WESTERN ARID REGION

LAND USE STUDY - PART IV

"DESERT"

DOWNS

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For information about this report contact soils@qld.gov.au

COVER PHOTOGRAPHS:

The top photograph illustrates the "desert" or eucalypt woodland east of Yalleroi while the bottom photograph depicts the open Mitchell grass downs south of Tambo.

WESTERN ARID REGION

LAND USE STUDY

PART 4

CONTRIBUTING ORGANIZATIONS

State Government

Department of Primary Industries

Department of Lands

Irrigation and Water Supply Commission

T E C H N I C A L B U L L E T I N N O. 2 3

PREPARED BY THE DIVISION OF

LAND UTILISATION

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FOREWORD

During and since the 1964-66 drought, graziers and commercial activity in our western grazing lands have been severely affected by further drought, low and uncertain commodity prices and increased costs. The resulting decrease in incomes and reduction in the work force have placed a great deal of stress on property management.

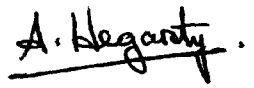
Fluctuations in producer incomes have been an historical feature of these lands. These fluctuations have led indirectly to land degradation as well as creating problems for the graziers and the service organizations.

In 1967, submissions were made to the Queensland Government to investigate the economic plight of producers in these areas, and particularly those of the smaller producer. Whilst some solutions to these problems could be found in the short term the basic need was for a restructuring of the industries in the area. This requires an understanding of both the productive potential of these lands and their management requirements. Collection of basic economic and land resource information on sample properties in the region began in 1968. This was conducted in association with the Bureau of Agricultural Economics.

The detailed study of the land resources and land use began in 1970. This was undertaken as a joint effort of the Development Planning, Botany and Agricultural Chemistry Branches of the Department of Primary Industries, the CSIRO Rangeland Research Unit, the Bureau of Agricultural Economics and the Department of Lands. Part 1 of the study was published in 1974 and embraces some 15 million hectares in the south-west corner of the State.

This particular report, termed Part IV, refers to an area of some four million hectares in the Blackall, Augathella and Jericho districts. Parts II and III, which are in preparation, will complete the cover for lands south and south-west of the area reported on herein.

Results from this and the previous report indicate that the area is capable of maintaining present stock numbers in good seasons. However, there is a need for graziers to be able to reduce numbers on a seasonal basis or otherwise stock at rather more conservative rates. These principles may protect the land but could subject smaller graziers to economic hardship. There is a continuing need for property reconstruction in these areas so that desirable stock and land management practices are carried out on an economic basis.



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AUTHORS

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SUMMARY

A land systems survey has been made of approximately four million hectares of pastoral land in central western Queensland. This region lies in the 450-600 mm rainfall zone with approximately 70% of the rainfall occurring during the summer months. A high incidence of winter rainfall occurs in the south. The summers are generally hot and heat-wave conditions are common. Winter is mild and frosts are experienced. Evaporation rates exceed precipitation.

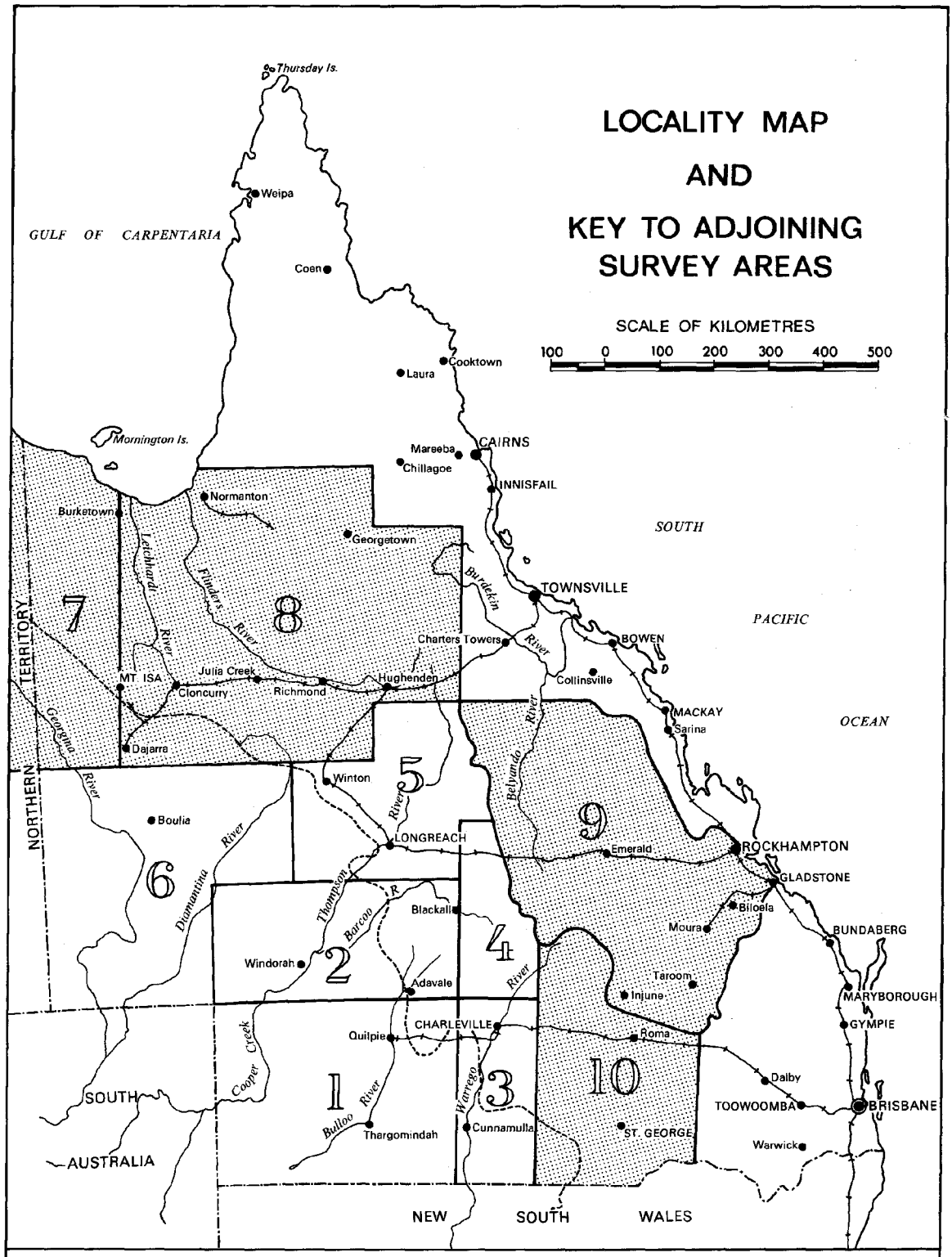
The region forms part of the Eromanga Basin, which is a sub-basin of the Great Artesian Basin. The geological sequence of the Eromanga Basin is based on a conformable succession of Jurassic, Cretaceous and Tertiary sediments. A major unconformity occurs at the base of the Jurassic sediments. All these sediments were deeply weathered during the Tertiary period. Erosion of these Tertiary sediments exposed the fresh Cretaceous and Jurassic sediments which weathered to form gently undulating plains and uplands. Quaternary deposits now mask the original sediments in many areas.

The lands of the area have been mapped into 36 land systems which are areas of country with similar patterns of land form, soils and vegetation. Each land system has been described in terms of its component "land units".

The boundaries of the soil mapping units are closely related to geological boundaries. The broad pattern of soil distribution generally has a definite catenary sequence.

The vegetation has been classified into 18 structural formations. Classification follows Specht (1970) and is based on projective foliage cover, height and life form of the tallest stratum. The distribution of the plant communities can be obtained from the land system descriptions and the vegetation map.

The grazing of native or improved pastures *(Cenchrus* spp.) by both sheep and cattle is the main form of land use in the area. Cropping is severely restricted by climate. Tourism also contributes to the income of the area.



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Division of Land Research (C.S.I.R.O.) .....

CONCLUSIONS

1. The present condition of the majority of these lands is fair to good.

   This can be attributed to the higher rainfall than the adjoining survey areas to the west and south-west and the better tree and ground cover. The more productive and most intensively used land types such as the Mitchell grasslands, gidgee lands and brigalow lands are stable. The land types most susceptible to land deterioration have not as yet been subjected to intensive use.

2. The development of property plans is essential for the maintenance and further improvement of the basic land resource.

   The poor location of fences, watering points, property roads and tracks, the clearing of erosion-susceptible areas, and poor pasture management have caused land deterioration. The development of property plans taking into consideration the characteristics of each of the land types and their potential is the most effective means of maintaining the productivity of these lands. This report provides the basic biological data which can be used as a base for management decisions.

3. Pasture development should be restricted to the undulating gidgee and undulating brigalow land zones and those suitable areas in the sandplain and eucalypt woodland land zones.

   With our present level of technology and economic conditions, there are only small areas of the eucalypt woodlands suitable for clearing and sowing to improved pastures. These occur in the Yalleroi and Wololla land systems. Even so, the maintenance of these areas in a productive state requires high levels of management.

   The brigalow and gidgee areas are more suited to development, mainly because of their higher soil fertility and soil moisture holding capacities. The clearing and sowing to buffel grass does pose some management problems. The major problem is regrowth and invasion by woody weeds such as sandalwood. These problems can be avoided to some extent by selecting only those areas suitable for development, by pulling and burning at optimum times and treating regrowth. The treatment of regrowth may not be economically feasible in times of depressed markets. It is important that considerable areas are left for shade and wind-breaks.

4. Timber clearing by pulling of the eucalypt woodlands is not recommended.

   Clearing of mature eucalypt trees can result in lignotuber regeneration and rapid growth of suppressed seedlings, leading to a less productive pasture than was originally present under the eucalypt woodland. Where cleared in such a manner it has not been possible to maintain pastures on these soils because of difficulties associated with low fertility, low soil moisture levels and management practices. Where pastures have deteriorated, the soils are highly susceptible to soil erosion and nutrient decline. When properly managed, these lands are stable. Abuse of native pastures by overgrazing or injudicious firing can lead to land deterioration.

5. Productivity of the soft mulga lands could be improved by selective thinning.

The density of mulga in the mulga lands of this area is higher than in adjoining survey areas. Research at the Charleville Pastoral Laboratory has shown that many of the mulga densities recorded in this area would reduce pasture productivity. Total removal of mulga, whilst it may increase productivity in the short term, can lead to long term deterioration in pasture composition and soil fertility and reduce drought reserves. Research indicates that mulga densities of 175 trees/ha would provide a balance between drought reserves and pasture production. Present economic conditions and availability of labour prevent this means of improving productivity.

6. Grazing restrictions should be applied to those areas subject to serious land degradation.

Highlands land system, a brigalow community, occurring on undulating to hilly lands with both erodible soils and parent material has been severely eroded in places. A similar situation occurs to that causing concern in the Nogoa catchment. The only means of control at this stage appears to be to impose stocking restrictions. Severe erosion is also occurring on large areas of those land systems in the dissected residual land zone. As it is, physical limitations restrict stocking and imposition of stocking restrictions would not affect large numbers of stock.

7. Climatically, the area is only marginally suitable for cultivation. Any cultivation areas will require soil conservation practices to maintain productivity.

8. A number of areas should be reserved for public use.

Three major plant communities are not currently represented in reserves in Queensland. These are the gidgee woodlands, the Mitchell grass grasslands and the eucalypt woodlands of the "desert".

EARLY SETTLEMENT

by E.J. Turner and A.N. Lee+*

In 1845, Major Mitchell left Sydney seeking a route to the Gulf of Carpentaria. He arrived at the watershed of the Victoria River (later renamed the Barcoo) in 1846 and followed this river to its junction with the Alice River. Mitchell thought the Barcoo River flowed to the Gulf and in the following year E.B. Kennedy was despatched to confirm this. Kennedy showed that the Barcoo River flowed into the Thompson River and thence into Cooper Creek (Allen, 1968).

Another explorer, A.C. Gregory, reached the area between Mt. Northampton and Mt. Enniskillen in 1858 in a futile search for the explorer Leichhardt. Over the following decade, the character of exploration changed, and in the place of official expeditions, private individuals pushed out in search of new lands and rivers. Pastoral occupation followed fast in the footsteps of the explorers. Already the squatters were taking advantage of the lack of controls of *bona fide* land ownership and were advancing from the Darling Downs and Burnett.

Moving westward onto the plains from their bases to the east, the pastoralists drove their stock along the watercourses, pausing occasionally to assess the prospects of the surrounding country. They finally built their stockyards at the waterhole which promised to best serve their choice of grazing land.

Some of the first "properties" to be settled included "Augathella", "Biddenham" and "Langlo Downs". Settlers also came to this area via Rockhampton and Peak Downs. This route had its hazards as many stock were lost to heart-leaf poison bush. In the centre of the survey area, Enniskillen was taken up by 1861. Other "properties" settled in the period 1861-65 included Tambo Station, Landsdowne, Minnie Downs, Greendale, Ravensbourne, Terrick Terrick, Malvern and Isis Downs (Towner, 1962). Merino sheep studs were established in the Tambo area around 1872. After 1865, no new land was taken up until 1869.

The present town of Tambo was established in 1863 and was the first town in western Queensland. Its name is derived from an aboriginal word meaning resting place or shady waters. Blackall was settled in 1864 and was incorporated as a township in 1888. It was named after Colonel Blackall who was Governor of Queensland from 1868-71.

On the 1st September, 1869 a Post Office was opened on the banks of the Warrego River at an isolated spot called Burenda. The name was changed to Ellangowan on the 1st September, 1877 and in 1883, a notice appeared in the Government Gazette stating, "the township on the Warrego River hitherto known as Ellangowan, is in future to be called Augathella".

The Government Gazette of the 26th June, 1880 gives a proclamation of the Reserve for Township Purposes on the Warrego River, resumed from the Augathella number 1 run, area 640 acres.

* Development Planning Branch, Queensland Department of Primary Industries.

\+ Department of Lands.

Barcaldine was originally named Lagoon Creek (Towner, 1962) and was an important link on the route from Rockhampton to the Central West.

Settlement was hastened by the discovery of artesian water. Drilling for artesian water was first started in Blackall in 1885 but the first bore did not come into production until 1888.

Early transport was crude and the tracks usually followed the watercourses to facilitate the watering of stock. As the area became settled, people agitated for improved postal services. Initially, mails were consigned from Rockhampton to Northampton Downs for collection by the various stations. Later Cobb and Co. established mail runs in the area with routes from Morven, Charleville and Alpha to Tambo and Blackall. A Post Office was opened in Tambo in 1866 and by 1868, mail services extended from Tambo to Isis Downs. The electric telegraph station opened in Tambo in 1874 connecting with the main northern line from Brisbane via Springsure and Nebo. In 1878 Tambo was connected by telegraph to Blackall and Charleville.

The railway from Brisbane to Charleville was completed by 1888 and the central western line from Rockhampton reached Barcaldine in 1886. An extension from Jericho to Blackall was completed in 1908. This line was later extended to Yaraka.

EARLY LAND TENURE

After separation in 1859, Queensland legislation had created a "Land Code" (from 3 existing Acts), within which all forms of accepted land settlement were to go forward side by side. Three types of selections were provided for, the homestead selector on 320 acres, the grazing farmer on up to 20,000 acres and the pastoral leases on up to 1,000 square miles.

During the period 1860-1866, new land was occupied at an unprecedented rate. By late 1860, tenders for frontages to the Warrego River were pouring into Brisbane, and an enquirer in October was told that, "the greater portion of the country on the banks of the Warrego has been tendered for".

The average price of land in the Blackall area in 1883 was 10/- per acre (compared with a State average of 13/0½d per acre) though it is doubtful if much land actually changed hands.

In 1883, a Land Office was opened in Augathella, and the area was open for general selection. However, interest in the land for use other than grazing was almost non-existant, and in the same year the Acting Land Commissioner, Mr. T.S. Sword stated, "there is no demand for land for cultivation in Augathella. A few persons say that they wish to obtain paddocks for grazing stock, but the country open to selection is not worth the £1/acre for that purpose".

Interest in farming the land continued low, and in 1886 the Acting Land Commissioner in Tambo stated, "no attempt at agriculture has yet been made, and I fear that the drought we are at present experiencing will deter those who might have been inclined to give it a try. The surveys under the Act of 1884 have only commenced here, so as yet nothing has been done". (In other areas around Blackall and Augathella, the surveys had been almost completed).

A history of the land tenure would show that the early blocks of land opened for selection were in general, far too small, with an area usually less than 200 hectares. Little could be done with a block this size in an area of low and unreliable rainfall, with the resulting severe droughts.

However, closer settlement did occur and new Land Acts were written to cope with the more complex situation.

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TOPOGRAPHY, GEOMORPHOLOGY AND GEOLOGY

by K.K. Hughes and E.J. Turner**

The Great Dividing Range is the main topographic feature, trending north-westerly through the Tambo and Jericho sheet areas, and forming the eastern boundary of the survey in these areas. Associated with the Great Dividing Range are the Warrego, Enniskillen and Aramac Ranges which divide the area into the Warrego, Barcoo and Alice River catchments.

Heights above sea level range from 636 metres on the Great Dividing Range to 320 metres in the south-west. Spot elevations and the main topographic features are shown on Figure 2.1.

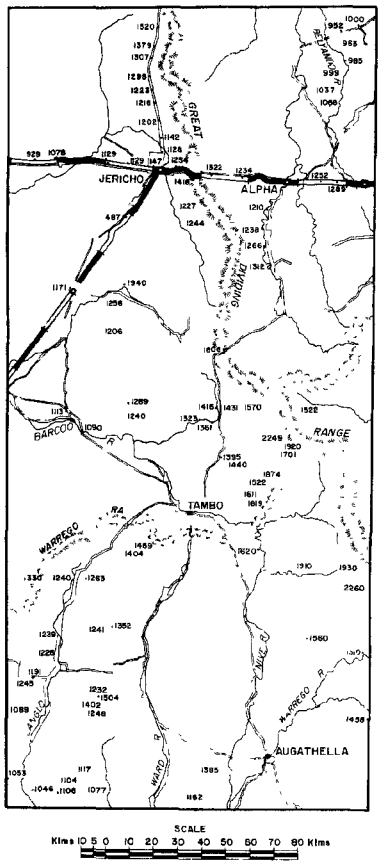

Fig. 2.1 *Topographic map.*

In the south, the southerly flowing Nive, Langlo, Ward and Warrego Rivers form part of the Warrego River catchment. The Warrego Range separates this drainage system from the Barcoo River system. The Barcoo system includes the Alice River catchment. The Barcoo trends north-westerly, thence flowing south-westerly to join Cooper Creek. The Alice River flows southerly between the Aramac Range and the Great Dividing Range, thence south-westerly to join the Barcoo. Some tributaries of the Alice River flow north-westerly around sandstone cuestas before joining the Alice River.

* Development Planning Branch, Queensland Department of Primary Industries.

Flood plains are best developed along the lower reaches of the Langlo, Ward and Warrego Rivers.

GEOMORPHOLOGY

The area comprises *uplands* and *plains* drained by the Warrego and Barcoo River systems. The geomorphology map of the area is included, and the relationship of geomorphology to geology and land systems in the central part of the Tambo sheet is illustrated by block diagram (Figure 2.2).

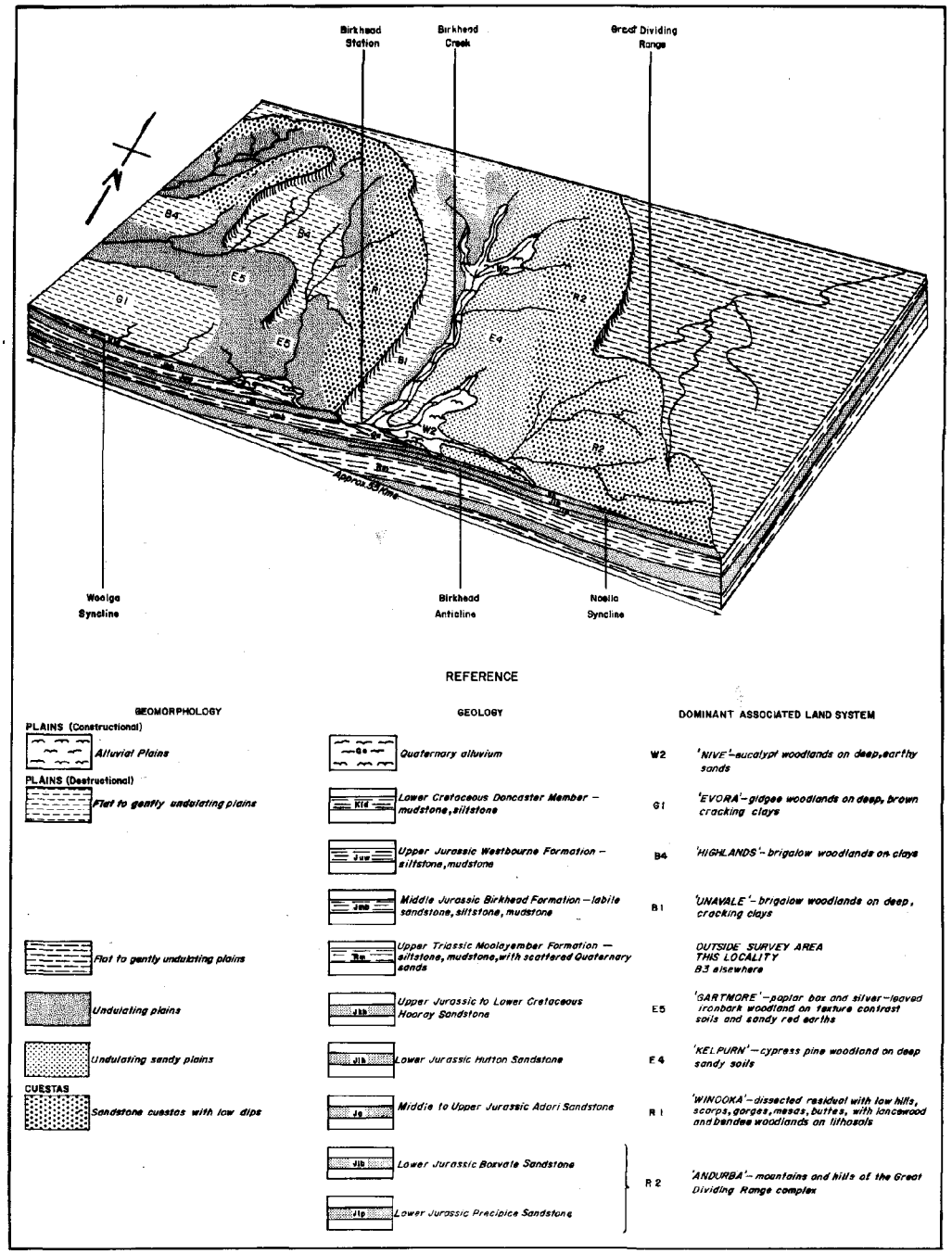

Fig. 2.2 *Relationship between geology, geomorphology and land systems.*

Uplands

The uplands comprise high plains and plateaux, dissected plateaux and cuestas.

Plateaux. These are remnants of an old Tertiary land surface formed on lateritised Cretaceous rocks and flat lying Tertiary sandstones and siltstones. This surface was gently folded, faulted and eroded, leaving scattered plateaux and high plains remaining in the north-west, south-west and south-east. Red earths are the dominant soil type on the high plains and plateaux.

Cuestas. Cuestas have formed on the more resistant Jurassic and Triassic sandstone beds which outcrop in the eastern part of the area. These beds form the eastern margin of the Eromanga sub-basin and the beds dip gently to the south-west forming very low angle cuestas. The sandstones are interbedded with formations of fine-grained labile sedimentary rocks which have weathered to clays. Differential weathering has resulted in cuestas forming on the sandstones, and plains on the fine-grained rocks, giving alternating cuestas and clay plains. The cuestas form the Great Dividing Range in this area.

Plains

Destructional plains. Erosion has stripped away much of the old Tertiary land surface, exposing fresh Cretaceous, Jurassic and Triassic rocks. The softer labile rocks have weathered to form undulating plains. Downs have formed predominantly on the Cretaceous labile rocks *(Winton, Allaru, Doncaster* and *Coreena Formations)* which have weathered to form deep, cracking clays. Wooded downs have formed predominantly on the *Mackunda Formation* which appears to be slightly more sandy, and has weathered to form shallow clays.

The undulating plains occurring between the zones of cuestas have formed on Jurassic and Triassic fine-grained rocks *(Birkhead, Westbourne* and *Moolayember Formations)*. These are mainly mudstones and siltstones which have weathered to form cracking clays. Scattered superficial transported sand derived from adjoining sandstone formations is common over these plains. Brigalow is the dominant vegetation.

The mantled plains fringe the eroded margins of the plateaux and dissected plateaux where erosion has exposed the underlying softer rocks. Due to differential erosion between the hard cap rocks of the plateaux (lateritised Mesozoic sediments, silcrete) and the underlying softer fresh labile rocks, parallel retreat of the scarps is maintained. Gravels and fragments of silcrete, ironstone and quartz derived from the erosion of the resistant cap rocks are distributed over the fresh labile rocks by alluvial and colluvial processes forming pediments and remnants of pediments. The stone cover may be concentrated on the surface by removal of finer material by wind and water action, and can form a protective mantle resistant to further erosion. Consequently, mantled plains can remain as remnants within areas of undulating downs, now distant from the scarps.

Constructional Plains. Large areas of Quaternary sands and clays with some gravels have been deposited in the south-east and north-east of the area forming flat to gently undulating plains. This material has been derived from erosion of Jurassic and Triassic sandstone and mudstone beds, erosion of Tertiary sandstones, and erosion and weathering of Cainozoic sandstones.

The sand sheets with interbedded clays extend generally westward from the source rocks blanketing areas of labile rocks and sandstones. These are mainly of alluvial origin, though they include some aeolian and colluvial deposits.

