3 km in width, often draining sandstone landscapes. A central watercourse may be present, but most runoff drains as a sheet flow. Slopes are 0.5% or less.

SOILS - Red earths (Um 5.52). Profiles are essentially uniform to a depth of at least 0.5 m, consisting of a dark reddish brown sandy clay loam pH 6.5-7.0 which is massive and earthy, or sometimes weakly pedal. Surfaces are weakly crusted.
VEGETATION - Sparse whitewood, often with scattered ironwood, bloodwood, dead finish, emu bush, broombush and silver cassia, over a tussock grassland of desert bluegrass, silky browntop and kangaroo grass.

LAND MANAGEMENT - A minor erosion hazard. Graded lines and tracks located diagonally across or along this unit will channel runoff and may initiate gullying.

Silky browntop and desert bluegrass are acceptable to stock when green and actively growing, and have moderate nutritional value. However, feed value and palatability decline rapidly as tussocks grow tall and rank, and they will then remain ungrazed. Utilisation might be improved by burning the rank growth, leaving the butts to produce green shoots.

Land Unit 7.4

These depressions support a dense growth of perennial tussock grasses such as silky browntop and bluegrass.
8. **SWAMPS**

These are the terminal areas of drainage systems, subject to periods of inundation when creek flows are adequate. Soils are fine-textured and have a high moisture holding capacity, but require significant rainfalls to produce a useful growth response.

**Land Unit 8.1**

**GENERAL DESCRIPTION** - Swamps with light clay soils; dense coolibah with perennial grasses and open areas with lignum.

**GEOLOGY** - Quaternary alluvium.

**LANDFORM** - Swamps at the foot of sandy floodouts, up to 4 sq. km in area. They have minor relief associated with floodout channels and closed depressions up to 200 m in diameter.

**SOILS** - Alluvial soils (Uf, Ua 5.51). Most areas have a dark reddish brown light clay A-horizon, pH 6.5, massive and earthy, to a depth of 0.2 m, overlying a hardpan which a hand auger failed to penetrate. Surfaces are weakly crusted.

Within the closed depressions, profiles exhibit obvious layering, and consist of a brown sandy clay loam, pH 6.5, with an earthy fabric, 0.4 m deep overlying a strong brown cemented sand, pH 7.0, with a sandy fabric. Surfaces are strongly crusted and partly veneered with loose deposits of coarse sand.

**VEGETATION** - The clay soils support an open woodland of coolibah over a tussock grassland of desert bluegrass, silky browntop and Queensland bluegrass. Sandier soils in closed depressions support sparse coolibah with an open cover of lignum over a sparse groundcover of grasses such as weeping lovegrass.

**LAND MANAGEMENT** - The soils on this landscape have a low erosion potential. Minor scouring may occur if earthworks channel floodout flows.
Pastures are of moderate quality when fresh growth is available, but are ignored by stock when rank and dry.

Land Unit 8.1
Most areas of this unit support coolibah and a dense growth of silky browntop and desert bluegrass.
Land Unit 8.2

GENERAL DESCRIPTION - Swamps with crabholed surfaces and calcrete outcrop; sparse coolibah with neverfail.

GEOLOGY - Quaternary alluvium and calcrete.

LANDFORM - Swamps, consisting of closed depressions with level floors, usually featuring crabhole gilgai.

SOILS - Brown clays (Ug 6.3). Profiles feature a stony brown light clay A-horizon, pH 9.0 and moderately calcareous, grading into a brown medium clay B-horizon, pH 9.0 and non-calcareous, by a depth of 0.5 m. They are strongly pedal throughout. Cobbles of calcrete, together with calcrete nodules and sandstone gravels, are locally abundant on the soil surface, which is weakly crusted and has marked cracking.

VEGETATION - Very sparse coolibah over an open tussock grassland of neverfail and desert bluegrass. Northern bluebush is occasionally present and was probably more abundant prior to pastoral use.