The clay plains are more common about the western margins of the Quaternary alluvials, and support gidgee or brigalow vegetation. Gravel overlying fresh labile Cretaceous rocks are common on the margins of the Quaternary alluvials. These represent part of the old pediment surface together with some additional gravels derived from the Quaternary alluvials. There is some geological erosion of Quaternary alluvials by present drainages.

Flat alluvial plains occur about the major present drainages. These are either sand plains or clay plains depending on source materials.

GEOLOGY

The area covers part of the Eromanga Basin, which is a sub-basin of the Great Artesian Basin. The geology of the general region has been studied in detail by Whitehouse (1941) Exon *et al.* (1972) and Senior *et al.* (1973). Their detailed reports and geological maps have been used as the basis for defining the overriding geological controls in the land systems mapping. The geology is outlined under the headings of Stratigraphy, Geological History and Economic Geology.

STRATIGRAPHY

The geological sequence of the Eromanga Basin comprises a conformable succession of Jurassic and Cretaceous sediments, unconformably overlain by Tertiary sediments. A major unconformity occurs at the base of the Jurassic sequence.

The stratigraphy of the area is shown in Table 2.1.

Table 2.1. Stratigraphy of the area - Upper Jurassic to Quaternary

Period	Rock Unit (map symbol)	Lithology	Thickness (m)	Basin Sequences	Environment
Quaternary	*Qa*	Alluvial sand, gravel, clay.	9		Alluvial
	Qs	Sand, soil.	15		Colluvial, aeolian.
Undifferentiated Cainozoic	*Cz*	Clayey sandstone, siltstone, claystone.	15		
	Czd	Minor duricrust (silcrete, laterite).	9		
Tertiary	*T*	Clayey sandstone, conglomerate, siltstone.	30		Fluviatile.
	Tb	Olivene basalt flows.	4.5		Terrestrial.
				UNCONFORMITY	
		Kaolinised, silicified, ferruginised			

Table 2.1. Stratigraphy of the area - Upper Jurassic to Quaternary (Cont'd)

Period	Rock Unit (map symbol)	Lithology	Thickness (m)	Basin Sequences	Environment
Lower to Upper Cretaceous	*Winton Formation (Kw)*	Labile sandstone, siltstone, mudstone, in part calcareous; minor coal, peat.	465+	Eromanga Basin	Fluvial, lacustrine.
	Mackunda Formation (Klm)	Labile to sublabile sandstone, siltstone, mudstone, coquinite, minor limestone.	105-150	"	Shallow marine, paralic.
	Allaru Mudstone (Kla)	Siltstone, and mudstone, in part calcareous; minor limestone.	150-270	"	Shallow marine.
Lower Cretaceous	*Toolebuc Limestone (Klo)*	Concretionary limestone, calcareous shale.	3-7	"	Shallow marine.
	Coreena Member (Klc)	Mudstone, siltstone some calcareous beds, coquinite.	25-90	"	Shallow marine, lacustrine.
	Doncaster Member (Kld)	Mudstone-siltstone, lenses of glauconitic sandstone near base.	150-210	"	Shallow marine.
Upper Jurassic to Lower Cretaceous	*Ronlow Beds (Jkr)*	Quartz and labile sandstone, mudstone, minor coal.	50	"	Fluvial, lacustrine, paludal.
	Hooray Sandstone (Jkh)	Sublabile to labile sandstone, some pebbly conglomerate, siltstone.	45-120	"	Fluviatile.

Table 2.1. Stratigraphy of the area - Upper Jurassic to Quaternary (Cont'd)

Period	Rock Unit (map symbol)	Lithology	Thickness (m)	Basin Sequences	Environment
Upper Jurassic	*Westbourne Formation (Juw)*	Siltstone and mudstone, quartz sandstone.	120	Eromanga Basin	Fluviatile.

GEOLOGICAL HISTORY

Sediments were deposited in the Galilee Basin during the Triassic period in fluviatile and lacustrine environments. These gave rise to quartzose sandstones, labile sandstones and mudstones.

From early Jurassic to Cretaceous times the area formed part of the depositional Eromanga Basin, which formed over the Galilee Basin. Fluviatile sands were first deposited, followed by lacustrine and paludal sedimentation during the Jurassic periods.

Marine deposition occurred in the Lower Cretaceous, with muddy sediments and some limestones. Fresh water sedimentation occurred during the Lower and Upper Cretaceous. In the Upper Cretaceous the Eromanga Basin was closed by regional uplift.

Broad folding of these sediments occurred throughout the Mesozoic, associated with basement faulting.

The area was subsequently levelled by erosion and the surface deeply weathered and chemically altered with formation of a siliceous and ferruginous duricrust. This surface was slightly uplifted and eroded to varying degrees.

During the Tertiary period, up to thirty metres thickness of well bedded clayey sandstone with siltstone and claystone was deposited in streams and swamps. Minor volcanic activity occurred with small basalt flows in the south-east of the Tambo sheet. Parts of the Tertiary sediments, particularly the quartzose sedimentary lenses were silicified to form silcrete. Finer Tertiary sediments were partly lateritised in some localities.

Erosion subsequently removed much of the Tertiary sediments, basalt and duricrust during the Quaternary. Alluvial, colluvial and aeolian deposits were laid down on outwash plans. Surface accumulations of gravels developed where finer materials were removed by erosion.

Alluvial sands, gravels and clays were deposited in old and recent river drainages.

ECONOMIC GEOLOGY

Oil and Gas

Exploratory drilling for oil and gas has been carried out in this area without locating any discoveries of value. Seven exploration wells have been put down. One showed minor gas, one a slight fluorescence in tight sandstone and the remainder had no hydrocarbon showings.

The area has favourable structure and favourable host rocks and as only very broad scale drilling has been carried out to date, the area still has potential for hydrocarbon production.

Coal

Coal occurs as scattered seams of coal and peat in the lower part of the *Winton Formation*. Tests have shown it to be of poor quality and the area appears to have little potential for coal production in this locality.

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SOILS

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Broadscale mapping of the area was undertaken by Prescott (1931, 1944) and Northcote *et al.* (1968) mapped the area for the Atlas of Australian Soils. Other studies of certain parts of the area were undertaken by Blake (1938), Whitehouse (1941), Isbell (1962), Edye *et al.* (1964) and Hubble and Reeve (1970).

The information contained in the foregoing reports and maps has been combined with the data collected during the survey to describe the soils encountered in the study area. The relationship between the soils and other features of the landscape such as geology and vegetation is discussed.

Brief summaries of the soils and some of their principal characteristics are also included in the land unit and land system descriptions (Appendices IV and V). Site descriptions and analytical data for selected profiles are given in Microfiche 1.

SOIL DEVELOPMENT AND DISTRIBUTION

Climate has had a dominant influence on the nature and distribution of soils in the area. Locally, soil development is closely related to the lithology, the weathering status of the parent material and past geomorphic cycles. The broad pattern of soil distribution generally has a definite catenary sequence. The red earths occur on intact remnants of the old land surface or on the depositional plains where extensive reworking has occurred. The cracking clay soils have developed where the weathered mantle has been removed thereby exposing fresh labile sediments. They have also formed where these clay sediments have been eroded to form alluvia. Uniform sands and sandy texture contrast soils have developed on both quartzose sandstones and recent alluvium.

The major geomorphic processes involved in producing the present landscape have been erosion of the Tertiary land surface to expose the underlying Mesozoic sediments and the deposition of the derived alluvial and colluvial material on outwash plains.

Other factors such as vegetation, soil fauna, animals and man, have modified the environment and affected the characteristics of some soils. Ebersohn and Lucas (1965) showed that trees such as poplar box and bloodwood significantly increase surface soil values of available nutrients such as phosphorus and potassium by leaf drop and recycling. This is especially important on those soils with low nutrient status (Burrows,1972). Changes in physical properties were in some cases associated with those chemical changes.

The removal of vegetation and the introduction of grazing animals have caused accelerated erosion. This is noticeable where mulga has been removed from shallow red earths. Timber clearing and litter removal can lead to loss of soil organic matter and deterioration in soil nutrient levels, structure and infiltration particularly if the resultant pasture is not well managed. This will increase runoff and promote erosion of the landscape.

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Termites and other soil insects have affected some soils by immobilising soil nutrients. Termites "lock-up" nutrients until the colony dies and the mound is eroded, and only then are these nutrients available to plants. Termites also tend to invert the soil profile and hence decrease soil porosity (Watson and Gay, 1970).

SOIL - PARENT MATERIAL RELATIONSHIP

The cracking clay soils, comprising the grey, brown and red clays, are the most productive soils in the area. They occur in two main situations, as sedentary soils and on alluvial plains. The sedentary clay soils are formed on fresh Cretaceous sediments and to a lesser extent on older beds such as the Triassic *Moolayember Formation* and the Jurassic *Birkhead* and *Westbourne Formations*.

The Cretaceous sediments generally associated with cracking clay soils consist of the *Doncaster* and *Coreena Members* of the *Wallumbilla Formation*, the *Allura Mudstone*, the *Mackunda Formation* and the *Winton Formation*. The soils formed on these Cretaceous beds are associated with the undulating downs, the undulating gidgee, the wooded downs and a limited area of undulating brigalow lands. The undulating brigalow areas are formed on the older beds of the *Moolayember, Birkhead* and *Westbourne Formations*. The cracking clays on the gently undulating downs do not carry a cover of siliceous pebble, but are relatively stone free, apart from an occasional sandstone "floater" or ironstone pebble. The undulating gidgee land zones have a more pronounced stone cover and stone pavements may occur especially near the scarp retreat zones. Stone cover in the undulating brigalow land zone is usually light.

The undulating gidgee and undulating brigalow land zones exhibit weakly to moderately developed nuram gilgais while the cracking clays associated with undulating downs may exhibit shallow linear gilgais on their mid-slopes. Incipient gilgais may also occur on the lower slope of the undulating downs.

The cracking clays developed on alluvia are mainly grey and brown clays. The grey clays are predominant on the poorly drained and flooded areas of the major alluvial plains. They are extensive along the Barcoo, Langlo and Ward Rivers and on the Warrego River from Augathella south. The brown clays are generally associated with the higher, less frequently flooded areas on the alluvial plains. Generally, the soil developed on the alluvium tends to reflect the nature of the source rocks, being fine-textured where they drain quartzose sandstones e.g. Nive and upper Warrego Rivers. In some cases such as the Warrego River, the deposition of coarser textured, wind blown and water transported materials have formed texture contrast soils on the clay flood plain.

A complex of cracking clays, deep texture contrast soils and earthy sands is associated with local stream alluvia and the outer margins of some of the major drainage lines. Sand seams are common in the grey clays of the major streams.

Non-cracking clays are mainly associated with beds in the Cretaceous sediments, especially in the *Mackunda Formation*. These soils are generally shallow to moderately deep and support bauhinia/vinetree/whitewood/eucalypt wooded open tussock grasslands.

The depth of the non-cracking clays is dependent to a large extent on parent material and position on the slope. The deeper soils are associated with older Jurassic beds such as the *Westbourne Formation* and to a lesser extent, the *Birkhead Formation*. The non-cracking clays are probably associated with the occurrence of siltstone beds.

Red earth soils have formed by weathering and erosion and redistribution of Cretaceous sediments and Tertiary sandstones. These soils support mulga associations in the south and south-east on the Nive and Langlo sandplains. Red earths are also extensive in the east and north where they form part of the "desert". In the "desert", the red earths have developed on the Quaternary sands which blanket older beds such as the Jurassic *Ronlow Beds*. The red earths have been separated into loamy red earths and sandy red earths on the basis of textural differences.

Closely associated with the red earths are yellow earths and texture contrast soils such as the red, sandy solodics.

Earthy sands, siliceous sands and sandy surfaced, texture contrast soils are formed either *in situ* on quartzose sandstones and conglomerates (the Jurassic *Precipice* and *Hutton Sandstones*) or on transported material on levees or sand sheets on old depositional plains.

Scalds and claypans formed on clay soils and texture contrast soils are of minor importance and occur adjacent to alluvia or on the lower slopes of the gently undulating downs.

Lithosols and shallow red earths occur on remnants of the Tertiary land surface (mesas, buttes) and the hills and mountains of the Great Dividing Range complex.

MORPHOLOGICAL CHARACTERISTICS

A wide range in soil physical properties is apparent and this is a reflection of the parent material and mode of formation. Red colours are predominant in the upland areas and this has been attributed to the presence of free iron oxide (Jackson, 1957). A distinct difference in hue was recorded between the red earths supporting mulga and those supporting eucalypt woodlands. The red earths occurring on the Alice Tableland had hues of 2.5 YR, while the red earths of the Nive and Langlo sandplain (mulga) had hues of 5 YR and the red earths of the desert hues of 7.5 YR. This could be a reflection on rainfall, litter production and hence soil organic matter. The red colours are commonly associated with freely drained profiles.

Grey and brown colours are usually associated with the cracking clays, both on alluvia and the gently undulating downs. Mottling commonly occurs on the alluvial clays. Colour changes may occur on the clay soils of the undulating downs and can sometimes be due to weathered parent material. Colours are not uniform throughout the profile in the poorly drained clay soils. In these soils, a surface colour of grey changes to yellowish brown or olive at depth.

The cracking clays of the undulating downs are moderately deep to deep and may become deeper at the base of slopes or on alluvial plains.

The cracking clays associated with the undulating gidgee and brigalow lands are deep to very deep.

The red and yellow earths are variable in depth, depending on their position in the landscape. They range from very shallow to shallow on the crests and upper slopes to deep and very deep on lower slopes and alluvia. Most of the earthy sands and siliceous sands are very deep. The texture contrast soils vary greatly in depth, generally being deeper down slope. The lithosols are extremely shallow to shallow.

Stone or pebble cover varies considerably on the soils supporting gidgee vegetation. The soils associated with the brigalow lands generally have a light scattering of surface pebbles with stones confined to the puffs of the gilgais or the glades. Glades are defined as natural openings in the woodlands which exhibit a characteristic pattern on aerial photographs. Except for an occasional sandstone floater or ironstone pebble, stones are generally absent from the soils of the undulating downs. These calcareous sandstone rocks often contain macrofossils.

Concretionary and pisolitic ironstone is associated with the red and yellow earths supporting the eucalypt woodlands ("desert") and appear both in the soil surface and throughout the profile. They commonly occur on rises, crests or scarp edges where the surface cover has largely been stripped away. Pisolitic ironstone has also been recorded at depth in shallow earthy sands and as an indurated layer in shallow red earths supporting mulga, bloodwood associations.

Ironstone gravel is common as a layer on top of the B horizon in texture contrast soils supporting brigalow/Dawson gum communities.

Ironstone shot is common on the soil surface and throughout the profile of red and yellow earths.

Silcrete cover may occur in the lithosols and stony gidgee soils in the west.

The undulating downs exhibit strongly self-mulching surfaces while the clay soils of the undulating gidgee and brigalow lands exhibit weak to moderate self-mulching surfaces. A thin, weak surface crust is common even on self-mulching soils. The red earths have hard setting, massive surfaces. Algal crusts are common on the red earths and the associated texture contrast soils. A fine layer of pinkish sand is often present on the crusts of the red earths. The earthy sands and siliceous sands are loose surfaced but also may exhibit weak surface crusts.

Soil cracking is extensive on the clay soils of the undulating downs, but is less marked in the undulating gidgee and undulating brigalow soils. Cracking is best developed on the alluvial clay soils.

Gilgai microrelief is common on the cracking clays. Linear gilgais occur on the mid slopes of the rolling downs and they may be weakly developed on the flat alluvial downs. Small gilgais and "slumping" occur on the undulating downs. Nuram gilgais are best developed in the gidgee and brigalow areas where vertical amplitudes of one metre and wavelengths of 30 m have been recorded. In these soils, vertical amplitude of 20-60 cm is more common.

Scalding is extensive on the alluvial soils of the major streams and also the alluvia of the undulating downs. The scalds characteristically have a thin crust of dispersed soil overlying pedal clays. A light scattering of surface stone may also be present. Wind erosion, water erosion and/or overgrazing have led to scalding on the red earths.

The cracking clays commonly have a thin, crumb structured layer overlying strong, fine to medium, sub-angular to blocky sub-soil structure. A surface crust is usually present. The cracking clays of the undulating downs have a fine, granular, strongly self-mulching surface, overlying medium to coarse, sub-angular blocky peds, with firm to hard consistence. The texture contrast soils have mainly massive, hard setting surfaces with earthy fabric overlying medium to coarse blocky peds with hard to very hard consistence. A bleached A_2 horizon is common on these soils. A thin surface crust occurs.

The red and yellow earths are massive with earthy fabric. The earthy sands are loose to massive when undisturbed, depending upon clay content, while the siliceous sands are loose and single grained.

Calcium carbonate is present as concretionary or soft lime in the cracking clays formed on the Cretaceous sediments. On the soils of the undulating downs, lime nodules may be present on the soil surface and gypsum is commonly present in the lower profile. Small mounds or puffs containing calcium carbonate are encountered in these Cretaceous sediments; both on the undulating downs and undulating gidgee areas. The soil profiles on the undulating downs tend to be neutral to slightly alkaline at the surface, becoming strongly alkaline at depth. Occasionally, they may be strongly alkaline throughout.

The cracking clays of the undulating gidgee and undulating brigalow areas also contain lime and gypsum with lime being common in the upper profile. Calcium carbonate occurs in varying amounts in the texture contrast soils, alluvial clays and non-cracking clays..

Infiltration rates vary with most variation being due to differences in the characteristics of the surface soil. Surface cracking, surface crusts, surface gravel, organic matter content and litter all have an effect on infiltration. The earthy sands, siliceous sands and the loose surfaced, sandy red earths have high infiltration rates, but their moisture storage capacities are low. Their greatest virtue is that most of the moisture stored after light falls of rain is available to plants. Hence, the sandy soils of this country will provide a green pick faster than clay soils.

The red and yellow earths have moderate to high infiltration rates and low to moderate available soil water capacities. The shallow red earths have low to very low soil water storage capacities and in a bare condition, high runoff rates. The texture contrast soils vary in their moisture characteristics with infiltration rates again being dependent on surface condition, depth and texture of the A horizon,and structure of the B horizon. The texture contrast soils with loose, sandy surfaces have high initial infiltration rates but also tend to dry out rapidly. The surface horizons on the hard setting texture contrast soils are massive and compact when dry and only slowly permeable. This leads to high rates of runoff. Permeability of the clayey B horizon is slow.

The cracking clays have high infiltration rates when dry and widely cracked, but these rates fall off rapidly as the soil becomes saturated and the cracks close. Due to their high clay content and depth, the cracking clays have high available soil water capacities.

THE SOIL GROUPS

A total of 360 soil profiles was examined during the course of the survey. The soils from these sampling sites were grouped into 13 major soil groups on the basis of geology, great soil groups and specific soil characteristics. These broad soil groups were then subdivided into 41 Soil Mapping Units (SMU's) with the criteria for classification into these SMU's being easily recognisable soil morphological characteristics. These included such profile differences as depth of soil, thickness and texture of the surface horizons, soil reaction and the colour of the sub-soils.

Table 3.1 shows the important characteristics of the SMU's and lists the sites where these SMU's were recorded.

Table 3.1 Characteristics of the soil mapping units.

Soil Mapping Unit	Brief Description	Geology	P.P.F.+ Recorded	Great Soil Group	Vegetation	Site Numbers*
Grey and brown clays						
Grey and brown clays on undulating plains						
Northampton	Moderately deep to deep, cracking clays with strongly self-mulching surfaces, alkaline soil reaction with lime and gypsum concretions in the profile.	Cretaceous sediments.	Ug 5.21 Ug 5.22 Ug 5.31 Ug 5.32	Grey and brown clays.	Mitchell grass open tussock grassland.	16, 18, 19, 23, 28, 29, 30, 32, 65, 92, 93, 94, 99,100,101, 103,127,128,129,130, 132,141,143,163,181, 201,231,232,251,296, 297.
Landsdowne	Shallow to moderately deep, cracking clays with strongly self-mulching surfaces with linear gilgais, alkaline soil reaction.	Cretaceous sediments.	Ug 5.13 Ug 5.21	Grey and brown clays.	Mitchell grass open tussock grassland.	88, 90,173,205.
Warrah	Moderately deep to deep cracking clays with moderately self-mulching surfaces, alkaline soil reaction, mottled at depth.	Cretaceous sediments.	Ug 5.26 Ug 5.29 Ug 5.34 Ug 5.11	Brown and grey clays.	Boree/myall wooded Mitchell grass open tussock grassland.	69, 70, 95,112, 161,165,177,185, 264,341,352.
Bayrick	Shallow, brown plastic clays with surface crusts and ironstone on soil surface, alkaline soil reaction trend.	Cretaceous sediments.	Uf 6.31	Brown clays.	Bauhinia, eastern dead finish, vinetree wooded, Mitchell grass open tussock grassland.	26, 27, 89, 98,131, 140,142,162,176,184, 190,234,246,286.
Mendip	Deep cracking clays, moderately gilgaied, slightly acid to neutral at the surface becoming strongly alkaline at depth.	Quaternary sheet.	Ug 5.11 Ug 5.21 Ug 5.31	Grey and brown clays.	Brigalow low open woodland.	37, 41, 49, 50, 87, 124,134,153,182,184, 194,199,229,244,245, 250,285,289,305,333, 340.
Connemarra	Deep, cracking clays, weakly gilgaied, slightly acid to neutral surface, to alkaline at 60 cm, to strongly acid at depth.	Quaternary sheet.	Ug 5.11 Ug 5.21 Ug 5.31	Grey and brown clays.	Brigalow low open woodland.	47,145,156,178,183, 271,272.
Windeyer	Moderately deep to deep, plastic clays with thin surface crust and ironstone on surface, subject to gully erosion.	Quaternary sheet.	Uf 6.31 Uf 6.32 Uf 6.33	Grey and brown clays.	Brigalow, gidgee woodland.	104,108,115,133,192, 342.
Romulus	Deep, cracking clays, weakly gilgaied, alkaline to strongly alkaline throughout.	Quaternary sheet/[1] Cretaceous sediments.	Ug 5.31 Ug 5.21 Ug 5.12	Brown and grey clays.	Gidgee low woodland.	20, 33, 66, 71, 91, 136,144,158,159,166, 200,238,239,240,241, 242,252,263,298,347.
Burenda	Deep, cracking clays, weakly gilgaied, alkaline surfaces to acid at depth.	Quaternary sheet/ Cretaceous sediments.	Ug 5.31 Ug 5.36	Brown clays.	Gidgee low woodland.	52,137,139,175,189, 233,236,243.
Grey and brown clays on alluvial plains						
Armagh	Moderately deep to deep, plastic clays with surface crusts; slightly acid to neutral profiles.	Quaternary alluvium.	Uf 6.31 Uf 6.33	Grey and brown clays.	Gidgee/poplar box woodland.	249,282,327,351.
Douglas Ponds	Deep to very deep, cracking clays with self-mulching surfaces, weakly gilgaied, slightly acid to neutral throughout and mottled at depth.	Quaternary alluvium.	Ug 5.31 Ug 5.36 Ug 5.24	Brown and grey clays.	Mitchell grass open tussock grassland to herbfield.	14, 15, 73, 80, 84, 160,204,216.
Summervale	Very deep, cracking clays with self-mulching surfaces; layering of horizons; moderately alkaline soil reaction throughout.	Quaternary alluvium.	Ug 5.24 Ug 5.11	Grey and brown clays.	Coolibah open woodland.	13, 81,349.
Duneira	Very deep, cracking clays with weakly self-mulching surfaces, subject to scalding, sand seams throughout, profile slightly alkaline to neutral.	Quaternary alluvium.	Ug 5.17	Grey clays.	Coolibah/river red gum woodland to herbfield.	148,150,151,357.
Tumbar	Deep, cracking clays, moderately to strongly gilgaied with very strongly alkaline soil reaction throughout.	Quaternary alluvium.	Ug 5.21 Ug 5.22	Grey clays.	Gidgee/brigalow woodland.	256,281,329.
Scalds						
La Plata	Deep to very deep clays with scalded surfaces, mildly alkaline surfaces becoming very strongly alkaline beyond 60 cm.	Quaternary alluvium.	Ug 5.34 Ug 5.24 Ug 5.15	Grey and brown clays.	Sparse herbfield.	24, 64,149,278.