LAND MANAGEMENT - This landscape has a negligible erosion hazard. As soils shrink and swell, they are unsuitable as a foundation for the construction of buildings or other improvements. Pastures are of moderate quality and high carrying capacity when green and growing, but palatability and nutritional value rapidly decline as feed dries off. If sufficient moisture is available, neverfail continues to produce green growth when hard grazed.

Northern bluebush attracts selective grazing pressure since it is highly palatable, has an excellent feed value and remains green when other feed is dry. The re-establishment of this species appears to require a seed source and a prolonged period of rest from grazing.
Land Unit - 8.3

GENERAL DESCRIPTION - Swamps with crabholed surfaces, regularly flooded; treeless with northern bluebush and neverfail.

GEOLOGY - Quaternary alluvium.

LANDFORM - Regularly flooded closed depressions with level floors occasionally with very low terraces around the margins. Strongly-developed seasonal cracking microrelief.

SOILS - Brown clays (Ug 6.3). These are strongly pedal seasonally cracking soils with a brown sandy clay A-horizon, pH 6.0-6.5, 0.2 m deep overlying a brown medium clay B-horizon, pH 6.5-7.0. They feature rough-faced subangular blocky peds throughout. Surfaces are strongly crusted with cracks up to 0.15 m wide, and carry deposits of rounded, ferruginized sandstone gravels.

VEGETATION - A sparse open shrubland of northern bluebush in association with neverfail. Gravelly deposits occasionally support mimosa bush.

LAND MANAGEMENT - No erosion hazard. Soils shrink and swell and are unsuitable as a foundation for any structures, including fencelines.

Northern bluebush is a source of good quality feed and is highly palatable to stock. These swamps can therefore attract heavy grazing pressures which may eventually eliminate the bluebush. Prolonged flooding also destroys this species. Valuable regeneration was occurring on Tomahawk Swamp at the time of the survey, and this will be assisted if grazing pressures remain light.
Land Unit 8.3

The surface of Tomahawk Swamp exhibits well-developed cracking features (foreground). Mature shrubs of northern bluebush are sparse, but young plants are present throughout this area.
9. DUNEFIELDS AND SANDPLAIN

Windblown sands are the substrate of these units, which have developed during periods of extreme aridity in recent geological time. Differences between the units arise mainly through variations in the depth of the sands, and their particle size composition. The soils contain no appreciable amounts of freshly-weathered minerals and are therefore chemically infertile. They have a low moisture holding capacity, although plants can readily extract any soil moisture present. Herbage species can therefore respond rapidly to light falls of rain.

Land Unit - 9.1

GENERAL DESCRIPTION - Sandplain, often as gently rising terrain; blue mallee with spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain, usually as slightly elevated terrain with extremely low relief, occasionally with minor sand dunes. Drainage features are usually absent.

SOILS - Earthy sands (Uc 1.23). Profiles are deep and uniform, consisting of a red clayey sand, pH 6.0, which is massive and earthy. Surfaces are usually weakly crusted or loose.

VEGETATION - A sparse open woodland of blue mallee and red-bud mallee, with scattered sandhill wattle, umbrella wattle and desert kurrajong, over a groundcover of hard spinifex. Sparse kerosene, wire and woollyoat grasses, chocolate bush and parakeelya occur between the hummocks of spinifex.

LAND MANAGEMENT - No erosion hazard while the spinifex cover remains intact. This unit has a negligible grazing potential although stock will be attracted when parakeelya is seasonally available. Burning practices can encourage a short-term flush of moderately palatable
growth, improve wildlife habitat and reduce the wildfire risk to adjacent pastoral areas.

Land Unit - 9.1  
Blue Mallee (right) grows with red-bud mallee and spinifex throughout this type of country. The soils lack fertility and moisture-holding capacity, so have negligible pastoral value.
Land Unit - 9.2

GENERAL DESCRIPTION - Dunefields with prominent, narrow-crested sand rises.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Dunefields featuring north-west trending longitudinal sand ridges, usually 0.2 km apart, with narrow crests and average relief to 19 m.

SOILS - Siliceous sands (Uc 1.23). Profile descriptions not recorded.

VEGETATION - A sparse open woodland of blue and red-bud mallees over hard spinifex.

LAND MANAGEMENT - No erosion hazard while the spinifex cover remains intact. Major soil disturbance may initiate a blowout. The unit has no pastoral value.

Land Unit - 9.3

GENERAL DESCRIPTION - Sandplain adjacent to upland terrain, often penetrated by minor creeks; acacias with spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain with level featureless surfaces. Narrow drainage channels from adjacent upland areas often flood out on the unit.

SOILS - Earthy sands (Uc 1.23). Profiles are deep and uniform, consisting of a red or dark red clayey sand, graduating from pH 6.0 at the surface to pH 6.5-7.0 at 0.5 m, massive and earthy throughout. Surfaces are generally in a loose condition.

VEGETATION - Sparse sandhill wattle, dogwood, bloodwood and occasionally ghost gum and long-leaved corkwood over an open hummock grassland of
hard spinifex. Kerosene, wire and woollybutt grasses occur amongst the spinifex hummocks.

LAND MANAGEMENT - No erosion hazard while the spinifex cover remains intact.

The unit has negligible pastoral value. Burning practices will reduce the risk of wildfire affecting adjacent grazing land, and promote a short-term flush of moderately palatable species.

Land Unit - 9.3
Sandhill wattle (foreground) is common throughout this land unit, together with scattered bloodwoods. Although a limited quantity of kerosene grass is sometimes present, grazing potential is very low.
Land Unit - 9.4

GENERAL DESCRIPTION - Sandplain with low relief, desert kurrajong and spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain with level surfaces and extremely low relief. This unit occupies low lying areas amongst the slightly elevated terrain of Unit 9.1.

SOILS - Earthy sands (Uc 1.23). Profile descriptions not recorded.

VEGETATION - Sparse kurrajong and desert bloodwood with scattered desert grevillea and dogwood over a hummock grassland of hard spinifex.

LAND MANAGEMENT - This landscape is stable while the spinifex cover remains intact. The unit has negligible pastoral value. Burning practices may stimulate a short-lived growth of moderately palatable feed and reduce wildfire risk.

Land Unit - 9.5

GENERAL DESCRIPTION - Sandplain with low relief; open witchetty bush, mulga and ironwood with spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain with featureless surfaces.

SOILS - Earthy sands (Uc 1.23). These are deep red soils, clayey sand in texture with pH 5.5 throughout. They are massive and earthy, and a weak surface crust is often present.

VEGETATION - A sparse open woodland of mulga with witchetty bush, dogwood, bloodwood, sandhill wattle and occasionally ironwood over hard
spinifex. Other species present include woollybutt, wire grass, cotton panic and a low grey shrub, *Newcastlia cladotricha*. Parakeelya should be seasonally abundant.

**LAND MANAGEMENT** - The erosion hazard is negligible while the spinifex cover remains intact. If denuded, surfaces will be subject to wind drift.

This unit has low pastoral value, but will be grazed when seasonal rains produce a flush of herbage, particularly parakeelya.

*Land Unit - 9.5*

This unit features mulga or ironwood in association with spinifex. Palatable grasses and herbage species are in greater abundance than other types of spinifex country.
Land Unit - 9.6

GENERAL DESCRIPTION - Sandplain with low dunes bordering swamps and the Sandover River; open whitewood with spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain, either featureless or with low, north-west trending dunes as near Goofy Bore.

SOILS - Earthy sands (Uc 1.23). These have deep uniform profiles, red in colour with a clayey sand texture, pH 6.5-7.0 at the surface trending to pH 7.0-7.5 by a depth of 0.5 m. They are massive and earthy soils, and often have weakly crusted surfaces.

VEGETATION - Sparse whitewood or supplejack with scattered prickly wattle, bloodwood, ironwood, long-leaved corkwood and beefwood, over a hummock grassland of hard spinifex. Kerosene, wire and woollybutt grasses and chocolate bush grow between the spinifex hummocks.