Table 3.1 Characteristics of the soil mapping units (cont'd)

Soil Mapping Unit	Brief Description	Geology	P.P.F.+ Recorded	Great Soil Group	Vegetation	Site Numbers*
Tambo	Deep to very deep clays with scalded surfaces, neutral profile throughout.	Cretaceous sediments.	Ug 5.34 Ug 5.24 Ug 5.27	Grey and brown clays.	Sparse herbfield.	31,102,164.
Texture contrast soils						
Texture contrast soils on recent alluvia						
Garfield	Deep to very deep texture contrast soils with loose surfaces of loamy sands overlying sandy clays. Surfaces are mildly alkaline becoming very strongly alkaline at depth. Lime is present in the subsoil.	Quaternary alluvium.	Dr 4.13 Db 4.23 Dy 5.23 Dy 5.43	Solodic soil.	Leopardwood/ poplar box/ bloodwood low open woodland.	25, 62,172,195,260, 315,331.
Jericho	Moderately deep to deep, texture contrast soils with slightly acid sandy loams overlying moderately alkaline, red and brown, structured clays. A surface crust and a conspicuous bleach are present.	Quaternary alluvium.	Db 2.43 Db 1.33 Dr 2.43	Solodic or solodized solonetz.	Poplar box open woodland.	283,317,354,355.
Champion	Moderately deep texture contrast soils with strongly acid sandy loams to loams overlying red and brown, mildly alkaline clays. Surface crusts are present.	Quaternary alluvium	Db 1.13 Dr 2.13	Red brown earths.	Gidgee, leopard-wood open wood-land.	17, 63, 78,225.
Texture contrast soils on undulating plains						
Caldervale	Shallow to moderately deep soils with hard setting sandy loams overlying medium clays. The soil profile is moderately acid throughout.	Quaternary sheet/ Cainozoic sediments.	Dy 2.41 Dy 3.41 Dr 3.31	Soloths.	Poplar box/ silver-leaved ironbark open woodland.	391,318,338.
Cunnalama	Moderately deep to deep soils with hard setting surfaces of sandy loams to sandy clay loams overlying medium to heavy clays. Surfaces are slightly acid becoming strongly alkaline at depth. Lime is often present in the sub-soil.	Quaternary sheet/ Jurassic beds.	Dr 2.43 Dy 2.43 Db 2.43 Dr 3.43	Solodized solonetz.	Poplar box woodland.	22, 53, 57, 82, 97, 123,135,186,226,237, 334,336,353.
Thrungli	Moderately deep to deep soils with hard setting surfaces of sandy loams to sandy clay loams over-lying structured, medium to heavy clays. Soil reaction is neutral throughout.	Quaternary sheet/ Jurassic beds.	Dr 2.12 Dr 3.12 Db 1.12	Non-calcic brown soils.	Silver-leaved ironbark/poplar box open wood-land.	7, 34, 35, 36, 38, 40, 83,109,116,147, 154,169,276,306,320, 321,346.
Stratford	Moderately deep to deep soils with hard setting surfaces of sandy loams overlying structured yellow clays. Soil reaction is slightly acid to neutral throughout.	Quaternary sheet/ Jurassic beds.	Dy 2.12 Dy 3.22	Yellow podzolics.	Poplar box open woodland.	11, 46, 51,157,219, 320,358.
Rosemount	Moderately deep to deep, texture contrast soils with a loose surface of loamy sands overlying sandy clay loams to sandy clays. Profile is neutral, becoming slightly acid beyond 60 cm.	Quaternary sheet/ Jurassic beds.	Dy 5.12 Dy 5.51 Dy 5.42	Yellow podzolics.	Poplar box open woodland/ cypress pine woodland.	59,122,300,324,339.
Lancevale	Moderately deep to deep soils with a loose surface of loamy sands overlying strongly alkaline light clays. Lime is present in the sub-soil.	Quaternary sheet/ Jurassic beds.	Dy 5.43	Solodized solonetz.	Poplar box open woodland.	280,299,310,322.

Table 3.1 Characteristics of the soil mapping units (cont'd)

Soil Mapping Unit	Brief Description	Geology	P.P.F.+ Recorded	Great Soil Group	Vegetation	Site Numbers*
Red earths						
Deep red earths						
Erne	Moderately deep to deep soils with hard setting surfaces of sandy clay loam or loam grading into light clays at depth. Surfaces are dark brown to brown. Profile is slightly acid to neutral.	Quaternary sheet/ Cretaceous sediments.	Gn 2.17	Red earths.	Silver-leaved ironbark open woodland.	48, 72, 74, 77,326.
Khyber	Moderately deep to deep soils with hard setting surface soil of loam to sandy clay loam grading to light clays. Surface colour is dark reddish brown. Profile is slightly acid throughout.	Quaternary sheet/ Cretaceous sediments.	Gn 2.12	Red earths.	Mulga low open woodland.	107,138,167,168,187, 209,211,213,218,223, 224,227,345.
Shallow red earths						
Milray	Shallow to very shallow soils with surface horizons of sandy loams to sandy clay loams with surface crusts. Ironstone gravel may be in the surface or in profile. Slightly acid to acid profile.	Quaternary sheet/ Tertiary sediments.	Gn 2.12 Um 5.31 Um 5.21	Red earths.	Mulga, bastard mulga tall open shrubland.	76,202,206,208,215, 220,221,228,248,273, 274,303,356.
Sandy red earths						
Rosefield	Shallow to moderately deep soils with loose surfaces of loamy sands grading to sandy loams or sandy clay loams at depth. Profiles are slightly acid throughout.	Quaternary sheet/ Jurassic sediments.	Gn 2.12 Gn 2.11	Red earths.	Silver-leaved ironbark/ yellowjack open woodland.	4, 9,255,269,294, 330.
Yo Yo	Moderately deep to deep soils with hard setting surfaces of sandy loam which grades into sandy clay loam. Surface soil is dark reddish brown.	Quaternary sheet/ Cretaceous sediments.	Gn 2.12	Red earths.	Mulga low open woodland.	152,155,170,191,203, 210,214,217.
Alice	Deep soils with crusted surface textures of sandy loams which grade to sandy clay loam. Pisolitic ironstone occurs on the soil surface and in the profile. Surface colour is dusky red.	Quaternary sheet/ Jurassic sediments.	Gn 2.12 Um 1.43	Red earths.	Yellowjack open woodland.	60,262,265,266,268, 273,274,275.
Tilbury	Deep to very deep, dark yellowish brown soils. The surface soil is crusted. Soil reaction is neutral throughout.	Quaternary sheet/ Jurassic sediments.	Gn 2.12	Red earths.	Silver-leaved ironbark open woodland.	39,319.
Yellow earths						
Sydenham	Moderately deep to deep soils with a loose surface of loamy sand to coarse sandy loam. Profile is slightly acid throughout.	Quaternary sheet/ Jurassic sediments.	Gn 2.21	Yellow earths.	Silver-leaved ironbark, budgeroo open woodland.	259,290,293.
Carbean	Moderately deep to deep soils with hard setting surfaces of sandy loam to loam. Profiles are slightly acid throughout.	Quaternary sheet/ Jurassic sediments.	Gn 2.22 Um 1.23	Yellow earths.	Silver-leaved ironbark open woodland.	48, 75,258,270,284, 304,312,325.
Earthy sands						
Birkhead	Deep to very deep soils with a weak surface crust. Profiles are slightly acid at the surface becoming mildly alkaline beyond 30 cm. Some weak horizonisation is evident.	Sand sheet on Quaternary alluvium.	Uc 5.21	Earthy sands.	Gidgee open woodland.	295.
Duck Creek	Deep to very deep soils with a weak surface crust. Profiles are slightly acid to neutral throughout. Some slight colour changes are evident in the profile.	Sand sheet/ Quaternary sheets.	Uc 5.21 Uc 5.22	Earthy sands.	Poplar box/ Moreton Bay ash open woodland.	67, 68, 79, 85,118, 119,125,126,261,314, 335,350.

Table 3.1 Characteristics of the soil mapping units (cont'd)

Soil Mapping Unit	Brief Description	Geology	P.P.F.+ Recorded	Great Soil Group	Vegetation	Site Numbers*
Devenish	Moderately deep to deep soils with loose surfaces. Profile is strongly acid throughout.	Quaternary sheet/ Jurassic sediments.	Uc 5.21 Uc 5.22	Earthy sands.	Narrow-leaved ironbark woodland.	61,310.
Tarabah	Deep to very deep soils with loose surfaces. Profile is slightly acid throughout.	Quaternary sheet/ Jurassic sediments.	Uc 1.21 Uc 1.43 Uc 5.11	Earthy sands.	Cypress pine woodland.	10, 44, 54, 86,117,121, 253,254,277,292,307,337.
Rosedale	Shallow soils with strongly acid profiles. Underlain by pisolitic ironstone or weathered parent material.	Quaternary sheet/ Jurassic sediments.	Uc 1.43 Uc 1.21 Uc 5.11	Earthy sands.	Tea-tree tall open shrubland.	58,106,110,196,247,308, 311,313,323.
Lithosols						
Neverfail	Very shallow to shallow, coarse textured soils with extensive rock outcropping. Soil reaction is extremely acid.	Altered Mesozoic sediments.	Uc 1.13	Lithosols.	Bendee, lance-wood, low wood-land.	43, 45,113,120,146,257, 309,348.
Lumeah	Very shallow to shallow, fine textured soils with extensive rock out-cropping. Soil reaction is slightly acid.	Altered Cretaceous sediments.	Um 1.23	Lithosols.	Bastard mulga, mulga tall open shrubland.	11,179,180,186,207,222, 344.

+ Principal profile form. * For detailed descriptions see Microfiche 1. /[1] slash in geology indicates overlying.
/[2] slash in vegetation indicates with or without.

There was a certain amount of bias involved in sampling in that the more productive soils such as the grey and brown clays were sampled more frequently than the unproductive soils such as the lithosols.

The results of chemical analysis for each soil profile analysed are given in Microfiche 1. The soils are described in terms of Principal Profile Form (P.P.F.) (Northcote, 1965) and great soil groups (Stace *et al.* 1968).

GREY AND BROWN CLAYS

These soils have formed predominantly on the sediments of the Cretaceous *Rolling Downs Group* and have only limited development on the older sediments such as the Jurassic *Birkhead Formation* and the Triassic *Moolayember Formation*.

These soils comprise the undulating downs, the undulating gidgee and undulating brigalow land zones. A strong relationship exists between soils and vegetation. Initial subdivision into the broad soil groups was based on vegetation differences. The non-cracking clays are closely associated with the cracking clays but have been described as a distinct SMU within this broad soil group.

The grey and brown cracking clays have high clay contents and are subject to seasonal cracking. The surface soil exhibits crusting and is self-mulching to varying degrees. Gilgai micro-relief is common and is better developed in the undulating brigalow and undulating gidgee land zones than on the undulating downs.

Soil group A - grey and brown clays on undulating plains (downs)

These are moderately deep to deep clays developed on the Cretaceous *Rolling Downs Group*. The soil surface is virtually stone free except for an occasional sandstone floater or ironstone pebble. The soil surface cracks widely when dry and is strongly self-mulching, with a granular surface layer overlying strongly structured, sub-angular blocky to blocky heavy clays which grade into weathered parent material at approximately 80 to 90 cm. Lime and gypsum are usually present in the soil profile. Soil pH ranges from neutral to very strongly alkaline at the surface.

E.C. (electrical conductivity) values are low in the surface, generally increasing to very high values at depth. The soils are non-sodic in the surface, becoming sodic to strongly sodic at depth. C.E.C. (cation exchange capacity) is usually greater than 40 m.equiv./100 g soil. The percentage clay generally increases with depth and is usually greater than 40%. C.E.C./100 g clay is generally >80 m.equiv. indicating predominantly montmorillonite type clay. C and N values are low to fair. Some low acid P values were recorded, but most sites exceeded 45 ppm P while most bicarbonate P values are low to very low. A.W.C. (available soil water capacity) values are high.

Soil group B - grey and brown clays on undulating plains (brigalow)

These soils developed on older beds such as the Jurassic *Birkhead Formation* and Triassic *Moolayember Formation* and to a limited extent on Cretaceous beds. They are deep and gilgais are weakly to moderately developed. Stone cover is light. The soils crack and exhibit surface crusting. The soil surface is weakly self-mulching. Soil pH is variable with surface values ranging from slightly acid to strongly alkaline. Many profiles show large variation down the profile and some sites were strongly acid at depth.

E.C. values are low in the surface generally increasing to high values at depth. The soils are non-sodic at the surface, becoming sodic to strongly sodic at depth. The percentage clay generally increases down the profile with values usually greater than 35%. C and N values are low to very fair. Acid P values are low except where brigalow fringes the downs. In these situations some high values were recorded. Values of acid P tend to be higher in the surface layer. Exchangeable K shows a build-up in the surface 10 cm below which values of 0.2 m.equiv. or less were recorded. A.W.C. values are high.

Soil group C - grey and brown clays on undulating plains (gidgee)

These soils are weakly to moderately gilgaied. Scattered stone cover is confined to the gilgai puffs. The soil surface is weakly self-mulching. Crusting is evident and a thin crumb layer overlies strongly structured heavy clays. Soil pH ranges from strongly alkaline to neutral in the surface generally increasing in alkalinity to 30 cm.

E.C. values are low in the surface, increasing to very high values at depth. Soils are non-sodic at the surface becoming strongly sodic at depth. The percentage clay is generally greater than 35% with the surface soil being coarser textured. C and N values are fair to low. Acid P values are fair to very high in the surface, decreasing in value to 60 cm. Bicarbonate P values are low to high. A.W.C. values are high.

Soil group D - grey and brown clays on alluvial plains

These soils are deep to very deep. They exhibit a wide variation in soil properties. They have been separated into SMU's on the basis of surface texture and pH trends. Sand seams and layering of soils are common. Soil pH is variable ranging from strongly alkaline to medium acid in the surface with a general increase in alkalinity with depth.

E.C. values are low in the surface soil and very low throughout the profile if regularly flooded. High E.C. values were recorded on those soils not frequently flooded. The frequently flooded sites were non-sodic throughout while those receiving run-on water may be sodic at the surface and strongly sodic at depth. The percentage clay is generally greater than 35%. Acid P values are low to very low but some high values were recorded. A.W.C. values are variable but range from medium to high.

Soil group E - scalds

These soils are deep and exhibit a hard, scalded surface which overlies a strongly structured clay.

High E.C. values were recorded on those soils not frequently flooded. Non-flooded scalds are strongly sodic throughout. C and N values are very low.

TEXTURE CONTRAST SOILS

The main characteristic of all texture contrast soils is the marked change in texture in the profile which results in an abrupt or clear boundary between the surface horizons and the clayey subsoils. Two subdivisions have been made; those formed on flat alluvial plains and those formed on undulating plains.

Soil group G - texture contrast soils on alluvia

These have been separated into SMU's on the basis of surface soil texture differences, pH and presence of an A_2 horizon. Soil pH values are variable and generally increase with depth.

E.C. values are generally low. The soil surface is non-sodic but may become sodic at depth. C and N values are low to very low. Acid P generally is low to very low, with some high values recorded. Salts were recorded in some profiles. Exchangeable K values are less than 0.2 m.equiv. and could limit plant growth. A.W.C. values are low at the surface, increasing with depth.

Soil group H - texture contrast soils on undulating plains

This group has been separated into SMU's by differences in surface texture, thickness of the A horizon, depth of soil, pH and the colour of the subsoil. Characteristics of the surface soil e.g. loose surfaces/hard setting surfaces were also used for separating those soils derived from Jurassic and Cretaceous sediments. Soil pH ranges from medium acid to mildly alkaline in the surface, generally increasing with depth.

E.C. values are low to medium. The soils are non-sodic. Very low N and very low to low C values were recorded. Acid P values were low. Exchangeable K values were low to fair with many sites recording 0.2 m.equiv. or less. Some low Ca and Mg values were recorded. A.W.C. values are low in the surface, increasing with depth.

RED EARTHS

The soils in this group have gradational texture profiles in which texture becomes finer with depth. The red earths have been subdivided into component SMU's on the basis of surface texture, soil depth and colour. These soils are reddish brown to red in colour, have massive structure and earthy fabric. The two main groups are the loamy red earths and the sandy red earths. The red earths have formed predominantly on weathered rocks. As Gunn (1974) observed, red earths are common on intact remnants of the old land surface and on extensive depositional plains where re-working has occurred. Depth varies somewhat. The loamy red earths have been separated into deep, red earths, which are deeper than 50 cm, and shallow, red earths, which are less than 50 to 60 cm deep.

Soil group I - deep, red earths

These soils are moderately deep to deep. The surface is crusted and ironstone shot is generally present on the surface and throughout the profile. Soil pH ranges from very strongly acid to slightly acid in the surface.

E.C. values are low. They are non-sodic. The percentage clay increases with depth. C is low to fair. N is very low to low. Acid P values are low to very low. A.W.C. values are generally low.

Soil group J - shallow, red earths

Depth ranges from 10 to 50 cm. Surface crusts are present. Ironstone shot is present on the surface and in the profile. Soil pH ranges from strongly acid to slightly acid. E.C. values are low. Soils are non-sodic. N values are low to very low. C values are low to fair. Acid P values are low to very low. A.W.C. values are low.

Soil group K - sandy red earths

These soils have surface textures of sandy loam or coarser. Subdivision into SMU's has been on the basis of surface soil characteristics and soil colour. Soil pH ranges from very strongly acid to slightly acid in the surface. pH generally increases slightly down the profile.

E.C. values are low. Soils are non-sodic. The percentage clay increases with depth. C values are very low to very fair. N values are low to very low. Acid P values are very low. Exchangeable K values are adequate in the mulga lands but values of 0.2 m.equiv. or less were recorded in yellowjack communities in the "desert". Ca and Mg may be limiting on some of these soils. A.W.C. values are low to very low.

Soil group L - earthy sands

The soils of this group have textures which range from uniform sands to loamy sands or occasionally sandy loams. They show little profile development. They have an earthy appearance apparently due to the coating and bridging of sand grains by clayey materials including iron oxides (Stace *et al.* 1967). The soils are loose and only weakly coherent. Initial separation into SMU's was by parent material.

One SMU consists of soils formed on transported materials on levee remnants or sand sheets on old depositional plains. The second group consists of soils formed *in situ*, underlain by quartzose sandstones. Soil depth and pH were used to separate the SMU's. Soil pH ranges from strongly acid to neutral in the surface with a few sites becoming alkaline to strongly alkaline at depth.

E.C. values are low. Soils are non-sodic. C values are very low to fair. N values are very low to low. Acid P values are very low but higher values may be encountered on alluvia. Generally values of 0.2 m.equiv. or less were recorded for exchangeable K on alluvia. Ca and Mg may be limiting for some soils. A.W.C. values are very low to low.

Soil group M - yellow earths

These soils occur in the northern and central parts of the survey area and are closely associated with the red earths. Separation into SMU's was based on surface texture. Soil pH ranges from medium acid to neutral with no consistent profile trend.

E.C. values are low. Soils are non-sodic. C values are very low to low. N values are very low to low. Acid P values are very low. Exchangeable K values less than 0.2 m.equiv. were recorded. Ca and Mg may be limiting in some soils. A.W.C. values are low to medium, depending on % clay.

Soil group N - lithosols

The soils of this group are very shallow to shallow with little profile development. Separation into SMU's has been on the basis of texture. Soil pH is usually strongly to very strongly acid.

E.C. values are low. Soils are non-sodic. Acid P values are very low. Exchangeable K can be limiting. A.W.C. values are very low.

SOIL CHEMICAL AND PHYSICAL PROPERTIES

A total of 83 profiles was selected for detailed analysis. Only 47 profiles were analysed in detail. Data for each analysed soil profile is given in Microfiche 1 as part of the site descriptions. Summaries of soil chemical and physical properties are given for each land unit description (Appendix V). The range of values for ratings such as high, fair, low, etc., for the various soil attributes is given in Appendix I. The analytical methods used are listed in Appendix II.

For interpretation purposes, the 41 Soil Mapping Units (SMU's) have been amalgamated into 13 broad soil groups (see previous section). Data relating to these 13 major groups have been presented as distribution tables to show the median characteristics and the range of values. Mean values and standard deviations are also included in the distribution tables.

Correlation coefficients were calculated for a number of soil chemical properties. These values and levels of significance are listed in Table 3.2.

Table 3.2. Correlation coefficients between soil factors (0-10 cm).

	C	TP	AP	BP
Clay Soils (A,B,C,D,E)				
Organic C (C)				
Total phosphorus (TP)	NS			
Acid extr. P (AP)	NS	0.79***(22)		
Bicarb. extr. P (BP)	NS	0.49* (22)	0.49** (38)	
Nitrogen (N)	0.91***(38)	NS	NS	NS
Texture contrast soils (G,H)				
C				
TP	NS			
AP	NS	0.81* (7)		
BP	NS	0.80* (7)	0.97***(16)	
N	0.83***(16)	NS	NS	NS
CEC		0.84* (7)	0.77* (7)	0.77* (7)
Replac. K	0.50* (16)	0.82* (7)	0.80***(16)	0.84***(16)
Red and yellow earths (I,J,K,L,M)				
C				
TP	NS			
AP	NS	0.69** (16)		
BP	NS	0.73** (16)	0.91***(27)	
N	0.81***(27)	NS	NS	NS
CEC	0.70** (16)	0.59* (16)	NS	NS
All data				
C				
TP	NS			
AP	NS	0.79***(47)		
BP	NS	0.59***(47)	0.57***(83)	
N	0.83***(83)	0.39** (47)	0.29** (83)	0.24* (83)

*** 0.1% significance level
** 1.0% significance level
* 5.0% significance level
( ) indicates pairs of values used to derive correlation coefficients.

Soil pH

Laboratory pH for soils in the survey area ranges from very strongly acid (pH 4.5) to very strongly alkaline (pH 10.5). The distribution of pH for the 13 soil groups is set out in Table 3.3. Soil pH is strongly correlated with % clay ($r=.75^{***}$), Ca^{++} ($.83^{***}$) and C.E.C. ($.84^{***}$) for all surface soils. These factors are strongly inter-correlated. When divided into three broad groups (Table 3.2), the clays are the only group where pH is significantly correlated with these factors.

Table 3.3. Frequency distribution of pH for soil groups.

See Microfiche 2.

If pH 8 or greater is taken to represent soil alkalinity in the surface soil, then the grey and brown clays are the ones where plant growth may be affected.

A considerable number of soils has values in the range of medium acid to extremely acid. This factor could indicate the need for some soil surface management. The red earths, yellow earths, earthy sands, lithosols and some texture contrast soils are the main groups where plant growth may be affected.

The effects of acidity and alkalinity are strongly dependent on other soil chemical features such as exchange properties, organic matter, nutrient availability and other environmental features such as rainfall and vegetation.

Carbonate

Carbonate may be present in the soil either as calcium or magnesium carbonate. The concretionary and soft forms have been referred to as lime in the field survey. Both concretionary and soft lime are present in many of the cracking clays and the subsoils of the texture contrast soils, and can occur in the earthy sands. Table 3.4 indicates the distribution and amount of lime calculated equivalent to % calcium carbonate within the soil groups. Lime is evenly distributed down the profile in the grey and brown clays except for the clays of the brigalow areas where lime tends to decrease with depth.

Table 3.4. Distribution of % $CaCO_3$ for the soil groups.

See Microfiche 2.

Gypsum

Gypsum occurs in crystalline form in many of the clay soils. Most of the grey and brown clays on the undulating plains have gypsum present in the profile at depth. Both gypsum and lime may occur together in the profiles. Gypsum is water soluble and in soils is generally leached to the depth of regular heavy wetting where it forms a saturated solution and crystallizes. Once large crystals form they do not readily dissolve unless subject to prolonged wetting in the soil. Where crystallized gypsum occurs it is fair to say that this is an indication of the depth of effective wetting in these soils.

Total Nitrogen and Organic Carbon

Total nitrogen (N) and organic carbon (C) levels in the surface 10 cm are low, with only 18% of samples exceeding 1% for C and 12% of samples exceeding 0.1% for N. 60% of values are extremely low, having values between 0.03 and 0.06% for N. The frequency distribution of values of C and N for the major soil groups is given in Tables 3.5 and 3.6 respectively.

Mean C value for all surface samples (0-10 cm) is 0.73%. This is higher than the 0.49% C recorded by Dawson and Ahern (1974) in south-west Queensland. This is due to the higher values on the clay soils and is associated with higher rainfall.

Table 3.5. Frequency distribution of % organic carbon (0-10 cm) for soil groups.

Soil Group	<0.2	0.3-0.4	0.5-0.6	0.7-0.9	1.0-1.4	>1.5	Mean
A Grey and brown clays on undulating plains (downs)			6	6	2		0.74
B Grey and brown clays on undulating plains (brigalow)			1	6	1	1	0.96
C Grey and brown clays on undulating plains (gidgee)				4	2		0.92
D Grey and brown clays on alluvial plains			4	2	1		0.77
E Scalds		2					0.40
G Texture contrast soils on alluvia	2	1	3	1			0.43
H Texture contrast soils on undulating plains		3	4	1	1		0.56
I Deep, red earths			2		1		0.70
J Shallow red earths			1	1	1		0.83
K Sandy red earths		1	1	4	1	2	0.90
L Earthy sands	2	3	1	2	1		0.54
M Yellow earths		2		1			0.57
N Lithosols		1				1	1.35
All soils	4	13	23	28	11	4	0.73

Table 3.6. Frequency distribution of % total nitrogen (0-10 cm) for soil groups.

See Microfiche 2.

The mean value of N for all surface samples is 0.057%. This mean is slightly higher than the 0.045% recorded by Dawson and Ahern (1974) and similar to Charley and Cowlings (1968) figure of 0.06% N for arid areas of New South Wales.

Those soils which have higher C and N values, commonly support mulga, gidgee, brigalow or bendee vegetation associations. These *Acacia* species belong to the Leguminosae family. Mulga and bendee are commonly associated with red earths and lithosols whilst brigalow and gidgee are associated with the grey and brown clays on undulating plains.

The lowest values for C and N were recorded on scalds, texture contrast soils, red and yellow earths and earthy sands. Highly significant correlations for organic carbon and total nitrogen were obtained for all groups. (See Table 3.2).

The mean C/N ratio for all surface soils is 13.9 (cv=35%). The grey and brown clays, if taken as a single group, have a mean C/N ratio of 11 (cv=15%). This is in contrast to the red and yellow earths of the "desert", where the C/N values recorded were both high and variable. Most of the high C/N ratios can be attributed to sites where spinifex vegetation is present. This may be related to the fact that spinifex is strongly lignified and has low plant protein values.

The management of soil organic matter is an important feature of these soils as the values are very low. It is particularly important on weathered soils. Gillman and Bell (1976) have shown it will be of prime importance to conserve or even increase organic matter content on weathered soils i.e. red and yellow earths, because the contribution of negative charge from organic matter is vital to the retention of nutrient cations in the surface soil.

Phosphorus

Phosphorus determinations (0.01 N H_2SO_4 acid extraction) were made on all samples. Phosphorus determinations (using the 0.5 M $NaHCO_3$ extraction) were made on all 0-10 cm samples and the 10-20 cm depth of the detailed sites.