LAND MANAGEMENT - No erosion hazard while the spinifex cover remains intact, but surfaces will drift if denuded by fire. No pastoral value, but seasonal flushes of herbage growth, particularly parakeelya, will attract stock. Regular burning will reduce wildfire risk and may promote a shrub-lived growth of moderately palatable feed.

Land Unit - 9.7

GENERAL DESCRIPTION - Drainage depressions in sandplain areas; open mulga and/or coolibah with spinifex.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Sandplain, occupying low lying parts of the landscape, often with poorly defined drainage lines or circular closed depressions.
SOILS - Red earths (Gn 2:12). Profiles graduate from a dark reddish brown sandy loam pH 7.0, at the surface to a dark red sandy clay loam pH 7.5, at about 0.5 m. They are massive and earthy throughout. Surfaces are weakly crusted and have a veneer of sandy deposits.

VEGETATION - Sparse coolibah, often with a mallee form, with occasional mulga, witchetty bush, prickly wattle and long-leaved corkwood, over a hummock grassland of hard spinifex. Wire, kerosene and woollyoat grasses grow amongst the spinifex, and desert bluegrass is present in depressions.

LAND MANAGEMENT - Surfaces are likely to drift when bare and disturbed, and may scour where runoff flows are diverted along graded tracks. Pastoral value is limited, but palatable herbage may grow following winter rainfalls.

Land Unit - 9.7
Low growing coolibahs and spinifex are characteristic of this unit. Wire and kerosene grasses occupy the open areas between the spinifex dumps, and occasionally sandhill canegrass (middle distance) is present.
Land Unit - 9.8

GENERAL DESCRIPTION - Broad floodout tracts in sandplain areas; open ghost gum and bloodwood with spinifex and some silky browntop.

GEOLOGY - Quaternary aeolian deposits.

LANDFORM - Gently-sloping plains with minor alluvial deposits where streams from upland areas flood out. Most of this landscape represents areas of peneplain buried by only a shallow aeolian deposit.

SOILS - Earthy sands (Uc 1.23). Profiles graduate from a dark reddish brown sandy loam, pH 6.0, at the surface to a red sandy loam, pH 6.5, by a depth of 0.4 m, and are massive and earthy throughout. Surfaces are crusted and in contrast to other aeolian soils in the survey area, feature abundant termite mounds.

VEGETATION - Sparse ghost gum and bloodwood, occasionally with whitewood and long-leaved corkwood, over a hummock grassland of hard spinifex. Silky browntop and wire grass are also common.

LAND MANAGEMENT - Soils will be subject to minor drift when denuded, and graded tracks channelling surface flows may scour with high intensity rainfalls.

The unit has limited pastoral value, which will be maximised by burning, which encourages the growth of herbage and kerosene grass, and removes rank growth from silky browntop.
REFERENCES


83.
# Appendix

## Specific Names of Plants Mentioned in Text

### Grasses

- Wire grass (on floodplains)
- Kerosene grass
- Mulga grass
- Wire grass
- Desert bluegrass
- Winged chloris
- Queensland bluegrass
- Cotton panic
- Umbrella grass
- Oat grass
- Limestone oat grass
- Woolly oat grass
- Curly windmill grass
- Curly windmill grass (on floodplain)
- Woollybutt grass
- Weeping lovegrass
- Neverfail
- Buck wanderrie grass
- Mountain wanderrie grass
- Silky browntop
- Eight-day grass
- Katoora
- Kangaroo grass
- Mulga mitchell grass
- Small-burr grass
- Hard Spinifex
- Buck Spinifex
- Five-minute grass

### Forbs

- Parakeelya
- Frankenia
- Smokebush
- Buckbush
- Copperburr
- Galvanized burr
- Grey copperburr
- Lifesaver burr
- Common sida
- Potato bush
- Caltrop
- Cattle bush