Total phosphorus (T.P.) determinations were made on the 0-10, 20-30, 50-60, 110-120 cm depths of the detailed profiles, using X-ray fluorescence. Frequency distributions are given in Tables 3.7, 3.8 and 3.9 for acid extraction, bicarbonate extraction and X-ray fluorescence results respectively. Significant correlations were obtained between total P and acid extractable P and bicarbonate extractable P. (See Table 3.2).

Mean total P values for all soils are 0.038% for the surface and 0.027% at the 120 cm depth. These values are lower than the mean values (0.041 and 0.032 respectively) recorded by Dawson and Ahern (1974) for south-west Queensland.

A strong correlation was obtained between acid extractable P and bicarbonate extractable P for the red earths (r=0.91***). This agrees with the value of r=0.916*** obtained by Dawson and Ahern (op. cit.) for red earths in south-west Queensland. The value (r=0.49**) for clay soils is much lower than their value of r=0.848***. This can be attributed to differences in parent material, soil types and acid extractable P values.

Total P values between sites on the undulating downs were variable (0.014% to 0.073% P) but generally showed little variation within profiles. Highest values for total P were recorded on the grey and brown clays of the gidgee lands where values ranged from 0.018% to 0.15% P. Total P declined down the profile for the woodlands and shrublands. They could have greater ability than the grasslands to extract P from the profile and bring it to the surface.

The grey and brown clays on alluvia generally had low values for acid P but some high values were recorded.

In a pot trial study of a red earth, Christie (1970) has shown that 25 ppm P (acid extraction) is the critical level for buffel grass establishment. If this value holds for other soils then the undulating gidgee and undulating brigalow lands have values suited to the establishment of buffel grass. However, many of the sites in the mulga and "desert" lands do not reach the value considered necessary for the establishment of buffel grass. Christie (1975) noted that buffel grass established readily beneath the tree canopies of poplar box. He found that the value for acid P in the surface soil beneath a mature poplar box tree canopy was 65 ppm which is much higher than the value of 10 ppm recorded outside the canopy zone. Similar results for soils in the "desert" were obtained by Orr (personal communication) where values of 27 ppm and 10 ppm were recorded for the canopy and inter-canopy sites respectively. These results agree with the findings of Edye *et al.* (1964) who found the sandy red earths of the "desert" to be very deficient in P and K and only marginally suited for the establishment of buffel grass.

Table 3.7. Frequency distribution of acid extractable phosphorus (ppm) for soil groups

Soil Group	Depth cm	<5	6-10	11-15	16-20	21-25	26-30	31-35	36-45	46-100	>100	Mean
A Grey and brown clays on undulating plains (downs)	0-10	1	1	1	1	1				5	4	85
	10-20	2	2	1				1		4	4	76
B Grey and brown clays on undulating plains (brigalow)	0-10		1	3	1		1			3		30
	10-20		2	2	1		1		2	1		25
C Grey and brown clays on undulating plains (gidgee)	0-10						2			2	2	123
	10-20				2	1				1	2	78
D Grey and brown clays on alluvial plains	0-10		1	3		1			1		1	35
	10-20	1	1	2	1				1	1		22
E Scalds	0-10					1					1	88
	10-20				1						1	96
G Texture contrast soils on alluvia	0-10		1	2	1				1	2		34
	10-20	1	2		1		1		1	1		25
H Texture contrast soils on undulating plains	0-10	4	3		1			1				10
	10-20	6	2		1							5
I Deep, red earths	0-10	1			1				1			20
	10-20	2			1							8
J Shallow red earths	0-10	2			1							9
	10-20	1	1									5
K Sandy red earths	0-10	4	5									5
	10-20	9										3
L Earthy sands	0-10	2	2	3					1		1	25
	10-20	4	2		1		1			1		14
M Yellow earths	0-10	3										2
	10-20	3										2
N Lithosols	0-10		2									8
All soils	0-10	17	16	12	6	3	3	1	4	12	9	40
	10-20	29	12	5	9	1	3	1	4	9	7	31

The present state of the pastoral industry requires low cost methods of establishing improved pastures. Sowing buffel grass seed into the relatively fertile micro-habitats would be one way of achieving this.

Table 3.8. Frequency distribution of bicarbonate extractable phosphorus (ppm) for soil groups

Soil Group	Depth cm	<5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-70	>70	Mean
A Grey and brown clays on undulating plains (downs)	0-10	5	4	1	1	1	1		1			12
	10-20	5	4	2								6
B Grey and brown clays on undulating plains (brigalow)	0-10	1	2	2		4						15
	10-20	2	2	1	2							10
C Grey and brown clays on undulating plains (gidgee)	0-10				2	1	1		1	1		28
	10-20		1	1			2					19
D Grey and brown clays on alluvial plains	0-10		5		1						1	20
	10-20	1	2					1				14
E Scalds	0-10			1						1		33
	10-20		1									8
G Texture contrast soils on alluvia	0-10		3	1				1		2		23
	10-20	2	1				1					10
H Texture contrast soils on undulating plains	0-10	6	1	1		1						6
	10-20	4	2									5
I Deep, red earths	0-10	2						1				14
	10-20	1		1								7
J Shallow red earths	0-10	2		1								7
	10-20	1	1									4
K Sandy red earths	0-10	7	2									4
	10-20	5										2
L Earthy sands	0-10	2	4		1			1		1		16
	10-20	2		1			1		1			17
M Yellow earths	0-10	3										2
	10-20	3										2
N Lithosols	0-10		1	1								10
All soils	0-10	28	22	8	5	7	2	3	2	5	1	14
	10-20	26	14	6	2		4	1	1			9

Table 3.9. Frequency distribution of % phosphorus for soil groups.

See Microfiche 2.

Available Soil Water Capacity

Available soil water capacity was determined in the laboratory by calculating the difference between moisture held at 0.33 bar and 15 bar. The available soil water capacity values for the soil groups are given in Table 3.10. Available soil water capacity ranges from 1% in the earthy sands to 22% in the grey and brown clays.

Table 3.10. Available soil water capacity (%)for the soil groups.

See Microfiche 2.

The grey and brown clays have medium to very high capacities to store water. These soils crack when dry and have high initial infiltration rates due to these cracks. The infiltration rates are reduced once the soil swells after wetting and the cracks close. The texture contrast soils often have poor surface characteristics such as crusts and hard setting surfaces. Infiltration rates on these soils are generally low. The red and yellow earths have variable infiltration rates, depending on surface cover and moisture content. When bare and dry, the hard setting surfaces of the red and yellow earths have high rates of runoff.

Only small areas are cropped and these are confined to the clay soils in the south. Pressland and Batianoff (1976) in a study of moisture accretion in clay soils in this semi-arid region, found that stored soil moisture increased in the 0-90 cm profile with cultivation. Maintaining a weed free fallow resulted in increased soil moisture at sowing and enhanced the probability of successfully growing a fodder crop.

Soluble Salts

The distribution of % Cl and E.C. (electrical conductivity) for the soil groups is shown in Tables 3.11 and 3.12 respectively. E.C. and Cl generally increase with depth for all soil groups. The highest values are recorded in the grey and brown clays.

Table 3.11. Frequency distribution of % Cl for the soil groups.

See Microfiche 2.

Cl values are very low for the red and yellow earths, earthy sands and texture contrast soils. These soils are permeable and salts are easily leached out of the profile. Cl values reach high levels in the grey and brown clays of the undulating gidgee, undulating brigalow and wooded downs above 120 cm.

Using the criteria established by Northcote and Skene (1972), only four clay sites had saline subsoils. These soils were associated with the undulating gidgee and undulating brigalow lands. One saline subsoil was recorded at the edge of a drainage line in the undulating downs.

E.C. values tend to increase down the profile. E.C. values for scalds (on the fringe of alluvial plains) were very high in the surface soil, while scalds on the flooded alluvia recorded only medium values. E.C. values on frequently flooded areas are generally low.

Exchangeable Cations and Cation Exchange Capacity

Cation exchange capacity (C.E.C.) and the major exchangeable cations were determined for all representative profiles.

Table 3.12. Frequency distribution of E.C. for soil groups

Soil Group	Depth cm	<.15	.16-.45	.46-.9	.91-2.0	2.1-5.0	5.1-9.98	>9.98	Mean
A Grey and brown clays on undulating plains (downs)	0-10	13							0.09
	50-60	2	3	2			2	3	4.04
B Grey and brown clays on undulating plains (brigalow)	0-10	8	1						0.10
	50-60			3	3		2	1	3.52
C Grey and brown clays on undulating plains (gidgee)	0-10	5	1						0.11
	50-60		1	2		1		2	4.34
D Grey and brown clays on alluvial plains	0-10	7							0.08
	50-60	3		3			1		1.13
E Scalds	0-10						1		4.55
	50-60		1					1	5.16
G Texture contrast soils on alluvia	0-10	7							0.04
	50-60	5		1		1			0.57
H Texture contrast soils on undulating plains	0-10	8	1						0.05
	50-60	8		1					0.11
I Deep, red earths	0-10	3							0.05
	50-60	3							0.03
J Shallow red earths	0-10	2	1						0.07
	50-60	1							0.02
K Sandy red earths	0-10	9							0.05
	50-60	9							0.03
L Earthy sands	0-10	8							0.04
	50-60	8							0.04
M Yellow earths	0-10	3							0.03
	50-60	3							0.04
N Lithosols	0-10	2							0.04
All soils	0-10	76	5						0.18
	50-60	42	5	12	3	2	5	7	1.71

The distribution of C.E.C./100 g clay for all soil groups is given in Table 3.13. The highest values were recorded in the grey and brown clays, with the clay soils of the undulating downs having higher values than the clay soils of the undulating gidgee or undulating brigalow. The clay soils of the undulating downs

recorded means of 85 and 84 m.equiv./100 g clay for the 20 to 30 cm layer and the profile base respectively. This indicates that the clays are predominantly of the montmorillonite type. The clay soils of the undulating brigalow and undulating gidgee had values of 72 and 73 at 20-30 cm and 67 and 76 at 120 cm respectively. The highest C.E.C./clay values were recorded on the clay soils formed from fresh fine-grained sediments. C.E.C./clay values for the alluvial clays were variable, ranging from 37 to 81 m.equiv./100 g clay. Except for the surface, the red earths, yellow earths and earthy sands mainly had values less than 30 m.equiv./100 g clay. They are mainly kaolinitic type clays. In coarse textured soils, the contribution of organic matter in the surface to the C.E.C./clay ratio is much greater than in the fine textured soils. This accounts for the higher values and greater variability in the surface soil.

Table 3.13. Frequency distribution of C.E.C. per 100 g clay for selected soil groups

Soil Group	Depth cm	<15	16-30	31-40	41-50	51-60	61-70	71-80	81-90	>90	Mean
A Grey and brown clays on undulating plains (downs)	0-10							1	3	2	88
	20-30						1		4	2	85
	50-60						1		2	3	87
B Grey and brown clays on undulating plains (brigalow)	0-10					1	1	2	1	1	75
	20-30						3	2	1		72
	50-60						3	2	1		71
C Grey and brown clays on undulating plains (gidgee)	0-10						1		1	1	80
	20-30					1	1		2		73
	50-60						2	1	1		71
D Grey and brown clays on alluvial plains	0-10				1	2			1		60
	20-30			1		2		1			57
	50-60				1	2	1				58
E Scalds	0-10					1					51
	20-30				1						50
	50-60						1				67
G Texture contrast soils on alluvia	0-10							1	1		82
	20-30						2				70
	50-60				2						50
H Texture contrast soils on undulating plains	0-10			1		1		1		1	66
	20-30			1	2	1					45
	50-60		1		3						41
I Deep, red earths	0-10			1	1						40
	20-30			2							35
	50-60		2								23
J Shallow red earths	0-10						2				63
	20-30			2							33
	50-60			1							33

It is difficult to obtain accurate values for soils with low C.E.C. The values are meaningless when related to percentage clay for very low clay soils. For this reason, the sandy red earths, the yellow earths, the earthy sands and lithosols are omitted from Table 3.13.

Exchangeable Cations

Calcium is the dominant cation for all the soil groups except the scalds. Tables 3.14, 3.15 and 3.16 indicate the frequency distribution of exchangeable Ca, exchangeable Mg and exchangeable Na respectively.

Table 3.14. Frequency distribution of exchangeable Ca for the soil groups

See Microfiche 2.

Exchangeable Ca levels in the surface of the grey and brown clays indicate satisfactory levels for plant nutrition.

Table 3.14. Frequency distribution of exchangeable Mg for the soil groups

See Microfiche 2.

Some of the red earths occurring in the eucalypt woodlands ("desert") have low Ca and Mg levels. This agrees with the conclusion of Edye *et al.* (1964) who obtained a Ca response using white clover as an indicator plant. Our results indicate Ca and Mg could also be deficient in the yellow earths of the "desert", and some of the red earths of the mulga lands for the growth of exotic plants.

Table 3.16. Frequency distribution of exchangeable Na for the soil groups

See Microfiche 2.

The distribution of exchangeable K values for each of the soil groups is given in Table 3.17. Some 76% of samples had values exceeding 0.3 m.equiv./100 g. The main soils with limiting values of exchangeable K were in the "desert" where some 24% of sites had values less than 0.2 m.equiv./100 g, which is the value considered by Crack and Isbell (1970) to be a plant deficiency level.

Table 3.17. Frequency distribution of exchangeable K for the soil groups

See Microfiche 2.

The frequency distribution of ESP (exchangeable sodium percentage) is given in Table 3.18. The grey and brown clays generally are sodic at depth and the scalds are sodic throughout. Excepting for the scald situation and drainage lines, no problem is expected with sodicity in the surface soils.

Table 3.18. Frequency distribution of ESP for the soil groups

See Microfiche 2.

Particle Size Analysis

The frequency distribution of % clay for all the soil groups is given in Table 3.19. For all soils, available moisture showed a highly significant correlation with % clay. This correlation did not hold with the red and yellow earths. The clay soils of the undulating downs recorded higher % clay values than the clay soils of the undulating gidgee, undulating brigalow and alluvial areas.

Table 3.19. Frequency distribution of % clay for the soil groups

See Microfiche 2.

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VEGETATION

*by G.R. Beeston**

The vegetation of the area has been studied by numerous workers since the area was first explored and settled. Mitchell (1848) was one of the early explorers who carried out botanical surveys during his trips.

Blake (1938) carried out the first major study of vegetation. Since then, very little descriptive botanical work has been carried out and most work has been related to the productivity of the associations in relation to the pastoral industries.

The Mitchell grass associations of the area have been studied by Bissett (1962), Everist (1935, 1951, 1964), Purcell (1963a), Purcell and Lee (1970) and Orr (1975) who has reviewed the *Astrebla* pastures. Purcell (1964) has studied the gidgee associations of the area. The area known as "the desert country", which supports plant associations dominated by *Eucalyptus melanophloia*, *E. populnea* and *E. papuana* has been studied by Christie (1975), Ebersohn and Lucas (1965), Edye *et al.* (1964), Humphreys (1963) and Purcell (1963b). Cull and Ebersohn (1969) worked on an area of the communities referred to in this report as the sand plain association.

ENVIRONMENTAL FACTORS

The plant associations of the area are generally more complex structurally than those in the area described by Boyland (1974). This is due to the more mesic environment of the area, where the long term annual average rainfall does not fall below 480 mm. In places on the Great Dividing Range it can be as high as 660 mm. Despite the uniformity of rainfall over the area and the short distance (approximately 100 km) between the eastern and western boundaries, there is still a decrease in canopy cover and structural complexity. This is particularly apparent in the *Acacia harpophylla* association, where the woodlands with well developed shrub layers in the east give way to grassy tall open shrublands in the west.

In the area there are correlations between landforms and the pattern and composition of vegetation. Physiographic and edaphic features control runoff, surface drainage and redistribution of the available moisture for plant growth. Slope and aspect also influence the effectiveness of any moisture available.

The effect of fires on the vegetation was evident in some associations. Some *Acacia harpophylla* associations in the east had been reduced to shrublands by the action of uncontrolled fires started by lightning or man's pastoral activities. Also in areas of the eucalypt woodlands the species composition of the ground layer has been affected by fires and the subsequent grazing history of the pasture. Heavy stocking of these pastures following burning has resulted in a decrease in *Triodia* species and an increase in other species of the genera *Aristida* and *Bothriochloa*. Continued heavy stocking can lead to total destruction of the ground layer and creation of bare areas.

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CLASSIFICATION OF VEGETATION

The vegetation of the area can be classified into nine major floristic zones. Within these zones some plant associations grade into one another, for example the *Acacia harpophylla* associations are often found with areas of the *Eucalyptus populnea* association. Some associations,for example the *Acacia harpophylla*, *Eucalyptus melanophloia* and *E. populnea* associations exhibit considerable variation in floristic composition and structural formations.

The vegetation of the area was classified structurally by using a modification of the scheme proposed by Specht (1970), (Table 4.1). This is based on projective foliage cover and height and or life form of the tallest stratum. Modification was necessary to eliminate some difficulties encountered in using Specht's scheme. Associations are assessed on the stratum which contributes most to the total biomass (perennial species only) and not necessarily the tallest stratum. This avoids the problem of how to classify an association with a sparse tree stratum and a dense tall shrub stratum. Nomenclature of structural formations follows that proposed by Specht (1970) with the addition of "sparse herbland" for the category of herblands with projective foliage cover (PFC) less than 10%.

Table 4.1. Structural formations represented in the region

	Projected Foliage Cover of Predominant Stratum		
Life Form and Height of Predominant* Stratum	Mid Dense (30-70%)	Sparse (10-30%)	Very Sparse (<10%)
Trees 10-30 m	Open forest	Woodland	Open woodland
Trees <10 m	Low open forest	Low woodland	Low open woodland
Shrubs 2-8 m	Open scrub	Tall shrubland	Tall open shrubland
Shrubs <2 m		Low shrubland	Low open shrubland
Hummock grasses 0-2 m		Hummock grassland	Open hummock grassland
Herbs include grasses, forbs and sedges	Herbland Tussock grassland	Open herbland Open tussock grassland	Sparse herbland Sparse forbland
	Sedgeland Forbland	Open sedgeland Open forbland	

* Predominant stratum is the layer which contributes most to the biomass. Tree is a woody plant more than 5 m tall usually with a single stem. Shrub is a woody plant less than 8 m tall either multi-stemmed or branched close to ground level, infrequently with a single stem.

MAJOR STRUCTURAL FORMATIONS

Eighteen structural formations are present. These formations range from sparse herbland to open forest (Table 4.1). Low open woodland, open woodland and woodland are the most widely distributed formations. Together they occupy approximately 80% of the total area. The remainder support predominantly grasslands but these are dependent on seasonal conditions.With heavy winter rainfall in periods following droughts,these associations are predominantly herblands and in some instances even forblands.

FLORISTICS

Within the area 599 plant species were recorded. These represent 249 genera belonging to 79 families (Appendix III). Of these species 417 are perennials including both short and longlife perennials. This is not a complete list of species occurring, as the area was not completely traversed or collected in detail. In arid regions ephemeral species adjust their growth period to particular seasonal conditions (Shreve, 1951; Went, 1955; Everist, 1964) and it is possible many ephermerals may not have been observed during the time spent in field work. Most of the botanical field work was carried out in the months of May and July.

As was found by Boyland (1974), Gramineae and Leguminosae are the largest families, being represented by 41 and 25 genera and 137 and 99 species respectively. Other floristically important families include Myrtaceae, Chenopodiaceae, Compositae, Malvaceae, Cyperaceae. Families represented by 5 or more species are listed in Table 4.2 in order of numbers of recorded species. These 22 families contain 496 species which is approximately 83% of the total species recorded. Of these 496 species, 367 are perennials. This represents 90% of the number of perennials listed for the area.

Table 4.2. Families represented by five or more species

Family	No. of Genera	No. of Species	No. of Perennials
Gramineae	38	127	96
Leguminosae	24	95	80
Myrtaceae	10	49	49
Chenopodiaceae	8	29	14
Compositae	19	26	11
Malvaceae	5	23	19
Cyperaceae	5	19	14
Myoporaceae	2	16	16
Sapindaceae	3	14	14
Proteaceae	6	14	14
Euphorbiaceae	7	13	11
Goodeniaceae	3	10	0
Thymeleaceae	2	8	4
Protulaceae	2	8	1
Solanaceae	2	7	6
Amaranthaceae	4	6	0
Apocynaceae	4	6	5
Convolvulaceae	6	6	0
Capparidaceae	2	5	5
Sterculiaceae	3	5	4
Umbelliferae	4	5	1
Verbenaceae	3	5	3

Table 4.3 illustrates the distribution of families, genera and species in the land zones. When the number of species is plotted against area for the various land zones, the woodlands on the alluvial plain have a higher species diversity than normal if a straight line relationship is assumed between species numbers and area of a land zone. All other zones have species numbers comparable with their area.

Table 4.3. Number of species, genera and families recorded for the major vegetation groups

Major Vegetation Group	No. of Species	No. of Genera	No. of Families	Major Families	Major Genera
Eucalyptus spp.	290	133	46	Gramineae (72 species); Leguminosae (53 species); Myrtaceae (32 species); Malvaceae (10 species); Chenopodiaceae (10 species); Myoporaceae (9 species); Sapindaceae (8 species).	Acacia (29 species); Eucalyptus (24 species); Aristida (20 species); Eragrostis (12 species); Bassia (7 species); Dodonaea (6 species); Eremophila (6 species).
Acacia cambagei	83	57	22	Gramineae (19 species); Chenopodiaceae (16 species); Leguminosae (7 species); Malvaceae (6 species).	Aristida (4 species); Abutilon (4 species); Bassia (7 species).
Acacia aneura (soft)	44	23	10	Gramineae (21 species); Myoporaceae (6 species); Leguminosae (4 species); Malvaceae (4 species).	Aristida (7 species); Eragrostis (5 species); Eremophila (6 species).
Acacia aneura (hard)	37	23	9	Gramineae (15 species); Myoporaceae (6 species); Myrtaceae (5 species); Leguminosae (4 species).	Eremophila (4 species); Eucalyptus (4 species); Digitaria (3 species).
Acacia catenulata	78	49	24	Gramineae (15 species); Leguminosae (13 species); Myrtaceae (14 species).	Acacia (10 species); Eucalyptus (10 species).

Table 4.3. Number of species, genera and families recorded for the major vegetation groups (Cont'd)

Major Vegetation Group	No. of Species	No. of Genera	No. of Families	Major Families	Major Genera
Astrebla spp.	150	92	34	Gramineae (47 species); Leguminosae (22 species); Chenopodiaceae (17 species); Myrtaceae (5 species).	Bassia (10 species); Acacia (9 species); Eucalyptus (5 species).
Acacia harpophylla	135	71	32	Gramineae (40 species); Leguminosae (16 species); Chenopodiaceae (16 species).	Bassia (8 species); Acacia (5 species); Eucalyptus (5 species); Eremophila (4 species).
Callitris columellaris	56	39	22	Gramineae (17 species); Myrtaceae (6 species); Leguminosae (5 species).	Eragrostis (5 species); Eucalyptus (5 species); Acacia (4 species).
Sandplain communities	68	55	24	Gramineae (14 species); Leguminosae (10 species); Chenopodiaceae (8 species).	Acacia (5 species); Aristida (5 species).

The genus *Eucalyptus* is well represented. Thirty-three species have been recorded from the area. Twenty-four of these were also recorded by Pedley (1967) in the Nogoa-Belyando area immediately to the east. *Eucalyptus populnea* is widespread throughout the area and only is absent from the undulating downs and gidgee areas. *Eucalyptus melanophloia* is also widespread and even occurs on the wooded downs in places. *Eucalyptus papuana* is also widely distributed and is found in all areas except the gidgee, alluvial plains, undulating downs and brigalow areas. Other species such as *E. camaldulensis, E. microtheca, E. exserta* and *E. thozetiana* have distinct habitat preferences. *E. camaldulensis* and *E. microtheca* were only found on the alluvial plains and river channel areas. *E. exserta* was restricted to mesas where the soil was very shallow and parent rock was exposed. *E. thozetiana* was found at the base of mesas or in areas where soil depth was limited by stone such as in the Mareto land system. Three other species *E. decorticans, E. microcarpa* and *E. tereticornis* are at their westerly limit in this area and occur only in the east.

Species of the genus *Acacia* are the most frequently occurring shrubs with a total of 45 species being recorded. These species are conspicuous on most land zones, the exception being the undulating treeless downs, although even here *Acacia farnesiana* and *Acacia victoriae* can be conspicuous. Eight of the *Acacia* species occurred on 4 or more land zones. *Acacia aneura* is important in the south. *Acacias*, which form a large part of the understorey of the *Eucalyptus* associations, are most numerous and widespread. As was found by Blake (1938) and Boyland (1974), *Acacia cambagei* is widespread but in this area occurred mainly on cracking clays with minor occurrences on texture contrast soils. *Acacia catenulata* and *A. shirleyi* occur in dense stands on the dissected residuals and ranges. *Acacia harpophylla* occurs in the east and this represents its most westerly occurrence as a major plant community.

Eremophila spp. were well represented with 14 taxa present out of the 23 recorded for Queensland (cf. 19 reported by Boyland, 1974). Many of the species had very restricted distribution and occurred in only a limited number of the land zones. Some species were even more restricted for example *Eremophila freelingii* was recorded only on the top of the residuals at Blacks'Palace north-east of Blackall. One of the most widespread species in the area is *Eremophila mitchellii* which was recorded in all land zones except the open alluvial plains and undulating downs. In most of the zones it is a troublesome woody weed, when timber clearance takes place. *E, gilesii* and *E. bowmanii* are also problems in the mulga lands.

Grasses were well represented in all associations. *Aristida* was the largest genus with 25 species recorded, while sixteen species of *Eragrostis* were collected. *Aristida armata, A. calycina, A. ingrata, A. latifolia* and *A. leptopoda* were the most frequently occurring *Aristida* species. Of the *Eragrostis* species found *E. lacunaria* and *E. setifolia* were the only ones at all widespread. Two genera *Triodia* and *Astrebla,* although not represented by many species occupy large areas of the survey area.

The genus *Triodia* is represented by two major species these being *T. mitchellii* and *T. pungens*. Much of the ground layer in the Eucalypt predominant associations was composed of these two species.

The genus *Astrebla* has three major species in the area and these dominate the vegetation of the undulating and wooded downs. *Astrebla lappacea* is the major species with *A. elymoides* and *A. squarrosa* also present. *A. pectinata* was very rare, occurring at only one site.

DESCRIPTION OF VEGETATION

Nine major floristic associations were recorded in the area.

Eucalyptus spp. predominant associations.
Acacia cambagei predominant associations.
Acacia aneura predominant associations.
Other *Acacia* predominant associations.
Spinifex predominant association.
Astrebla predominant associations.
Acacia harpophylla predominant associations.
Callitris columellaris predominant associations.
Sandplain association.

Floristic associations within each major grouping are given in Table 4.4 with references to their structural formation, range, projective foliage cover, tree or shrub density and frequently occurring species. Broad distribution and soil type for each association are outlined. It is intended that the various land unit descriptions supplement this account of the vegetation and the relevant ones have been listed in the comment column for each association. The map of the major vegetation associations included with this report is a compilation of various land systems based on the predominant vegetation of the land system.

Eucalyptus predominant associations

Associations dominated by various species of *Eucalyptus*, are extensive (approximately 32% of the area) and contribute significantly to the flora.

These associations (Table 4.4) occur mainly on sandy red earths, texture contrast soils and on clay and alluvial soils associated with the streams. They are best developed in the east where they constitute the majority of the area referred to as the "desert country" (Blake, 1938).

Structurally, the associations range from low open woodland to open forest. Various species of *Eucalyptus* predominate depending mainly on the soil and topography. Approximately 50% of total species recorded occur in these associations.

Acacia cambagei predominant associations

These associations (Table 4.4) occur throughout the area and occupy approximately 10% of the area. They are developed in two different situations, one associated with the alluvia and the other on fresh Cretaceous beds which may have a thin covering of Quaternary material.

Structurally, the associations range from low open woodland to woodland with occasional areas of tall shrubland. These associations contain 14% of the total species recorded.

Acacia aneura predominant associations

These associations (Table 4.4) are found in the south. They occupy 13% of the area and occur on red earths and deep texture contrast soils. Structurally, these associations vary from open scrub to open woodland.

The hard and soft mulga types contain 6% and 7% of the total species recorded respectively.

Table 4.4 Description of floristic associations

Floristic Association	Structural Formation Range Height, PFC, Trees/ha	Frequently Occurring Species	Comment
Eucalyptus predominant associations			
Eucalyptus microtheca	Open woodland to woodland occasionally open forest. Height:10-17 m. PFC:5-40% Trees/ha:75-150. Shrubs/ha:25-200.	Trees: *Eucalyptus microtheca*. Shrubs: *Acacia farnesiana, Eremophila bignoniiflora, Heterodendrum oleifolium* Grasses: *Astrebla* spp., *Cenchrus ciliaris, Panicum* spp., *Sporobolus caroli*. Forbs: *Atriplex* spp., *Bassia* spp., *Sida* spp.	Characteristic of units 70, 78, 79, 81. Occurs on cracking clay soils in drainage lines, plains and backswamps.
Eucalyptus microtheca Acacia harpophylla	Open woodland or woodland. Height:10-15 m. PFC:10-15%. Trees/ha:150-250. Shrubs/ha:250-500.	Trees: *Acacia harpophylla, Eucalyptus microtheca, Bauhinia carronii, Heterodendrum oleifolium*. Shrubs: *Eremophila mitchellii, Geijera parviflora*. Grasses: *Astrebla* spp., *Aristida* spp. Forbs: *Bassia* spp.	Characteristic of units 83, 87. Occurs on cracking clay soils in shallow depressions and minor channels of alluvial plains.
Eucalyptus microtheca Eucalyptus camaldulensis	Open woodland. Height:10-15 m. PFC:5-10%. Trees/ha:100. Shrubs/ha:125.	Trees: *Eucalyptus microtheca, E. camaldulensis*. Shrubs: *Acacia farnesiana, A. stenophylla*. Grasses: *Dichanthium sericeum, Enteropogon acicularis, Leptochloa digitata, Sporobolus caroli*. Forbs: *Alternanthera nodiflora, Euphorbia drummondii*.	Characteristic of unit 68. Occurs on deep clays along major alluvia.
Eucalyptus camaldulensis	Open woodland to woodland. Height:10-20 m. PFC:1-15%. Trees/ha:50-200. Shrubs/ha:25-100.	Trees: *Eucalyptus camaldulensis*. Shrubs: *Acacia farnesiana*. Grasses: *Dichanthium sericeum, Enteropogon acicularis, Leptochloa digitata, Sporobolus caroli* Forbs: *Alternanthera nodiflora, Euphorbia drummondii*.	Characteristic of units 3, 48, 71. Occurs along major channels on clay soils and minor occurrences on tableland tops with deep sandy red earths.
Eucalyptus melanophloia	Low woodland to woodland. Height:10-17 m. PFC:5-20%. Trees/ha:100-200. Shrubs/ha:100-800.	Trees: *Eucalyptus melanophloia*, in areas *Eucalyptus whitei*. Shrubs: *Acacia coriacea, Albizia basaltica, Bursaria incana, Eremophila mitchellii*. Grasses: *Aristida* spp., *Bothriochloa ewartiana, Heteropogon contortus, Themeda australis, Triodia* spp. Forbs: *Sida* spp., *Solanum* spp.	Characteristic of units 21, 32, 37, 40, 74. Occurs on red and yellow earths and associated texture contrast soils. There is a unique occurrence on shallow brown clays east of Blackall.
Eucalyptus melanophloia E. terminalis	Open woodland. Height:7-13 m. PFC:1%. Trees/ha:125. Shrubs/ha:100.	Trees: *Eucalyptus melanophloia, E. terminalis*. Shrubs: *Acacia excelsa, A. farnesiana, Eremophila mitchellii*. Grasses: *Astrebla* spp., Forbs: *Portulaca* sp. aff. *P. oleracea, Salsola kali, Sida* spp.	Characteristic of unit 10. Occurs on very shallow brown clays with hard surface crusts.
Eucalyptus melanophloia Bauhinia carronii	Open woodland Height:10-12 m. PFC:10%. Trees/ha:175. Shrubs/ha:300.	Trees: *Eucalyptus melanophloia*. Shrubs: *Bauhinia carronii, Grevillea striata*. Grasses: *Aristida ingrata, Heteropogon contortus, Themeda australis*.	Characteristic of unit 76. Occurs on flat alluvial plains with deep gilgaied grey and brown cracking clay soils.
Eucalyptus decorticans	Woodland. Height:12-15 m. PFC:20%.	Trees: *Eucalyptus decorticans*.	Unique community found at the base of the cliffs at Blacks Palace.
Eucalyptus populnea Eucalyptus papuana	Open woodland. Height:11-13 m. PFC:1%. Trees/ha:75.	Trees: *Eucalyptus populnea, E. papuana*. Grasses: *Eragrostis* spp., *Cyperus fulvus*.	Characteristic of unit 51. Occurs on flat to gently undulating tops of tablelands and mesas. The soils are moderately deep texture contrast soils.
Eucalyptus populnea Eremophila mitchellii	Open woodland to woodland. Height:6-20 m. PFC:5-30%. Trees/ha:50-250. Shrubs/ha:20-1000.	Trees: *Eucalyptus populnea*. Shrubs: *Acacia excelsa, Albizia basaltica, Eremophila mitchellii*. Grasses: *Aristida* spp , *Bothriochloa ewartiana, Cenchrus ciliaris, Heteropogon contortus*. Forbs: *Bassia birchii, Boerhavia diffusa, Salsola kali*.	Characteristic of units 7, 33, 39, 44, 45, 56, 72, 73, 88. Occurs on texture contrast throughout area. Minor occurrences earthy sands.

Table 4.4 Description of floristic associations (cont'd)

Floristic Association	Structural Formation Range Height, PFC, Trees/ha	Frequently Occurring Species	Comment
Eucalyptus papuana	Open woodland. Height:6-15 m. PFC:5-10%. Trees/ha:100-250. Shrubs/ha:75-175.	Trees: *Eucalyptus papuana, E. polycarpa, E.dichromophloia.* Shrubs: *Acacia coriacea, Bursaria incana.* Grasses: *Aristida* spp., *Heteropogon contortus, Themeda australis.* Forbs: *Sida* sp., *Evolvulus alsinoides.*	Characteristic of units 34, 38. In places *Eucalyptus polycarpa* and *E. dichromophloia* are co-dominant with *E. papuana.* Occurs on shallow red earths and moderately deep to deep loamy red earths and texture contrast soils.
Eucalyptus terminalis	Open woodland. Height:10-12 m. PFC:5%. Trees/ha:100. Shrubs/ha:75.	Trees: *Eucalyptus terminalis.* Shrubs: *Acacia curvinervia, A. coriacea, Alphitonia excelsa, Cassinia laevis, Grevillea juncifolia, . Petalostigma pubescens.* Grasses: *Aristida* spp., *Triodia mitchellii.*	Characteristic of unit 47. Occurs on elevated plains with deep sandy red earths with hard setting surfaces of sandy loams.
Eucalyptus polycarpa	Woodland. Height:10 m. PFC:10-15%. Trees/ha:350. Shrubs/ha:100.	Trees: *Eucalyptus polycarpa.* Grasses: *Aristida pruinosa, Eragrostis speciosa.* Forbs: *Bulbostylis barbata.*	Characteristic of unit 91. Occurs on slight sandy rises of flat clay pans.
Eucalyptus similis *E. dichromophloia*	Open woodland. Height:12 m. PFC:5%. Trees/ha:100. Shrubs/ha:1025.	Trees: *Eucalyptus dichromophloia, E. similis, E drepanophylla.* Shrubs: *Acacia* spp., *Canthium oleifolium, Grevillea* spp. Grasses: *Aristida* spp., *Triodia* spp. Forbs: *Cheilanthes sieberi, Lomandra leucocephala, Solanum ferocissimum, Verbena officinalis.*	Characteristic of unit 46. Occurs on deep earthy sands and associated sandy red earths. This association is confined to the north.
Eucalyptus thozetiana *Acacia harpophylla*	Low woodland to woodland. Height:7-12 m. PFC:5-15%. Trees/ha:75-300. Shrubs/ha:25-1000.	Trees: *Eucalyptus thozetiana, Acacia harpophylla.* Shrubs: *Eremophila mitchellii, E. oppositifolia* var. *rubra, Geijera parviflora.*	Characteristic of units 23, 24. In places *Acacia harpophylla* forms a dense shrub layer. Occurs on shallow to deep, brown clays usually with stone cover.
Eucalyptus thozetiana	Low open to open woodland. Height:4-15 m. PFC:5%. Trees/ha:50-400. Shrubs/ha:250.	Trees: *Eucalyptus thozetiana.* Shrubs: *Acacia* spp. Grasses: *Aristida caput-medusae, Sporobolus actinocladus.* Forbs: *Enchylaena tomentosa.*	Characteristic of units 29, 96. In places *Acacia microsperma* becomes conspicuous. Occurs on ridges and edges of scarps with shallow, red loamy lithosols.
Eucalyptus tessellaris	Open woodland. Height:20-30 m. PFC:1%. Trees/ha:450. Shrubs/ha:400.	Trees: *Eucalyptus tessellaris, E. melanophloia, Angophora melanoxylon.* Grasses: *Aristida armata, Cenchrus ciliaris, Heteropogon contortus.*	Characteristic of unit 75. Scattered shrubs occur but no well defined shrub layer exists. Occurs on higher sandy levees, sand sheets mainly associated with old channels.
Eucalyptus drepanophylla	Open woodland to woodland Height:10-20 m. PFC:5-15%. Trees/ha:100-125. Shrubs/ha:75-175.	Trees: *Eucalyptus drepanophylla, E.melanophloia, E. polycarpa.* Shrubs: *Acacia* spp., *Dodonaea* spp., *Lysicarpus angustifolius.* Grasses: *Aristida* spp., *Triodia* spp., *Heteropogon contortus.* Forbs: *Exocarpus cupressiformis.*	Characteristic of units 41, 63. In places the other two *Eucalyptus* spp. may be co-dominant. Occurs on low stony hills and jump-ups or lower slopes of scarp retreats associated with dissected tablelands. This association occurs only in the east.
Associated Communities			
Acacia coriacea *Hakea chordophylla*	Low open woodland. Height:10-12 m. PFC:5%. Trees/ha:100. Shrubs/ha:200.	Trees: *Acacia coriacea, Hakea chordophylla, Eucalyptus populnea, E. polycarpa.* Grasses: *Aristida* spp., *Triodia* spp. Forbs: *Goodenia glabra, Solanum ferocissimum.*	Characteristic of unit 35. Occurs on shallow earthy sands interspersed with the *Eucalyptus melanophloia* association.
Melaleuca tamarascina	Tall open shrubland. Height:3 m. PFC:5%. Shrubs/ha:125.	Trees: *Eucalyptus papuana, E. setosa.* Shrubs: *Melaleuca tamarascina, Acacia* spp. Grasses: *Aristida* spp., *Triodia* spp.	Characteristic of units 36, 49. Occurs on knolls and interfluves with shallow red and yellow earths.
Ricinocarpos bowmanii	Shrubland. Height:3-6 m. PFC:25%. Shrubs/ha:4000.	Trees: Scattered *Eucalyptus polycarpa.* Shrubs: *Acacia* spp., *Alstonia constricta, Bertya oleifolia, Eriostemon difformis, Leptospermum attenuatum, Lysicarpus angustifolius, Persoonia falcata, Ricinocarpos bowmanii.* Grasses: *Aristida* spp. Forbs: *Cheilanthes sieberi.*	Characteristic of unit 65. Occurs on the lower slopes, sandy aprons and fans in deeply dissected mountains and hills of the Great Dividing Range.

Table 4.4 Description of floristic associations (cont'd)

Floristic Association	Structural Formation Range Height, PFC, Trees/ha	Frequently Occurring Species	Comment
Cypress pine predominant associations			
Callitris columellaris *Eucalyptus melanophloia*	Open woodland to woodland. Height:11-25 m. PFC:10-20%. Trees/ha:75-250. Shrubs/ha:125-1000. (Depends on numbers of *Callitris columellaris* seedlings).	Trees: *Callitris columellaris*, *Eucalyptus melanophloia*, *E. tessellaris*. Shrubs: *Acacia* spp., *Dodonaea viscosa*. Grasses: *Aristida browniana*, *Eragrostis sororia*, *Fimbristylis dichotoma*, *Eulalia fulva*, *Chrysopogon fallax*. Forbs: *Helichrysum semiamplexicaule*, *Lomandra longifolia*.	Characteristic of units 43, 66. Occurs in the east on earthy sands, sandy surfaced texture contrast soils and siliceous sands.
Callitris columellaris *Eucalyptus populnea*	Woodland. Height:8-12 m. PFC:10%. Trees/ha:550 ± 400 (Depends on density of *Callitris columellaris*). Shrubs/ha:50.	Trees: *Callitris columellaris*, *Eucalyptus populnea*. Shrubs: *Acacia bancroftii*, *Dodonaea boronifolia*, *D. viscosa*, *Eremophila mitchellii*, *Grevillea stenobotrya*. Grasses: *Chrysopogon fallax*, *Cymbopogon refractus*, *Enneapogon polyphyllus*, *Themeda australis*, *Tragus australianus*, *Tripogon loliiformis*, *Perotis rara*.	Characteristic of unit 42. Occurs in the east on earthy sands, sandy surfaced texture contrast soils and siliceous sands. May intergrade with the previous community.
Acacia cambagei predominant association			
Acacia cambagei *Eremophila mitchellii*	Low open woodland to woodland occasionally tall shrubland. Height:5-11 m. PFC:5-35%. Trees/ha:200-1000. Shrubs/ha:200-1600.	Trees: *Acacia cambagei*. Shrubs: *Eremophila mitchellii*, *Geijera parviflora*. Grasses: *Enneapogon* spp., *Enteropogon acicularis*, *Sporobolus caroli*. Forbs: *Abutilon* spp., *Salsola kali*.	Characteristic of units 11, 15, 16, 82, 86. Occurs on brown and grey cracking clays minor areas on deep texture contrast soils.
Acacia cambagei *Acacia harpophylla*	Low woodland to woodland. Height:9-11 m. PFC:10-15%. Trees/ha:800. Shrubs/ha:175.	Trees: *Acacia cambagei*, *A. harpophylla*. Shrubs: *Eremophila mitchellii*, *Eremocitrus glauca*, *Geijera parviflora*.	Characteristic of unit 17. Occurs on brown cracking clays.
Acacia aneura predominant associations			
Acacia aneura *Eucalyptus tessellaris*	Low open woodland. Height:9-10 m. PFC:5%. Trees/ha:150. Shrubs/ha:500.	Trees: *Acacia aneura*, *Eucalyptus tessellaris*. Shrubs: *Cassia sturtii*, *Cerbra* sp., *Eremophila latrobei*. Grasses: *Enneapogon* spp. Forbs: *Cheilanthes sieberi*.	Characteristic of unit 53. Unique community found only on the top of the Enniskillen Range south of Blackall. Occurs on moderately deep texture contrast soils.
Acacia aneura *Eucalyptus microcarpa*	Low open woodland. Height:5-10 m. PFC:5-25%. Trees/ha:300-800.	Trees: *Acacia aneura*, *Eucalyptus microcarpa*. Shrubs: *Cassia* spp., *Eremophila longifolia*, *E. mitchellii*. Grasses: *Aristida* spp., *Cenchrus ciliaris*, *Digitaria brownii*, *Eragrostis lacunaria*. Forbs: *Cheilanthes sieberi*, *Sida* spp.	Characteristic of unit 55. *Confined to a* small area of the area north east of Augathella. *Eucalyptus microcarpa* is usually an emergent. Occurs on red earths.
Acacia aneura *Eucalyptus cambageana*	Open scrubs to low open woodlands. Height:5-15 m. PFC:10-30%. Trees/ha:175-800. Shrubs/ha:200.	Trees: *Acacia aneura*, *Eucalyptus cambageana* (as an emergent). Shrubs: *Eremophila latrobei*. Grasses: *Cenchrus ciliaris*, *Digitaria brownii*, *Enteropogon acicularis*, *Eriochloa pseudoacratricha*, *Tripogon loliiformis*.	Characteristic of unit 58. Found only in the south-west on upper slopes and crests with shallow red earths.
Acacia aneura *Eucalyptus populnea*	Low open woodland to open woodland. Height:5-15 m. PFC:5-25%. Trees/ha:150-800. Shrubs/ha:50-2000.	Trees: *Acacia aneura*, *Brachychiton populneum*, *Eucalyptus populnea*, *Eucalyptus melanophloia*. Shrubs: *Eremophila bowmanii*, *E. gilesii*. Grasses: *Aristida* spp., *Panicum* spp., *Themeda australis*, *Digitaria brownii*, *Eragrostis lacunaria*.	Characteristic of units 52, 60. Occur on deep, red earths in the south. Shrub layer is variable but can be so dense as to severely limit production in places.
Acacia harpophylla predominant associations			
Acacia harpophylla *Eucalyptus cambageana*	Tall shrubland to woodland. Height:4-15 m. PFC:5-20%. Trees/ha:100-400. Shrubs/ha:300-500.	Trees: *Acacia harpophylla*, *Eucalyptus cambageana*, *Brachychiton rupestre*. Shrubs: *Enchylaena tomentosa*, *Eremophila mitchellii*, *Myoporum deserti*. Grasses: *Cenchrus ciliaris*, *Sporobolus* spp. Forbs: *Abutilon oxycarpum*, *Portulaca* spp., *Sida* spp.	Characteristic of units 26, 30, 54. Occur on texture contrast soils usually on slight rises.

Table 4.4 Description of floristic associations (cont'd)

Floristic Association	Structural Formation Range Height, PFC, Trees/ha	Frequently Occurring Species	Comment
Acacia harpophylla Atalaya hemiglauca	Tall open shrubland. Height:4-7 m. PFC:1-5%. Trees/ha:50. Shrubs/ha:250-750.	Trees: *Atalaya hemiglauca, Brachychiton rupestre.* Shrubs: *Acacia harpophylla, Albizia basaltica, Eremophila mitchellii.* Grasses: *Aristida latifolia, Astrebla spp., Dichanthium sericium, Digitaria divaricatissima, Enneapogon avenaceus, Enteropogon acicularis, Sporobolus caroli.* Forbs: *Hibiscus trionum, Malvastrum americanum, Salsola kali, Sida fibulifera.*	Characteristic of unit 31. Unique association occurring only in Stirton land system. Occurs on deep, grey cracking clays.
Acacia harpophylla Casuarina cristata	Open woodland to woodland. Height:10-15 m. PFC:5-15%. Trees/ha:300. Shrubs/ha:150.	Trees: *Acacia harpophylla, Casuarina cristata, Eucalyptus cambageana.* Shrubs: *Carissa ovata, Geijera parviflora, Flindersia maculosa, Eremophila mitchellii, Ventilago viminalis.* Grasses: *Aristida spp., Digitaria brownii, Eragrostis lacunaria, Enteropogon acicularis, Panicum caespitosum.* Forbs: *Cheilanthes distans, Evolvulus alsinoides, Solanum parvifolium.*	Characteristic of unit 19. Occurs only in the east on deep, grey and brown cracking clays.
Acacia harpophylla Eremophila mitchellii	Tall open shrubland to woodland. Height:4-12 m. PFC:5-20%. Trees/ha:50-400. Shrubs/ha:75-200.	Trees: *Acacia harpophylla.* Shrubs: *Eremophila mitchellii, Geijera parviflora, Albizia basaltica.* Grasses: *Aristida spp., Cenchrus ciliaris, Enteropogon acicularis, Enneapogon polyphyllus, Tripogon loliiformis.* Forbs: *Boerhavia diffusa, Portulaca sp. aff. oleracea, Salsola kali.*	Characteristic of units 8, 18, 20, 22, 25, 77. Occurs on grey and brown cracking clays with minor occurrences on loamy red earths and texture contrast soils.
***Astrebla*/short grass/forb predominant associations**			
Astrebla lappacea Eucalyptus microtheca	Wooded open tussock grassland. Height:1 m. PFC:20-35%. Trees/ha:25. Shrubs/ha:150.	Trees: *Eucalyptus microtheca.* Shrubs: *Acacia farnesiana, Apophyllum anomalum, Eremophila maculata.* Grasses: *Astrebla lappacea.* Forbs: *Bassia biflora, Boerhavia diffusa, Desmodium brachypodium, Malvastrum americanum, Neptunia dimorphantha, Phyllanthus maderaspatensis, Polymeria marginata, Sida fibulifera, Solanum esuriale.*	Characteristic of unit 80. This association is found only around the town of Blackall on deep to very deep, grey cracking clays.
Astrebla spp.	Open tussock to tussock grassland. Height:0.5-1 m. PFC:5-50%. Shrubs/ha:0-50.	Shrubs: *Acacia farnesiana, A. victoriae.* Grasses: *Aristida leptopoda, Astrebla spp., Dichanthium sericeum, Enneapogon avenaceus, Panicum decompositum.* Forbs: *Bassia spp., Boerhavia diffusa, Malvastrum americanum, Sida spp.*	Characteristic of units 1, 2, 13, 84. Occurs on deep, grey and brown cracking clays.
Astrebla spp.	Wooded open tussock grassland. Height:0.5-1 m. PFC:5-25%. Shrubs/ha:25-200.	Trees: *Acacia excelsa, A. cambagei, Albizia basaltica.* Shrubs: *Acacia farnesiana, Eremophila mitchellii, Heterodendrum oleifolium.* Grasses: *Astrebla spp., Aristida latifolia, A. leptopoda.* Forbs: *Bassia spp., Boerhavia diffusa, Ptilotus spp., Sida spp.*	Characteristic of units 12, 57. Occurs on deep, grey cracking clays.
Short grass and forbs	Sparse to open herbfield. Height:0.5-0.75 m. PFC:1-10%.	Grasses: *Aristida anthoxanthoides, Astrebla lappacea, Chloris pectinata, Enneapogon avenaceus, Sporobolus actinocladus.* Forbs: *Atriplex spp., Bassia spp., Portulaca sp. aff. P. oleracea, Salsola kali, Trianthema triquetra.*	Characteristic of units 4, 69. Occurs on deep, scalded grey and brown cracking clays with thin hard surface crust.
***Spinifex* predominant associations**			
Triodia longiceps	Hummock grassland. Height:1 m. PFC:30-50%. Shrubs/ha:50 (very scattered).	Shrubs: *Myoporum acuminatum.* Grasses: *Chloris virgata, Triodia longiceps.*	Characteristic of unit 90. Occurs on flat clay pans with deep to very deep, poorly drained grey clays with massive sandy surface soil.