- Aristida biglandulosa
- Aristida holglandulosa
- Aristida contorta
- Aristida inaequiglumis
- Bothriochloa martiana
- Chloris scaricea
- Dichanthium sericeum
- Digitaria brownii
- Digitaria coenocentola
- Enneapogon avenaceus
- Enneapogon cylindricus
- Enneapogon polyphyllus
- Enteropogon acidulatis
- Enteropogon ramosa
- Eragrostis eriopoda
- Eragrostis parviflora
- Eragrostis setifolia
- Eriachne helmsii
- Eriachne micronata
- Eulalia fulva
- Fimbristylis dihotoma
- Sporobolus actinoladus
- Themeda triandra
- Thyridolepis mitchelliana
- Trogus australius
- Triodia basedowii
- Triodia longcaeps
- Triopogon lolliformis
- Calandrinia balonensis
- Frankenia spp.
- Ptilotus obovatus
- Salsola kali
- Sclerolaena spp.
- Sclerolaena aornishiana
- Sclerolaena dacantha
- Sida platyoalyx
- Sida rhomanes
- Solunum ellipticum
- Tribulus terrestris
- Trichodesma zeyclanicum
### Trees and Shrubs

<table>
<thead>
<tr>
<th>Tree/Mulga</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulga</td>
<td>Acacia aneura</td>
</tr>
<tr>
<td>Northern myall</td>
<td>Acacia calicola</td>
</tr>
<tr>
<td>Dogwood</td>
<td>Acacia coriacea</td>
</tr>
<tr>
<td>Sandhill wattle</td>
<td>Acacia diotyphleba</td>
</tr>
<tr>
<td>Ironwood</td>
<td>Acacia estrophiata</td>
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<tr>
<td>Mimosa bush</td>
<td>Acacia farnesiana</td>
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<tr>
<td>Georgina gidyea</td>
<td>Acacia georginae</td>
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<tr>
<td>Witchetty bush</td>
<td>Acacia kempeana</td>
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<tr>
<td>Umbrella bush</td>
<td>Acacia ligulata</td>
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<tr>
<td>Colony wattle</td>
<td>Acacia murrayana</td>
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<tr>
<td>Dead finish</td>
<td>Acacia tetragonophylla</td>
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<tr>
<td>Prickly wattle</td>
<td>Acacia victoriae</td>
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<tr>
<td>Whitewood</td>
<td>Atalaya hemiglauc</td>
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<tr>
<td>Desert kurrajong</td>
<td>Brachychiton gregorii</td>
</tr>
<tr>
<td>Silver cassia</td>
<td>Canthium latifolium</td>
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<tr>
<td>Blue-leaf cassia</td>
<td>Cassia artemisioides</td>
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<tr>
<td>Broombush</td>
<td>Cassia helmsii</td>
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<tr>
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<td>Cassia nemophila var. nemophila</td>
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<td>Chocolate bush</td>
<td>Cassia oligophylla</td>
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<tr>
<td>Northern bluebush</td>
<td>Cassia pleurocarpa</td>
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<tr>
<td>Ruby saltbush</td>
<td>Chenopodium auricomum</td>
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<tr>
<td>Fuschia bush</td>
<td>Enahylana tomentosa</td>
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<tr>
<td>Emu-bush</td>
<td>Eremophila freelingii</td>
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<tr>
<td>Blue mallee</td>
<td>Eremophila longifolia</td>
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<tr>
<td>Coolibah</td>
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<tr>
<td>Ghost gum</td>
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<td>Eucalyptus papuana</td>
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<td>Native fig</td>
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<tr>
<td>Beefwood</td>
<td>Ficus platypoda</td>
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<td>Holly grevillea</td>
<td>Grevillea striata</td>
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<td>Long-leaved corkwood</td>
<td>Grevillea wickhamii</td>
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<td>Hakea subera</td>
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<td>Grey samphire</td>
<td>Indigofera georgei</td>
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<td>Mallee broombush</td>
<td>Halosarcina halomonomides</td>
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<tr>
<td>Lignum</td>
<td>Melaleuca undinata</td>
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<tr>
<td>Ruby saltbush</td>
<td>Mushlenbeckia cunninghamii</td>
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<tr>
<td>Supplejack</td>
<td>Rhagodia spinescens</td>
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<td></td>
<td>Ventilago viminalis</td>
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