Table 4.4 Description of floristic associations (cont'd)

Floristic Association	Structural Formation Range Height, PFC, Trees/ha	Frequently Occurring Species	Comment
Mixed associations			
Mixed tall open shrubland or woodland. (*Albizia basaltica* is always present but any one of the other species can be dominant or co-dominant with it)	Tall open shrubland to woodland. Height:4-15 m. PFC:1-15. Trees/ha:150-450. Shrubs/ha:100-400.	Trees: *Albizia basaltica, A. excelsa, Atalaya hemiglauca, Bauhinia carronii, Eucalyptus terminalis, Heterodendrum oleifolium, Ventilago viminalis.* Shrubs: *Canthium oleifolium, Capparis* spp. Grasses: *Aristida* spp., *Cenchrus ciliaris, Enneapogon avenaceus, Tragus australianus.* Forbs: *Salsola kali, Sida spinosa.*	Characteristic of units 7, 9, 85, 89. Occurs on uniform sandy soils and associated sandy texture contrast soils also on grey and brown clays.
Other: *Acacia* sp. predominant associations			
Acacia cana	Low open to open woodland. Height:4-12 m. PFC:1-5%. Trees/ha:200. Shrubs/ha:50-250.	Trees: *Acacia cana, A. cambagei.* Shrubs: *Acacia farnesiana, Apophyllum anomalum, Heterodendrum oleifolium.* Grasses: *Aristida leptopoda, Astrebla lappacea, Cenchrus ciliaris.* Forbs: *Bassia quinquecuspis, Boerhavia diffusa, Malvastrum americanum.*	Characteristic of units 5,14. Occurs on moderately deep to deep, grey and brown cracking clays.
Acacia pendula	Open woodland to wooded tussock grassland in places. Height:4 - 6 m. PFC:5-10%. Trees/ha:125. Shrubs/ha:50.	Trees: *Acacia pendula.* Shrubs: *Apophyllum anomalum, Heterodendrum oleifolium.* Grasses: *Astrebla lappacea.* Forbs: *Atriplex muelleri, Bassia quinquecuspis, Malvastrum americanum, Polymeria marginata, Rhagodia spinescens.*	Characteristic of unit 6. Occurs on moderately deep to deep, grey and brown cracking clays.
Acacia catenulata *A. shirleyi* or *Eucalyptus exserta*	Low woodland to woodland. Height:5-10 m. PFC:10-30%. Trees/ha:200. Shrubs/ha:700-6000.	Trees: *Acacia catenulata, A. shirleyi, Eucalyptus exserta.* Shrubs: *Eremophila latrobei.* Grasses: *Aristida* spp., *Paspalidium* spp. Forbs: *Abutilon otocarpum, Cheilanthes distans, C. sieberi.*	Characteristic of units 61, 62. Occurs on upper slopes and tops of mesas, the soils are very shallow red and yellowish brown lithosols.
Acacia clivicola *Eucalyptus exserta*	Tall open shrubland. Height:3 m. PFC:1%. Shrubs/ha:150.	Shrubs: *Acacia clivicola, Eucalyptus exserta.* Grasses: *Aristida* sp., *Tripogon loliiformis*	Characteristic of unit 59. Occurs on scalded areas with very shallow red loamy lithosols.

Other *Acacia* predominant associations

These associations are composed of two major types. Firstly, the association occurring on the residuals in the east and south-west composed of *Acacia catenulata, A. shirleyi* and *A. clivicola* respectively. Secondly, the *A. cana* and *A. pendula* associations which occur in conjunction with the *Astrebla* association.

The residual associations are the most widespread of these and occupy 7% of the area. They contain 24% of the total species recorded for the area. The other associations were only minor constituents of the *Astrebla* association and had species numbers similar to this association.

Acacia harpophylla predominant associations

These associations (Table 4.4) occur throughout the area and are restricted to areas of clay soil with minor areas of texture contrast soils. This complex of associations occupies approximately 12% of the area.

Structurally, these associations range from tall open shrubland to woodland. There is a decrease in physiognomic complexity from east to west due to increasing aridity.

Species numbers are quite high with approximately 22% of the total species occurring in this association.

Spinifex predominant association

There is only one association in which a *Triodia* species is the dominant, despite the fact that *Triodia* species form the ground layer of many of the eucalypt associations.

A *Triodia longiceps* hummock grassland occurs on the claypans east of Barcaldine. It is a unique community and only occupies a limited area.

Astrebla spp. short grass, forbs, predominant associations

These associations occur in the centre and west of the area on undulating downs and alluvial plains. These associations always occur on clay soils and occupy approximately 20% of the area.

Structurally, these associations range from a wooded tussock grassland through to a sparse to open herbfield. Composition of the community is usually dependent on seasonal conditions. In good seasons the spaces between the perennial tussock grasses is occupied with other grasses, particularly *Dichanthium sericeum* and forbs.

Approximately 25% of the total species recorded occurred in these associations. In very wet seasons species numbers can be very low with almost monospecific stands occurring. Unlike similar associations described by Boyland (1974), the *Astrebla* spp. do form a large percentage of the pasture and it is either *Astrebla lappacea, A. elymoides* or *A. squarrosa* which form the monospecific stands.

Callitris columellaris predominant association

These associations (Table 4.4) are found in the east and are at the northern limit of these associations in Queensland. They occur on earthy sands, sandy surfaced texture contrast soils and siliceous sands and occupy 3% of the area.

Structurally, the associations range from open woodland to woodland. They contain only 9% of the total species and in places *Callitris columellaris* forms almost monospecific stands.

Sandplain association

This association is not easily classified as while *Albizia basaltica* is always present any one of a number of other species may be present as a dominant or co-dominant. It occurs on approximately 1% of the area. Soils on which it occurs vary from sandy soils through to clays.

Structurally, it ranges from a tall open shrubland to woodland. It has about 10% of the total species recorded.

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HYDROLOGY *by Officers of Irrigation and Water Supply Commission*

Underground Water

Supplies of groundwater are obtainable throughout this area at depths ranging from less than 15 metres to about 1800 metres. Yields are generally small, but are sufficient for stock use. Licensing conditions do not permit irrigation from bores penetrating aquifers of the artesian basin.

General

The area is part of the Great Artesian Basin and both artesian and sub-artesian water areavailable in some quantity in most of the formations.

The *Clematis, Precipice, Hutton, Adori* and the *Hooray Sandstones* are the main aquifers of the artesian basin in this area. All these formations outcrop in the eastern part of the area and dip towards the west where the top of the upper formation *(Hooray Sandstone)* is about 600 metres below ground level. All these formations produce artesian supplies in the southern and western parts of the area and sub-artesian supplies in the remainder.

The *Clematis, Precipice* and *Hutton Sandstones* are rarely tapped in the southern and western part of the area because of their depth. Supplies are usually obtained from other formations before these beds are reached.

The *Wallumbilla Formation* which is located between about 300 metres and 450 metres below ground level in the western part of the area and rises to outcrop in the central part, produces good supplies of sub-artesian water.

In the south western part of the area the *Winton Formation* produces sub-artesian supplies while in the northern part the *Ronlow Beds* produce similar supplies.

The alluvium and associated Quaternary deposits are mainly superficial. However, close to some of the major streams the alluvium reaches sufficient depth to produce stockwater supplies. Properties in general are well-watered, with supplies coming from bores, dams and tanks. Permanent supplies are also found in major streams and rivers.

Yield

The main aquifers of the artesian basin *(Clematis, Precipice, Hutton, Adori* and *Hooray Sandstone)* produce flowing supplies between about 0.20 litres per second and 5.0 litres per second in the south western part of the area. In the eastern and northern parts of the area they produce pumping supplies of about 1.20 litres per second.

The *Wallumbilla* and *Winton Formations* and the *Ronlow Beds* produce sub-artesian supplies of up to 1.20 litres per second.

Many bores tapping the *Ronlow Beds* originally flowed but in recent years, pressure in the aquifers has dropped and the potentiometric surface is now below ground level.

Quality

Water of suitable quality for stock use is obtained from all the major aquifers. Small quantities of saline waters are obtained from some sediments between the main aquifers but these can be cased and cemented out.

Generally, the waters from the deeper aquifers have a total dissolved solids content of between about 300 mg/litre and 1500 mg/litre, with most in the range 500 mg/litre to 1000 mg/litre. The fluoride content in the deeper water ranges from 0.5 mg/litre to 3 mg/litre.

The shallow supplies have more varied quality but most are still suitable for stock use. The range of total dissolved solids is from 300 mg/litre to more than 5000 mg/litre. The shallow water has a very low fluoride content.

Potential Future Development - Irrigation

The alluvial deposits of the major streams offer the only potential for irrigation supplies in this area. Investigation drilling carried out in the Warrego River alluvium near Augathella indicates that only small irrigation supplies could be available. The extent and the depth of alluvial deposits on other streams in the area compares with that on the Warrego River and therefore do not offer favourable prospects of producing significant irrigation supplies.

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LAND SYSTEMS

*by E.J. Turner**

Survey Methods

The survey carried out was basically a reconnaissance land survey. This means that mapping units were delineated by photo interpretation. Initial photo interpretation was followed by field traverses and further photo interpretation. All mapped areas are described in terms of land systems which have been defined by Christian and Stewart (1953, 1968) as "an area or groups of areas throughout which there is a recurring pattern of topography, soils and vegetation". Land systems are an amalgamation of one or more land units which are the individual components of the land system. For each land unit a detailed description of landform, geology, soils, vegetation and land use factors is given. The soils are described and classified in terms of principal profile forms, great soil groups and soil mapping units. Analyses of most of the representative soil profiles within the land units are included. The vegetation description includes lists of the predominant, frequent and infrequent species and their structural formation. The land use summary considers land use limitations and availability of drought fodder.

The mapping and field techniques are the same as reported by Dawson *et al.* (1974).

Land Systems

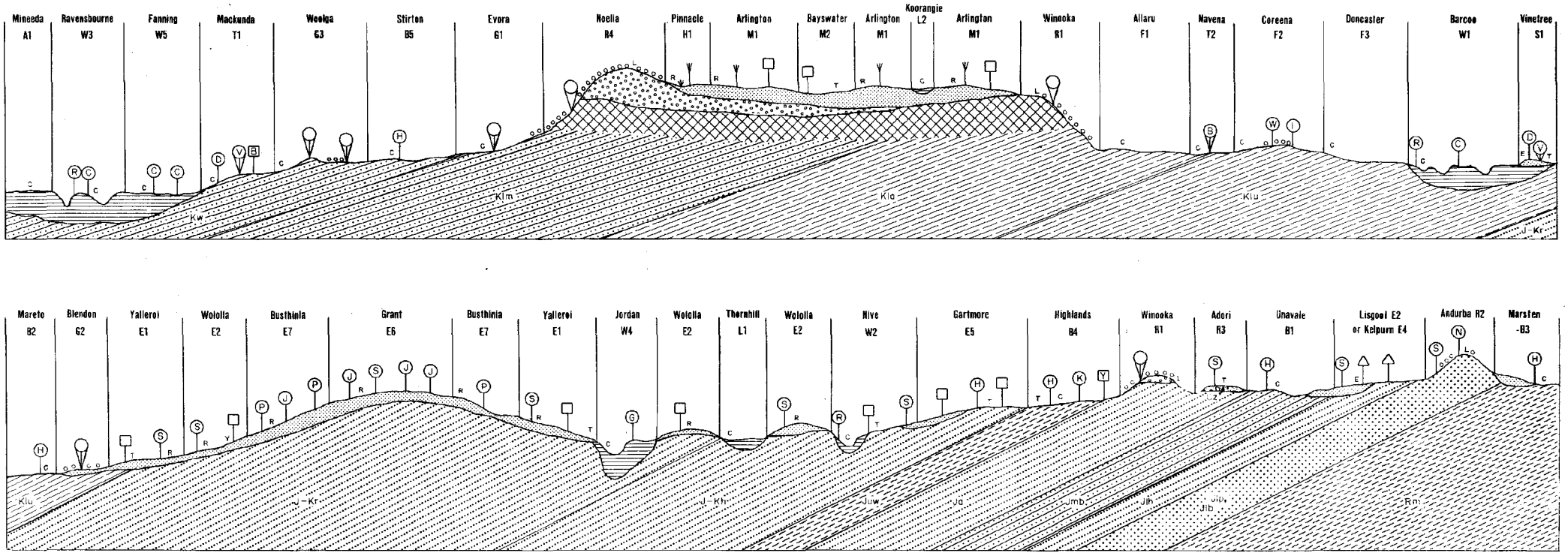
The area has been mapped into 36 land systems which have been grouped into 12 broad land zones. A map at a scale of 1:500 000 depicting the extent and distribution of the land systems is enclosed. The land system approach provides a convenient and practical method of mapping the various types of country. The descriptions of the land systems (Appendix IV) show the relationship between the land units occurring within each land system. More emphasis has been attached to the description of the land units than the land systems in considering land use. Detailed information for the 96 land units is given in Appendix V. An estimation of the percentage occurrence of each land unit in each land system is given. For example, unit 62 (a lancewood/bendee association) occupies 70% of *Winooka* land system but occupies less than 5% in *Grant* land system. The proportion of the land units in each land system is an estimate which was made during field work.

Due to mapping scale and the fact that land types are generally a continuum, boundaries between some land systems (e.g. *Grant* and *Busthinia*) are gradual rather than sharp.

The number of land units per land system varies considerably. In all land systems in this area, one land unit was dominant over all the other units occurring in that system. Figure 6.1 illustrates the spatial relationship existing between the land systems and also partly explains past geomorphic cycles and development of the present landscape.

The 36 land systems have been grouped into 12 land zones on the basis of vegetation, soils, topography and geomorphic development. The undulating downs and wooded downs occupy 7 040 km^2 (18% of the area), the undulating gidgee occupies 3 870 km^2 (10%), the undulating brigalow - 4 610 km^2 (12%), the hard and soft mulga

* Development Planning Branch, Queensland Department of Primary Industries.



REFERENCE

SOILS AND VEGETATION

- C Clay
- T Texture contrast soil
- R Red earth
- E Earthy sand
- L Lithosol
- Y Yellow earth
- Weelga G3 Land system
- River red gum
- Coolibah
- Poplar box
- Whitewood
- Lancewood, bendee
- Gidgee
- Dawson gum
- Mountain yapunyah
- Vinetree
- Brigalow
- Boree
- Bastard mulga
- Mulga
- Cypress pine
- Silver-leaved ironbark
- Narrow-leaved ironbark
- Yellowjack
- E. polycarpa
- Eastern dead finish
- Bauhinia
- Ironwood

PARENT MATERIALS

QUATERNARY
- Clay , alluvium
- Sand
- Gravel, stonecover
- Sandstone (Cz)

TERTIARY
- Sandstone, conglomerate minor siltstone

CRETACEOUS
- Chemically altered Cretaceous —Jurassic rocks
- Labile sandstones: Kw Winton Form., Klm Mackunda Form.
- Mudstones: Kla Allaru Mudstone, Klu Wallumbilla Form.

JURASSIC
- Sublabile sandstones: J-Kh Hooray Sandstone, J-Kr Ronlow Beds, Ja Adori Sandstone, Jlh Hutton Sandstone

JURASSIC
- Siltstone, mudstone: Juw Westbourne Form.
- Labile sandstone: Jmb Birkhead Form.
- Sandstones: Jlb Boxvale Sandstone, Jlp Precipice Sandstone

TRIASSIC
- Siltstone, mudstone: Rm Moolayember Form.

Fig. 6.1 *Diagrammatic cross section illustrating idealized relationships between land systems and associated soils, vegetation and geology.*

- 5 030 km^2 (13%), the dissected residuals - 2 800 km^2 (7%) and the eucalypt woodlands or "desert" occupy 10 650 km^2 (28%). The cracking clay soils associated with the undulating downs, the undulating gidgee, the undulating brigalow and alluvia occupy 50% of the total survey area.

Sandplain Land Zone

Vinetree land system comprises the very gently sloping plains on the outer margins of major alluvia. Vegetation ranges from eastern dead finish/leopard wood/vinetree/bauhinia shrubby low open woodland to gidgee open woodland. Soils are deep to very deep, red and brown texture contrast soils, earthy sands and some grey clays. The gidgee areas are suitable for development to improved pastures. This frontage country is a valuable asset in view of the availability of top feed.

Mulga Land Zones

The mulga lands have been separated into two land zones, the soft mulga lands and the hard mulga lands, on the basis of geomorphic history, soil and vegetation development. The soft mulga land zone has developed on the Langlo and Nive sandplains. The Langlo sandplain is an extensive remnant of a low-relief land surface covered by younger superficial sand deposits. The Nive sandplain consists of an outwash of sand from the sandstone hills overlying Cretaceous sediments. Both sandplains have very gentle slopes. The hard mulga land zone is formed on gently undulating plains or low rises within the soft mulga lands where the Quaternary sand cover has been eroded exposing the Tertiary material. They have poor vegetation development when compared to the soft mulga. Soils are mainly deep, red earths. The mulga lands grade into the dissected residual land zone on the more elevated areas. A very distinct boundary exists between the mulga lands and the gidgee/ brigalow land zones and locally, mulga occurs at a higher elevation.

Soft Mulga Land Zone

Arlington land system comprises superficial deposits on the higher parts of the landscape and constitutes the main soft mulga land system in the area. Mulga density is quite high as these mulga lands are more mesic and have been less extensively thinned for drought fodder than those in adjoining survey areas to the west and south-west. Woody weeds such as Charleville turkey bush and silver turkey bush are a problem in some areas. For some unexplained reason, Charleville turkey bush was not observed on that part of the Nive sandplain between the Nive and Warrego Rivers. Minor sheet erosion occurs in some areas.

Bayswater land system is developed downslope from *Arlington* land system and comprises the run-on areas or flat plains adjacent to alluvia. It is not extensive in this area.

Hard Mulga Land Zone

Erosion and dissection of the Tertiary land surface has resulted in a number of different landscapes ranging from low rises within the soft mulga lands to low hills developed from chemically altered Cretaceous material. Since the collective area of these landscapes is quite small, they cannot be separated at this mapping scale and they have all been placed in the one land system. Productivity is low and the vegetation cover should be maintained as these lands are subject to sheet and gully erosion.

Dissected Residual Land Zone

The dissection and erosion of the Tertiary weathered landscape have resulted in mesas, buttes and tablelands. These landscapes have formed on a number of geological beds varying in age from Cainozoic to Triassic. Subdivision into component land systems has been on the basis of vegetation and geomorphology. The dissected residual land zone constitutes the high areas in the landscape and often forms catchment boundaries and ranges. Soils are mainly lithosols with shallow red earths on mesa tops. Stone cover is extensive and parent rocks are commonly exposed. In the east, the backslopes of these residuals grade into undulating plains of eucalypt woodland where the quartzose sandstones have been less resistant to weathering. In the west, the residuals grade into mulga or gidgee lands depending upon the degree of weathering. The dissected residual land zone is naturally unstable and unproductive.

Noella land system occurs in the west and comprises mesas and hills dissected from a more extensive tableland. Vegetation comprises bendee, lancewood tall open shrubland to bowyakka tall open shrubland.

Winooka land system has formed on various Mesozoic and Cainozoic beds. In the central west on the Enniskillen Range, this land system has formed on the duricrust developed on the Cretaceous *Rolling Downs Group*. In the east, this land system is present as sandstone cuestas, ridges and hills developed on Jurassic sandstones and Triassic beds. Vegetation is lancewood, bendee, low woodland with eucalypt open woodland on the lower slopes.

Andurba land system occurs along the eastern boundary and constitutes the Great Dividing Range. Vegetation is lancewood, bendee, low woodland on the scarps with eucalypt open woodland on the lower slopes.

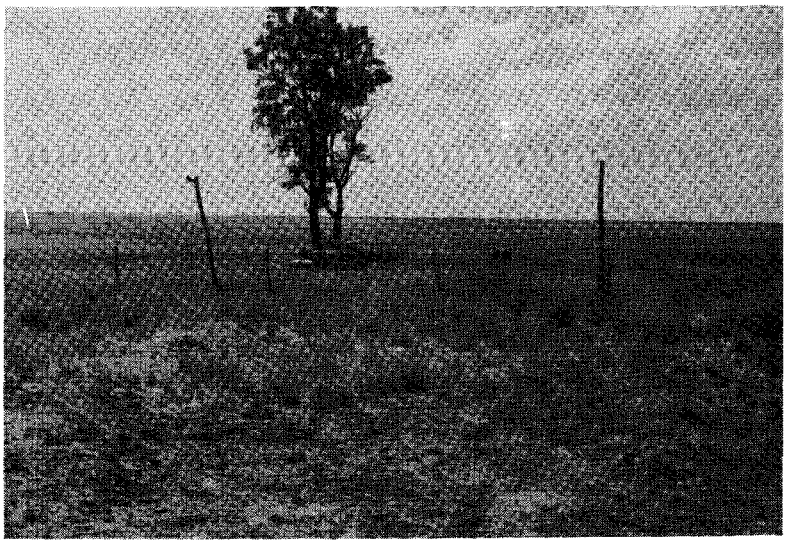
Adori land system occurs as gently undulating tops of mesas and buttes derived from poorly consolidated clayey sandstones. Vegetation ranges from eucalypt woodland to bendee/*Acacia triptera* tall open shrubland; sheet and gully erosion are common near the scarp edges.

Eucalypt Woodlands Land Zone ("Desert")

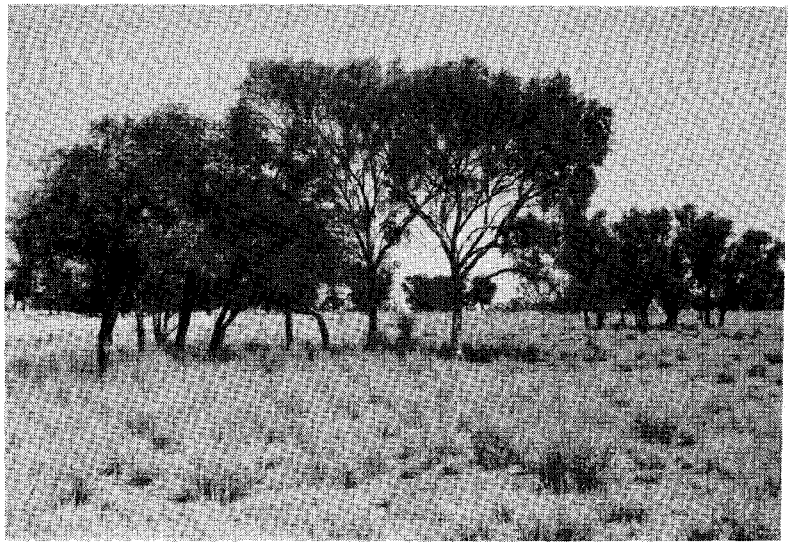
The eucalypt woodlands, commonly referred to as "the desert country" are very extensive, occupying 28% of the survey area. They occur as flat to gently undulating plains and tablelands and extend from the quartzose sandstones east of Tambo, north-west to the sandplains around Yalleroi and then in a northerly direction to beyond Lake Galilee. Separation into land systems has been based on geomorphic history, land form, soils and vegetation development. Soils are red and yellow earths associated with earthy sands and texture contrast soils.

Yalleroi land system comprises an outwash sandplain formed by redistribution of sand derived from the Jurassic sandstones. Slopes are low and the land system has an indistinct surface drainage pattern in the south. Vegetation is silver-leaved ironbark open woodland with poplar box open woodland on the run-on areas. Desert oak/*Hakea* spp. open woodland occurs on sand sheets throughout. This land system is stable but sheet erosion may occur locally. It is possible to develop this country to improved pastures such as buffel grass, but any timber clearing programme should make provision for the control of eucalypt regrowth and careful pasture management.

Evora land system - gidgee, wilga, sandalwood. Suitable for clearing and sowing to buffel grass.



Allaru land system. Lack of shade and drought reserves can be a problem on Mitchell grass downs.



Mackunda land system or timbered downs. Contains valuable browse trees such as bauhinia, boonaree, vinetree, whitewood, and boree. Also valuable for shade areas.

Serious gully erosion in Winooka land system. Such areas should be allowed to re-vegetate and then be managed with the aim of maintaining the vegetative cover.

Blendon land system has developed on Cretaceous sediments with a definite cover of Quaternary sand. Layering of soils occurs on the alluvial flats. Closely associated are texture contrast soils. Vegetation is gidgee low woodland. This land system is suitable for development to improved pastures. Woody weeds,particularly sandalwood, are a problem especially on the texture contrast soils.

Undulating Brigalow Land Zone

This land zone has developed on a variety of geological beds and separation into land systems has been based on geology, soil and vegetation development. Soils are deep, grey and brown cracking clays. A surface crust is usually present.

Marsten land system has developed on the *Moolayember Formation*. This formation may be overlain in part by a covering of Quaternary sand. Stone cover is light. Gilgai development is moderate. Vegetation is brigalow, sandalwood, woodland with Dawson gum, brigalow on the rises. This land system is stable in its natural state and is suitable for development to improved pastures. Any brigalow regrowth will require treatment with herbicides to maintain productivity. Some gully erosion is evident near the scarp retreat zones.

Mareto land system has developed on the Cretaceous *Doncaster Member*. A glade effect is evident. A glade is defined as a natural opening in the woodland which gives a characteristic pattern on the aerial photographs. Stone cover is moderate. Vegetation is brigalow, boonaree tall shrubland with mountain yapunyah low woodland on rises. This land system is suitable for development to improved pastures.

Unavale land system has developed on the Jurassic *Birkhead Formation* which is often overlain by a covering of Quaternary sand. Vegetation is brigalow, belah open woodland to brigalow, sandalwood low open woodland. Silver-leaved ironbark low woodland occurs on the rises. This land system is suitable for development to improved pastures. Any brigalow regrowth will require treatment with herbicides.

Stirton land system has developed on the Cretaceous *Winton Formation*. The soils are very weakly gilgaied. Vegetation is brigalow tall open shrubland with emergent whitewood. This land system is quite productive in its natural state due to the low density of trees per hectare. Timber clearing by mechanical means is not advisable as the virgin brigalow is of "whipstick" form and clearing would result in sucker regrowth. Aerial spraying with herbicides would overcome this.

Highlands land system comprises the lower slopes of scarps and incised valleys and is adjacent to the dissected residual land zone. Vegetation is sparse herbfields with scattered brigalow tall shrubland to mountain yapunyah open woodland. This land system has formed mainly on the sandstones of the Jurassic *Westbourne Formation* and it is naturally unstable and subject to erosion. Due to its inherent instability, timber clearing is not recommended and every effort should be made to maintain the vegetation cover to minimise the erosion risk.

Wooded Downs Land Zone

Mackunda land system has developed on the Cretaceous *Mackunda Formation*. Vegetation ranges from silver-leaved ironbark open woodland to bauhinia/vinetree/ironwood/eastern dead finish/western bloodwood wooded open tussock grassland. Soils are shallow to moderately deep, brown and grey clays with linear gilgais sometimes prominent on the grey cracking clays. This land system is valuable in providing shade for the adjacent undulating downs.

Wololla land system consists of a gently undulating outwash sandplain with a definite drainage pattern. Vegetation is similar to *Yalleroi* land system. Tea-tree open shrubland occurs on shallow rises. Desert gum open woodland and narrow-leaved ironbark are also common on shallow rises or crests. Principles for development are the same as for *Yalleroi* land system. This land system is subject to more sheet and gully erosion than *Yalleroi* land system.

Lisgool land system comprises gently undulating country on the eastern edge of the Yalleroi sandplain and at a lower elevation. Soils are sandy yellow earths and earthy sands derived from reworking of materials derived from the adjacent Jurassic sandstones. Vegetation is silver-leaved ironbark woodland with budgeroo common throughout. It is stable under natural conditions but sheet erosion occurs locally.

Kelpurn land system comprises gently undulating plains formed mainly on the Jurassic *Hutton Sandstones*. Soils are deep to very deep, earthy sands and sandy surfaced, texture contrast soils. Vegetation is cypress pine woodland, associated with poplar box and silver-leaved ironbark throughout. Pasture productivity is very low but the cypress pine is a valuable asset as it is a commercial timber.

Grant land system occurs on the Alice Tableland which is an elevated sandplain formed of colluvial material. Vegetation is groved with yellow-jack and long-fruited bloodwood. The dominant species spinifex occurs throughout. Animal productivity is very low due to the presence of heart-leaf poison bush which occurs throughout.

Busthinia land system occurs as a sandplain adjacent to *Grant* land system. It has formed by fluvial and aeolian reworking of the colluvium surrounding the elevated tableland. Vegetation is similar to *Grant* land system.

Gartmore land system comprises gently undulating plains derived from the Jurassic *Hooray Sandstones*. Vegetation is poplar box, sandalwood, shrubby open woodland with brigalow occurring throughout. This land system is relatively unstable and is subject to sheet and gully erosion. Woody weeds such as sandalwood are a problem after any timber treatment programme.

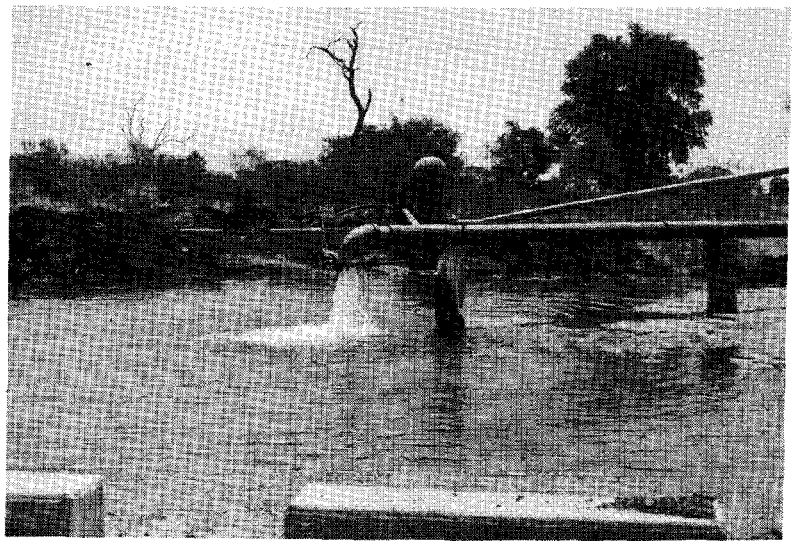
Undulating Gidgee Land Zone

The undulating gidgee land zone occurs mainly where the Tertiary land surface and weathered rocks below were completely stripped away, exposing less weathered, labile Cretaceous sediments. The exception to this is *Jordan* land system which occurs on recent sediments and has been included in the alluvial plain land zone.

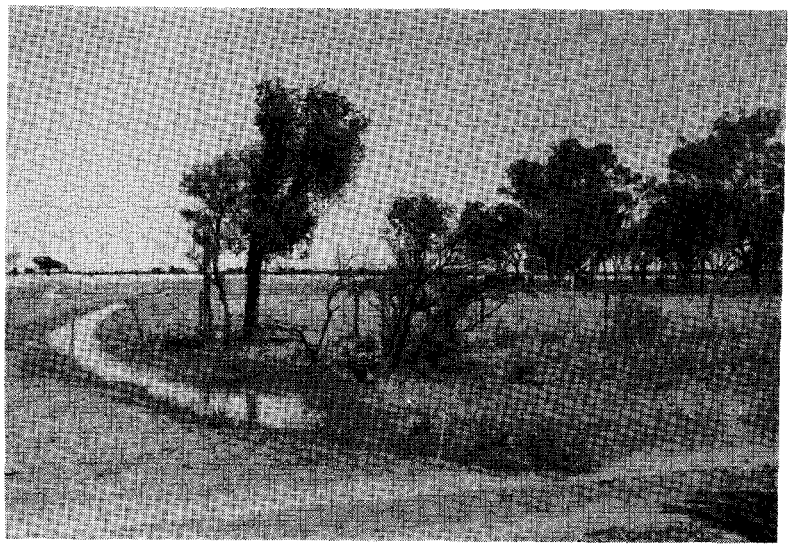
The land systems have been separated on the basis of vegetation development, geology and stone cover. All these land systems occur as gently undulating plains but can occur on the lower slopes of the scarp retreat zone of the dissected residuals. Soils are deep, grey and brown cracking clays. The surface soil is weakly self-mulching and a surface crust is evident.

Evora land system has limited stone cover. Gilgai development ranges from weak to moderate. Vegetation is gidgee, wilga low woodland to low open woodland. The lands are generally stable and are quite suitable for development to improved pastures. Woody weeds are not usually a problem after clearing.

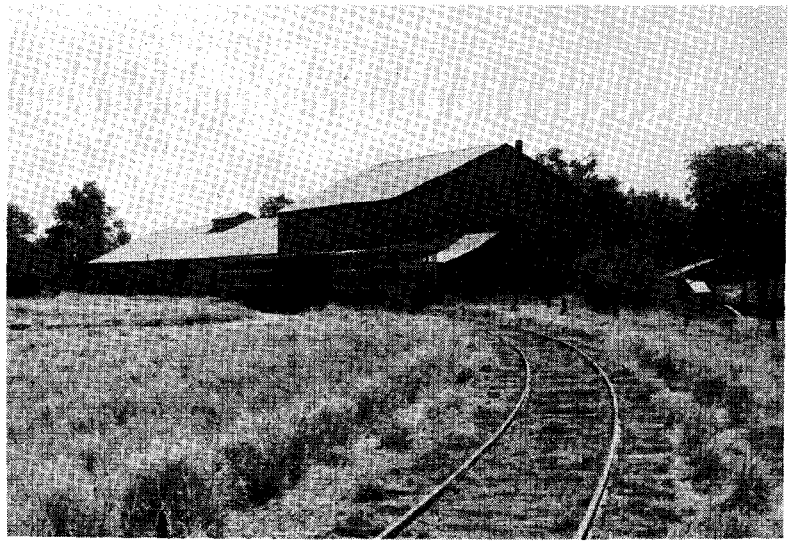
Woolga land system has developed on the *Winton Formation*. Gilgai development is moderate and stone cover quite pronounced. Vegetation is gidgee low woodland with brigalow scattered throughout. This land system is suitable for development to improved pastures. Woody weeds can be a problem.



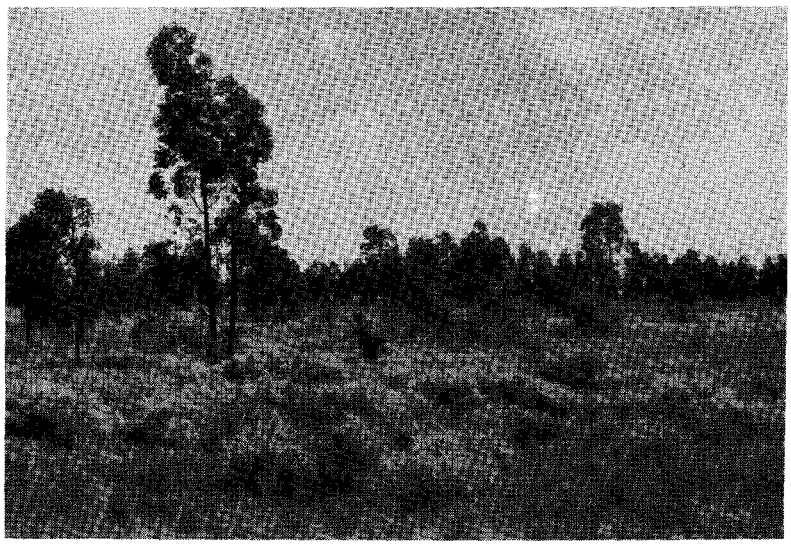
The discovery of artesian water from the Great Artesian Basin led to more intensive land use in the semi-arid region.



Open bore drains are still used to distribute stock water. Water use is inefficient. Reticulation by closed pipes (polythene piping) is now required for new water schemes.



The wool scour at Blackall ceased operating in 1977. It should be preserved as part of the National Estate.



The clearing of the eucalypt woodlands is not recommended because of the consequent emergence of seedlings and regrowth from lignotubers.

Navena land system comprises flat to gently undulating plains developed on Cretaceous sediments. Vegetation consists of boree, boonaree,myall open woodland to wooded open tussock grassland.

Soils are moderately deep to deep, grey and brown cracking clays. This land system is valuable in that it provides shade and camping areas for animals.

Undulating Downs Land Zone

The undulating downs have developed where the Tertiary land surface and the weathered rocks below have been completely stripped away, exposing the fresh Cretaceous sediments. The basis for separation into land systems has been geology and vegetation development. The change from one land system to another is usually clear since each land system displays characteristic patterns on the aerial photographs. Transition zones do occur to some extent. The undulating downs are concentrated east of Augathella and in a wide belt between the Nive and Langlo Rivers, extending north to Tambo and Blackall. Apart from an occasional sandstone floater or ironstone pebble there is little stone cover. The undulating downs are generally very stable but sheet and gully erosion will occur when vegetation cover is absent or very low and high intensity rains are experienced. The ploughing of firebreaks is a necessary management practice on the downs but can lead to gully erosion. Poor siting of fences, roads and watering points can also lead to erosion under certain conditions. Grazing capacities on the downs are high compared to the mulga lands but their disadvantage lies in the fact that there are no drought reserves and grazing capacities fall away rapidly in low rainfall seasons.

Soils are moderately deep to deep, grey and brown cracking clays with strongly self-mulching surfaces. These soils have high A.W.C's. This ability to store water in the soil profile means the Mitchell grass land zone has a lengthier growing season in comparison to other land zones.

Allaru land system has formed on the Cretaceous *Allaru Mudstones* and few outcrops occur. Slopes range up to 2% and average 1%. Boree, myall and boonaree occur occasionally but this land system is regarded as treeless except along the water-courses. Vegetation is Mitchell grass open tussock grassland. Lack of shade and drought reserves are its main limitations.

Coreena land system has developed on the *Coreena Member* of the Cretaceous *Wallumbilla Formation*. It extends in a belt roughly parallel to and west of the Landsborough Highway from Augathella to north of Tambo. Its topographic relief is greater than that of the *Allaru* and *Doncaster* land systems. Rubbly outcrops are common and these outcrops support whitewood/boonaree/ ironwood/eastern dead finish tall open shrublands. Mimosa bush is conspicuous along the drainage lines and gundabluey may be prominent in places. Grazing capacities are the same as for *Allaru* land system but there is more shade. These small shade areas on the outcrops are generally overgrazed.

Doncaster land system has formed on the *Doncaster Member* of the *Wallumbilla Formation*. Slopes are usually <1%. Scalding is extensive throughout. Mimosa bush and needlewood occur along the drainage lines and river red gum/coolibah fringe of the creeks.

Alluvial Plains Land Zone

The alluvial plains have been separated into two major and one miscellaneous land zones on the basis of vegetation, soil and drainage patterns. These land zones are not extensive in area because they comprise only the headwaters of major streams. These land zones assume greater importance in adjacent survey areas.

Alluvial Plains - Woodlands Land Zone

The *Barcoo* land system is associated with major streams with a main channel and some braided channels. Scalding is common on the interchannel areas. Layering of soils occurs. Vegetation is coolibah/river red gum open woodland. This land system is seasonally flooded.

The *Nive* land system comprises single channel streams draining the sandstone country fringing the eastern sector. Seasonal flooding occurs but is not extensive. Vegetation is river red gum, tea-tree, river oak shrubby open woodland on the channel with poplar box or silver-leaved ironbark open woodland upslope. Moreton Bay ash, *Angophora* open woodlands occur on the sand sheets or levee remnants. This land system responds quite rapidly to small falls of rain because of the coarse textured, porous nature of its soils. Brigalow open woodland becomes a major unit in the north where it is subject to occasional flooding.

Ravensbourne land system consists of flooded alluvial plains with numerous braided channels.

Jordan land system comprises the alluvial plains of the "desert" country. The soils are moderately gilgaied grey cracking clays. Vegetation is gidgee low woodland. Poplar box, sandalwood woodlands occur on the flood free, outer margins. Clearing the gidgee would lift pasture production but regrowth is likely, especially of sandalwood.

Fanning land system comprises occasionally flooded plains. Vegetation is coolibah open woodland.

Alluvial Plains - Open Land Zone

Mineeda land system comprises flat alluvial plains adjacent to major streams. Vegetation is Mitchell grass open tussock grassland with sparse herbfields on the scalded areas.

Miscellaneous

Thornhill land system comprises flat claypans receiving run-on water and sediments from the surrounding Jurassic sandstone cuestas. Vegetation is porcupine spinifex hummock grassland on the claypan and long-fruited bloodwood woodland on the sandy rises.

Koorangie land system comprises claypans occurring in the soft mulga lands. Vegetation is sparse herbfields fringed by mulga open woodland.

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CURRENT LAND USE

by E.J. Turner and A.N. Lee+*

SOCIAL ORGANIZATION AND COMMUNICATIONS

There are approximately 230 properties in the area. Population figures for the representatives shires are given in Table 7.1. There has been a gradual decline in population in recent years and this can be partly attributed to the present depressed economic state of the pastoral industries.

Table 7.1. Population figures at census for selected Local Government areas

Shire	1971	1977*	Av. Annual Rate of Increase %
Blackall	2,325	2,160	- 1.46
Jericho	1,420	1,220	- 2.99
Murweh	6,053	5,585	- 1.60
Tambo	831	668	- 4.27
Barcaldine	1,868	1,780	- 0.8

* Corrected 1976 census figures.

Primary school facilities are available at Blackall, Jericho, Tambo and Augathella, but students wishing to complete their education to Grade 12 level must be prepared to attend boarding schools or hostels in larger centres. Costs of education can be prohibitively high for those people on properties distant from these centres. In these cases, children usually attend hostels at a very young age.

T.A.A. services Blackall thrice weekly while the railway service is four times a week. A daily bus service is also available to Brisbane.

Telephone facilities and rural power are available to many properties while television reception is restricted to within a small radius of the repeater towers.

Hospital facilities and dental clinics exist at Blackall, Tambo and Augathella. Not all the hospitals are staffed by a resident doctor.

The main industry of the area is wool production and the beef industry is of importance along the eastern and northern sectors. The beef industry is presently in financial difficulties and this is an added burden for those relying mainly on cattle for income.

Table 7.2 illustrates the fluctuations in estimated gross income from the area over a six year period (1964-1969).

TRANSPORT

Road and rail are the main means of moving sheep and cattle into and out of the area. Droving is of minor importance. The Leichhardt Highway links the towns of Blackall, Tambo and Augathella to Charleville and then via the Warrego Highway to Brisbane. The Leichhardt Highway is the main supply route to Mt. Isa and Darwin. Formed, but unsealed roads radiate from all the main towns. These secondary roads are usually untrafficable during the wet conditions.

* Development Planning Branch, Queensland Department of Primary Industries.

\+ Department of Lands.

Table 7.2. Estimated value of production from the area (x $1 000)

	1964	1965	1966	1967	1968	1969
Blackall Shire*						
Agricultural, Poultry Dairying and Bees	12	15	17	18	17	24
Pastoral	1 668	2 261	1 922	1 539	1 640	1 421
Mining, Forestry, etc.	18	15	8	9	20	12
Jericho Shire*						
Agricultural, Poultry Dairying and Bees	4	5	6	5	6	12
Pastoral	562	556	704	719	675	709
Mining, Forestry, etc.	-	-	6	6	19	12
Murweh Shire*						
Agricultural, Poultry Dairying and Bees	28	50	73	37	55	81
Pastoral	3 946	4 957	4 210	2 928	3 498	3 847
Mining, Forestry, etc.	48	25	71	86	79	61
Tambo Shire						
Agricultural, Poultry Dairying and Bees	10	12	15	10	14	24
Pastoral	3 106	3 626	3 377	2 199	2 492	2 579
Mining, Forestry, etc.	28	22	24	26	61	35
Barcaldine Shire *						
Agricultural, Poultry Dairying and Bees	4	3	2	4	4	8
Pastoral	329	420	737	600	643	572
Mining, Forestry, etc.	-	-	6	6	15	8
TOTAL	9 763	11 967	10 178	8 192	9 238	9 405

Source: Australian Bureau of Statistics.

* One-third, one-quarter, one-half and one-quarter of the value of production has been apportioned to those parts of the Blackall Shire, Barcaldine Shire, Murweh Shire and Jericho Shire respectively within the area.

Blackall is linked by rail to Rockhampton. This is an important method of transporting cattle to the abattoirs in Rockhampton.

Blackall currently enjoys the reputation of being the biggest cattle selling centre in western Queensland, supplying cattle to meatworks in Rockhampton, Roma and Brisbane. The majority of beef cattle for slaughter are supplied during the six month period from April to September.

LAND TENURE

A detailed discussion of the administration of land tenure is found in the Part 1 study of the "Western Arid Region Land Use Study".

Table 7.3. Types of tenure and estimated carrying capacity

Tenure	No.	Area in Hectares	Estimated Carrying Capacity	
			Sheep	Cattle
Agricultural Farm	1	3 424	2 114	-
Perpetual Lease Selection	3	1 761	1 124	-
Grazing Farm	112	532 140	217 068	2 602
Grazing Homestead	167	1 423 898	674 392	5 303
Grazing Homestead Freehold Lease	124	834 133	448 087	1 529
Grazing Homestead Perpetual Lease	10	89 055	36 835	1 535
Stud Holding	2	34 188	28 490	-
Pastoral Development Holding	6	109 709	38 043	-
Pastoral Holding	42	800 484	132 355	30 490
Preferential Pastoral Holding	3	35 170	10 144	-
Special Lease	1	1 556	1 112	-
Freehold Land (portions)	40	45 062	35 172	59
	511	3 821 525	1 624 936	41 518

Table 7.3 provides statistics of rural land held under leasehold and freehold tenure in the study area as at 31st August, 1977, together with the estimated carrying capacity.

Range of Property Sizes:- Tables 7.4 and 7.5 set out the statistics of the area and estimated carrying range of aggregations for both cattle and sheep properties.

Table 7.4. Property size ranges and estimated carrying capacity (cattle)

Property Size Range (hectares)	No. of Aggregates	Estimated Carrying Capacity (Cattle) Range	Total Estimated Carrying Capacity (Cattle)
5 000-10 000	1	-	325
10 000-15 000	6	450 - 1 150	4 370
15 000-20 000	5	600 - 1 250	4 622
20 000-40 000	5	720 - 1 550	6 523
40 000-80 000	3	1 500 - 5 000	8 712
80 000 and over	2	4 000 -10 000	16 048

Most cattle aggregations (73%) fall in the range of 10 000 to 40 000 hectares, these being fairly equally spread over the 3 ranges 10 000-15 000, 15 000-20 000 and 20 000-40 000 hectares. However, these properties account for only 38% of the total estimated carrying capacity of cattle, as most cattle are found on the larger properties.

Table 7.5. Property size ranges and estimated carrying capacity (sheep)

Property Size Range (hectares)	No. of Aggregates	Estimated Carrying Capacity (Sheep) Range	Total Estimated Carrying Capacity (Sheep)
500- 5 000	12	160- 4 051	20 618
5 000-15 000	93	2 098-11 962	530 071
15 000-20 000	46	3 219-14 523	366 845
20 000-30 000	29	4 775-18 480	351 591
30 000-40 000	8	8 912-21 742	135 691
40 000-50 000	7	17 425-32 000	161 835
50 000 and above	2	20 962-51 688	72 650

Of the sheep properties, 85% of the aggregations are in the range of 5 000-30 000 hectares, with these accounting for approximately 76% of the total carrying capacity.

Table 7.6. Distribution of estimated carrying capacity and number of properties

Stock Numbers (Sheep)	No. of Properties	Stock Numbers (Cattle)	No. of Properties
1- 1 000	4	1- 200	2
1 000- 3 000	15	200- 500	4
3 000- 4 000	13	500-1 000	7
4 000- 5 000	21	1 000-2 000	7
5 000- 6 000	30	2 000-5 000	1
6 000- 7 000	32	5 000 and over	2
7 000- 8 000	14		
8 000- 9 000	17		
9 000-10 000	9		
10 000-11 000	14		
11 000-12 000	5		
12 000-13 000	5		
13 000-14 000	5		
14 000-15 000	4		
15 000-16 000	1		
16 000-17 000	2		
17 000-18 000	3		
18 000-19 000	4		
19 000-20 000	2		
20 000-25 000	4		
25 000-30 000	2		
30 000 and over	1		

In Table 7.6 properties are classified according to flock or herd size on the basis of estimated carrying capacity.

Of the 207 sheep properties, 32 have a flock of 4 000 or less, with 137 properties (66%) having a flock in the range of 4 000-11 000 sheep.

Living Area Standards (sheep)

In the annual report for 1970-71, the Lands Administration Commission published guidelines to "living areas" in terms of sheep numbers. These figures were intended as a basis only and would vary according to local circumstances. As reported in Part 1, a flock size of 8 000 was regarded as a basic minimum guideline at that time. In this area, only 38% of properties carried more than 8 000 head. This does not mean that properties with less than 8 000 head are uneconomic. Due to a relatively favourable climate and availability of pasture types, flock size is probably not as important as in adjacent survey areas in determining the profitability of the enterprise. Managerial skill and husbandry practices are important overriding factors in determining economic flock sizes.

THE PASTORAL INDUSTRY

Commercial pastoral activity is confined to beef cattle and sheep production. Beef production comprises both breeding and fattening. Store cattle are generally supplied from the 'desert' country. Sheep production is confined mainly to wool production but presently there are moves to supply the live sheep export market to the Middle East.

Cattle are mainly produced along the eastern and northern sectors while sheep production is concentrated on the undulating downs, gidgee and mulga areas. Following the fall in wool prices in 1970-72 there was a move to increase cattle numbers. The beef industry at that time was enjoying a period of high prices. This trend eased when the Commonwealth Government introduced the guaranteed minimum floor price plan for wool. This move effectively halted the wide wool price fluctuations and provided for some stability in the industry.

Stock population figures for beef cattle and sheep from 1945 to 1976 for the area appear in Table 7.7.

Table 7.7. Stock populations 1945-1976*

Year	Beef Cattle ('000 head)	Sheep ('000 head)	Year	Beef Cattle ('000 head)	Sheep ('000 head)
1945	75.1	1 575.7	1961	94.2	1 234.9
1946	71.7	1 361.0	1962	103.9	1 518.1
1947	65.2	1 052.3	1963	110.3	1 217.0
1948	58.0	1 151.1	1964	111.2	1 348.8
1949	66.1	1 205.4	1965	114.7	1 645.9
1950	73.5	1 321.7	1966	87.2	1 146.2
1951	98.2	1 300.1	1967	87.9	1 319.0
1952	98.5	1 208.9	1968	101.1	1 380.3
1953	112.8	1 332.5	1969	108.6	1 438.3
1954	111.4	1 239.6	1970	104.1	1 098.7
1955	111.6	1 440.4	1971	113.2	1 013.4
1956	115.6	1 557.7	1972	138.8	987.0
1957	118.1	1 567.1	1973	147.6	914.5
1958	120.4	1 598.7	1974	175.0	948.5
1959	95.6	1 384.8	1975	196.3	1 006.2
1960	93.9	1 610.3	1976	214.2	958.6

Source: Australian Bureau of Statistics.

* One-third, one-quarter, one-half and one-quarter of total numbers have been apportioned to those parts of the Blackall Shire, Barcaldine Shire, Murweh Shire and Jericho Shire respectively within the area.

The effects of major droughts are reflected in large fluctuations in cattle numbers. The sheep population has tended to move in parallel with cattle population in relation to drought but appear to be more sensitive to rainfall fluctuations. Cattle numbers built up appreciably during the 1970s and are currently at their peak in spite of depressed markets.

Livestock numbers have been converted to cattle equivalents and examined on the basis of five year moving averages. Figure 7.1 illustrates the relationship between livestock numbers and rainfall. In plotting livestock numbers, the same figures are used as in Table 7.7 but sheep numbers have been converted to cattle by a conversion equivalent of eight sheep to one bovine.

Rainfall has been calculated on the basis of the mean of annual falls at the five official recording centres of Barcaldine, Blackall, Jericho, Tambo and Augathella.

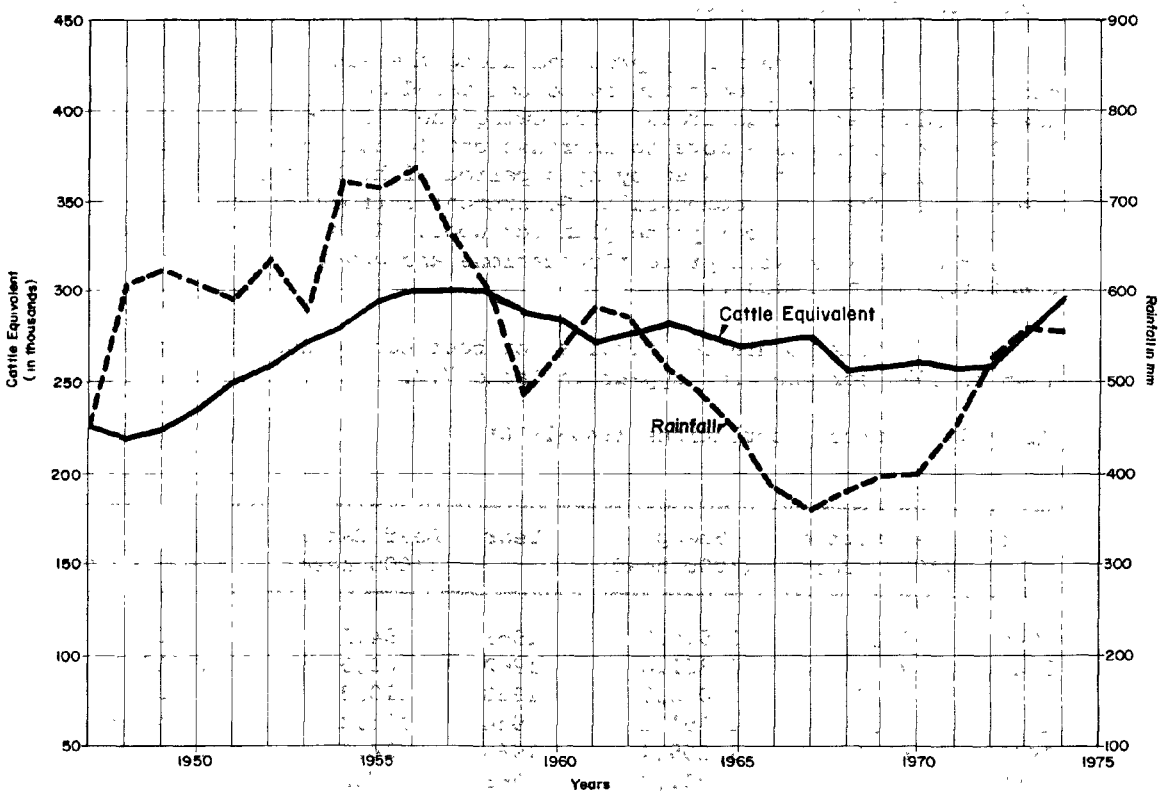

Fig. 7.1 *Index of 5 years moving average. Rainfall and cattle equivalent.*

Stock numbers tend to show less variation than rainfall and exhibit a "lag" of one to two years compared to rainfall. This lag effect is evident for both troughs and peaks.

Beef cattle herds are predominantly of the Hereford breed whilst Shorthorns are also widely represented. Other breeds such as Santa Gertrudis, Droughtmaster and Brahman are also quite prominent. Commercial studs of the various breeds are present in the area.

Sheep flocks are of the Merino breed. Wool produced is of the medium type with an average diameter of 21-22 microns. Rams are usually supplied from studs within the area.

Property Improvements

The level of general property improvements has been reported in WARLUS Part 1. Improvements are probably more advanced in this area due to smaller property size. The clearing of gidgee and brigalow virtually ceased in the mid 1970s when the taxation incentive for such improvements was withdrawn. The general economic state of the pastoral industry precludes any further major improvements. Many properties are now only in a position of maintaining present improvements.

Herd Composition and Performance

The composition of the beef cattle herd has been examined for the period 1953 to 1976. Since numbers of breeders actually mated are not available, the classification of "cows and heifers over one year" may be accepted as a reasonable guide to breeding intensity. The ratio of breeders to total cattle numbers (expressed as a percentage) for the area is compared to the same ratio for the State in Figure 7.2. The percentage for the area is consistently higher than the State ratio. Figure 7.2 also illustrates the ratio of brandings to total cattle numbers for both the area and the State. Again, the branding percentage for the area is better than the State ratio except during major drought periods. Figure 7.2 also illustrates the ratio of mortalities to total cattle numbers for the area and the State. There is generally good agreement with the State ratio except during drought periods. Mortalities in the area exceeded the State average in these periods as the drought was relatively milder in the easterly cattle areas of the State.

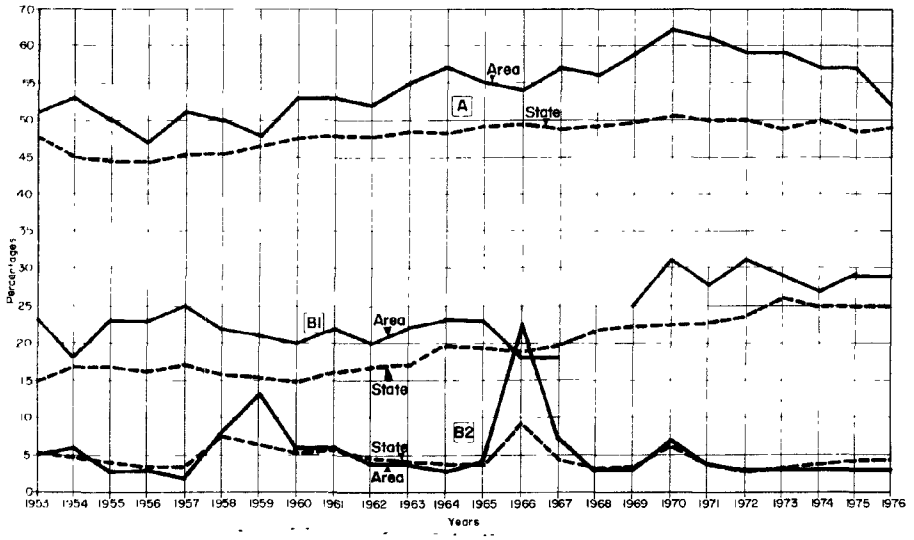

Fig. 7.2 *A %* *breeding cattle to total cattle*
B 1 *comparative efficiency branding / total cattle*
B 2 *mortalities / total cattle*

Flock Composition and Sheep Efficiency

As at September 1976, the area held approximately 7% of the total sheep in Queensland. Figure 7.3 shows the average weight of greasy wool per animal for the period 1953 to 1976. With the exception of drought years, average greasy wool cut per animal in the area has been higher than the State average.

The ratio of breeding ewes to total sheep for both the area and the State for the period 1953 to 1976 is also depicted in Figure 7.3. Generally, the ratio is higher in the area. Greatest divergence has occurred during major drought periods. This shows that breeding females are retained as a deliberate drought policy.

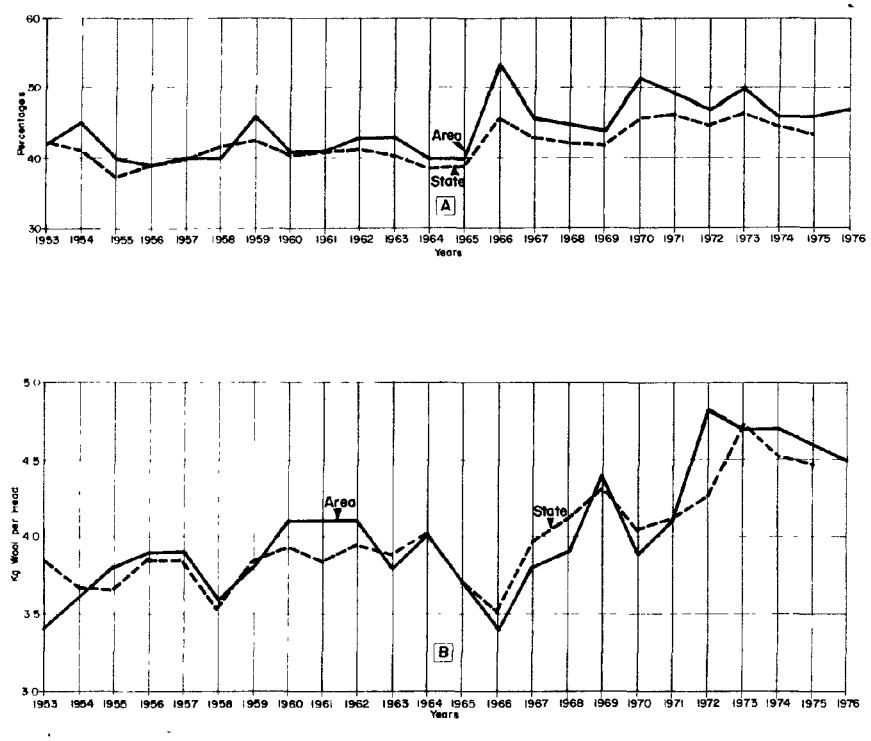

Fig. 7.3 *A% breeding ewes to total sheep*
B kg of wool per animal

Efficiency ratios are expressed as the number of lambs marked annually and as mortalities. The percentage of lambs marked to breeding ewes is compared with a similar ratio for the State in Figure 7.4. The breeding performance of sheep in the area compares favourably with the State as a whole, and in some years, has risen above the State percentage. In general, low lambings in one year were invariably followed by peaks the following year. In all cases, these peaks in the area exceeded those for the State.

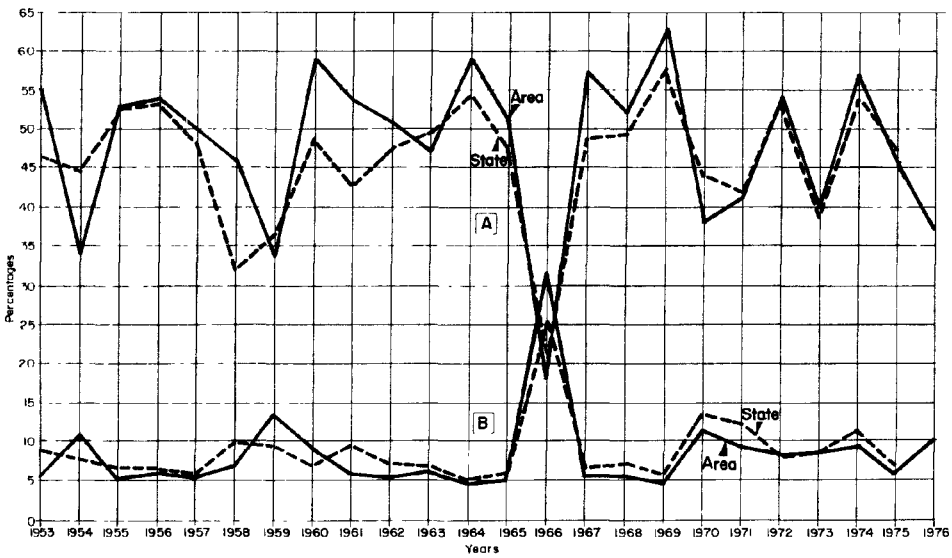

Fig. 7.4 *A% lambs marked / breeding ewes*
B% sheep mortalities / total sheep

Figure 7.4 also depicts sheep mortality percentages for the area and the State. The area compares very favourably with the State ratio. Mortalities for the area were higher than the State percentage during major drought periods.

RESOURCE USE

by E.J. Turner and G.R. Beeston+*

PASTURES

The pastures of the area are composed largely of native species, however, quite a large area has been sown to improved pasture mainly *Cenchrus ciliaris* (buffel grass). The pastures differ from areas farther west in that the area of annual pasture is very limited being confined to small areas on claypans. Seasonal conditions determine the composition of the annual pasture. Grasses predominate following summer rains and forbs are present after winter rains. This annual pasture group is particularly sensitive to drought conditions.

Although the composition of the ground flora is variable, the pastures can be divided into six major groupings characterized by species composition and habitat. The major environmental factors causing changes in the pastures have been fire and grazing history. Man has effected major changes in species composition by timber clearing to increase productivity or to provide drought fodder. The time of year that rain falls is important in the *Astrebla* grasslands, as it determines the component of forbs to be found in these pastures. The pasture groups have close affinities with those of the Nogoa-Belyando described by Pedley (1967).

Pasture Groups

Mitchell grasses (Astrebla spp.*) ± short grasses ± forbs pasture group:* These occur mainly on the undulating downs and alluvial plains, the dominant soil of which are clays. Mitchell grasses are drought resisting tussock species up to one metre high. The commonest species is curly Mitchell grass *(Astrebla lappacea)* with hoop and bull Mitchell *(A. elymoides* and *A. squarrosa)* also present. The tussocks are widely spaced and after early summer rains these interspaces are occupied by short grasses such as the Flinders grasses and button grass. The grass species commonly associated with the Mitchell grass areas include Queensland blue grass, feather top grass, white spear grass and Yabila grass.

Following winter rain, the forb component of the pasture increases. These are mainly from the Chenopodiaceae family. The value of Mitchell grass declines rapidly if winter rainfall is followed by frosts.

After a sequence of good seasons, the proportion of forbs decreases due to increased competition from Mitchell grass. This is not regarded as a favourable grazing situation.

Herbage is preferred by the grazing animal and if dry conditions are encountered, the animal must survive on the dry Mitchell grass.

On the shallow sandstone outcrops which occur in some of the areas of this grouping short grasses predominate. The most important species is *Enneapogon avenaceus*. However, in many areas the invader *Cenchrus ciliaris* was a common constituent.

* Development Planning Branch.

+ Formerly Botany Branch.

Scrub grasses pasture group: This is the pasture group associated with the brigalow, brigalow-belah and gidgee woodlands. The species are low (<0.7 m), perennial, drought-evading tussock grasses. The major grass species are *Enneapogon* spp., *Enteropogon acicularis, Sporobolus* spp., particularly *Sporobolus caroli.* Forbs comprise a small but important part of this pasture group. In many areas, especially the gidgee areas *Cenchrus ciliaris* has become a naturalized species.

In their natural state the communities containing these pastures have a very low carrying capacity. Clearing by either ringbarking to allow increased growth of the native pasture species or pulling followed by sowing of introduced pasture species greatly increases the carrying capacity. Some years after pulling, these areas exhibit a fertility decline with a resultant loss in vigor of the pasture.

On those areas covered by bendee and lancewood woodlands the grasses are even sparser and are dominated by short *Aristida* spp. In places *Tripogon loliiformis* is the only grass present. The grazing value of these areas is almost nil.

Mulga pasture group: This is the pasture group which occurs as the ground layer in the mulga communities. It consists of a group of perennial tussock species, 70-100 cm tall, of which the *Aristida* spp. *(A. armata, A. calycina, A. glumaris* and *A. jerichoensis), Eragrostis lacunaria, Enteropogon acicularis* and *Digitaria brownii* are the most important. The forbs *Thyridolepis mitchelliana* and several *Sida* spp. are also important species.

The composition and cover of these pastures are dependent to a large extent on the density of the mulga and the woody shrubs *Eremophila gilesii* and *E. bowmanii.* When the mulga is cleared the amount of *Aristida* spp. seems to increase. In dense stands mulga often had little or no pasture present and the mulga fern *Cheilanthes sieberi* was the only frequent species.

Triodia pasture group: This pasture group is the western extension of the eastern spinifex country described by Pedley (1967). It is associated with the eucalypt woodlands of the "desert" country. The group consists of perennial drought resisting hummock grasses mainly *Triodia pungens* and *T. mitchellii,* about one metre tall. The spaces between the hummocks are often bare or have *Aristida* spp. in them. In places this group forms a mosaic with the eastern mid height group and in the *Eucalyptus* associations of the east this mixture of grasses was found throughout.

The origin of these mosaics is undoubtedly related to past burning history and subsequent stocking rates. The *Triodia* spp. being very sensitive to fire is undoubtedly replaced by the eastern mid height grasses under certain conditions of prolonged burning and grazing.

The forage value of the pasture is low and is restricted to periods following a burn. Forbs constitute a small but important component of this pasture group. The stocking rates are low and are really dependent on the amount of eastern mid height grasses present.

Eastern mid height grasses pasture group: This group is similar to the pasture lands of the same name described by Pedley (1967). It is associated with the *Triodia* pasture group previously described and is associated with the eucalypt woodlands of the "desert". The pasture is characterized by perennial drought evading tussock grasses (1-1.5 m tall), the chief species of which are *Bothriochloa ewartiana, Heteropogon contortus, Themeda australis, Chrysopogon fallax* and *Aristida* spp. *(Aristida armata, A. browniana, A. calycina, A. caput-medusae, A, ingrata, A. jerichoensis, A. ramosa).*

The pasture quality varies with the species composition and pastures dominated by *Bothriochloa ewartiana* are regarded as being better than those dominated by *Aristida* spp.

Sown Pasture Group: This group is dominated by one species namely *Cenchrus ciliaris* (buffel grass). Many areas which have been cleared by pulling have been sown to cultivars of this species. The resultant pastures are perennial, tussock grasslands usually about 0.7-1 m tall.

The carrying capacity of this pasture group is far greater than any of the native pastures already discussed. A long term grazing trial concerning this aspect is continuing at "Eastwood", south of Blackall. On some of the lighter soil types there is evidence that the long term stability of these pastures may be questionable.

Woody Weeds

The grazing lands are made up of two types of pastures, one dominated by native pasture species and the other by introduced pasture species mainly *Cenchrus ciliaris* (buffel grass). In both cases the productivity of the pasture can be decreased by the invasion of woody weeds. Boyland (1974) has discussed many of the factors leading to woody weeds becoming established in arid land pastures.

The problem is far greater in the present survey area as much of the gidgee and brigalow associations and some of the eucalypt associations of the area have been cleared. This has led to increased woody weed problems mainly due to the presence of *Eremophila mitchellii* (sandalwood).

Sandalwood is a constituent of the shrub layer of most of the gidgee and brigalow communities. It is also found in some of the eucalypt associations, which occur on texture contrast soils. Its rapid regeneration and seedling build up, after the upper stratum has been removed, has been documented by Purcell (1964) and Beeston and Webb (1977).

The eucalypt species when disturbed by pulling and ringbarking can regrow rapidly and release suppressed seedlings. While gidgee does not regrow to any great extent, brigalow suckers were present to varying degrees in cleared areas.

The following woody species were observed to be causing weed problems. Those marked with an asterisk are the species of major significance.

Acacia harpophylla (brigalow)*. In places regrowth caused problems after clearing. Methods of control have been outlined by Johnson (1976).

Acacia farnesiana (mimosa bush). This formed dense stands on parts of the downs. It provides shelter and fodder for stock. Plant populations appear to be increasing in places.

Acacia longispicata. In some of the Eucalyptus associations this species had formed dense stands following disturbance.

Acacia stenophylla (belalie). May form dense stands along watercourses restricting stock movement.

Acacia triptera. On some of the mesa tops in the east this species forms dense stands excluding grasses.

Callitris columellaris (cypress pine)*. In the cypress pine communities the seedlings can form dense stands and exclude ground layer species. Some areas visited had become useless for grazing. Stands would have to be selectively thinned for any of the trees to develop into usable timber.

Carissa ovata (currant bush). This species may form dense thickets in the Eucalyptus association and gidgee association on lighter soils. It was also found on cleared gidgee in the Blendon land system.

Cassia nemophila (butter bush). This may become a problem in cleared gidgee. The control methods described by Purcell (1966) should overcome the problem.

Eremophila bowmanii (silver turkey bush). This is the most important weed in these mulga lands. It forms dense stands, which can exclude the ground layer.

Eremophila gilesii (Charleville turkey bush). This is a serious problem of the south western mulga lands. Its distribution in the survey area is limited.

Eremophila latrobei. This species forms dense stands on some residual tops making them totally useless.

Eremophila mitchellii (sandalwood)*. Undoubtedly, the most serious woody weed in the area. The control measures outlined by Beeston (1976), Purcell (1964, 1966A, 1966B) and by Robertson (1965) are applicable although limited by current economic conditions.

Eucalyptus cambageana (Dawson gum)*. This species can cause some problems in cleared brigalow country. Back (1972) considers the injection technique is the best method to control this species.

Eucalyptus populnea (poplar box)*. This can be a problem in disturbed country. Regeneration from lignotubers and the growth of suppressed seedlings may follow clearing. Injection techniques involving the use of chemicals such as Tordon** are the best methods of control.

Eucalyptus melanophloia (silver-leaved ironbark)*. Problems result from this species in the same way as poplar box. However, the problem of suppressed seedlings is far greater. Unless follow-up treatments such as stickraking and ploughing are used most of the country carrying this species is best left untreated.

Eucalyptus microtheca (coolibah). Usually it is not a problem. When country is flooded beyond the normal channel, mass germinations may occur resulting in dense stands. Seedling problems can also result if the mature trees are treated by ringbarking or chemical injection techniques.

Eucalyptus whitei (White's ironbark). Can be a problem in the same way as *E. melanophloia* if disturbed.

Myoporum deserti (Ellangowan poison-bush). Because of its poisonous properties it is sometimes considered a pest. It was also found to be a weed of some of the cleared gidgee associations where it increased rapidly after clearing.

Xanthium pungens (Noogoora burr). Although this plant is not a woody weed but an annual forb it warrants mentioning as it forms dense stands along some creeks in the area. On sheep properties active eradication programmes involving chemical spraying are being undertaken.

** Trade name for herbicide containing picloram.

Topfeed (the edible trees and shrubs), while being present in most of the land zones, is not as important to the grazing industry in this area as it is to the south and further west.

The most utilized of the fodder trees in the area is mulga and many areas have been cut and pushed for drought feeding. Unlike areas to the west the species has regenerated well and little permanent damage has been done.

Most of the other species listed below occur only as scattered trees and while being edible for stock are never sufficient in numbers to constitute a real drought reserve. The following are the principal topfeed species occurring in the area. Everist (1969) gives brief descriptions, distribution and photographs of many of the species. He also discusses the management techniques used to feed and maintain the important fodder species.

Fodder Plants

Bauhinia *(Bauhinia carronii)*. Eaten by cattle but is of little use in droughts due to shedding of leaves during late winter. Common on the sandy textured soils of watercourses and the timbered downs.

Beefwood *(Grevillea striata)*. Appears to be more acceptable to sheep than cattle, but is still a useful species. Occurs mainly in the eucalypt woodlands.

Belalie *(Acacia stenophylla)*. Eaten readily but not used extensively as a drought feed.

Bendee *(Acacia catenulata)*. There was little evidence of this species being eaten in the area. At times animals will eat the leaves resulting from windfall.

Berrigan or emu bush *(Eremophila longifolia)*. Regarded as a useful fodder plant and is eaten in large quantities without obvious ill-effect. Feeding tests have shown it can be poisonous to sheep. Common in the mulga and eucalypt woodlands of the survey area.

Bitter bark *(Alstonia constricta)*. Eaten in the area by sheep and cattle without harmful effects, but the leaves can cause stock losses.

Bottle tree *(Brachychiton rupestre)*. Can be used as drought feed but must be cut for stock to reach them.

Boobiala *(Myoporum acuminatum)*. Toxic if eaten in excess, but stock had eaten many of the bushes encountered in the area.

Boonaree *(Heterodendrum oleifolium)*. Common throughout the area and eaten where accessible.

Boree *(Acacia cana)*. Small areas occur these being mainly associated with the undulating downs. Many had been browsed as high as stock could reach.

Brigalow *(Acacia harpophylla)*. Occasionally browsed - when young or as regrowing suckers. Not readily sought.

Broom bush *(Apophyllum anomalum)*. Heavily browsed and is readily sought by sheep and cattle.

Bumble or wild orange *(Capparis mitchellii)*. The leaves are eaten readily and are usually considered excellent fodder. It is not extensive in the area.

Currant bush *(Carissa ovata)*. Occurs in the east of the area and is browsed in places.

Desert oak *(Acacia coriacea)*. It is eaten freely by sheep but the yield is small. Occurred throughout the eucalypt woodlands.

Ellangowan poison bush *(Myoporum deserti)*. Both sheep and cattle eat it readily in the field but it has caused large stock losses in hungry travelling animals.

Gidgee *(Acacia cambagei)*. Although an abundant species in the area is not a useful fodder species. At times animals will eat the leaves blown down by wind and in places sheep eat the leaves if the trees are burnt down.

Gooramurra *(Eremophila bignoniiflora)*. Eaten freely by all classes of stock.

Gundabluey *(Acacia victoriae)*. Eaten readily by stock but does not produce any bulk of forage. Common on the downs.

Ironwood *(Acacia excelsa)*. Wherever accessible eaten freely by sheep and cattle. Occurred throughout the area.

Kurrajong *(Brachychiton populneum)*. Mixed with other trees it is excellent fodder. Must be cut for stock.

Leopardwood *(Flindersia maculosa)*. Leaves are eaten readily by both sheep and cattle and are regarded as excellent fodder. Not extensive in the area.

Maytenus cunninghamii. Eaten readily by sheep and cattle. Is not widespread.

Mimosa bush *(Acacia farnesiana)*. The most important topfeed species of the downs. Is eaten readily when leaf present, but loses its leaf when conditions are dry.

Mulga *(Acacia aneura)*. The most important topfeed species. Has been used extensively for drought feeding in the past. Regeneration of the stands is good.

Myall *(Acacia pendula)*. Eaten readily where it was accessible. Only occurred in limited areas.

Myrtle tree *(Canthium oleifolium)*. Where it occurs is eaten readily. Regarded as excellent fodder species.

Mountain sandalwood *(Eremophila oppositifolia* var. *rubra)*. Eaten where it occurred but of only limited distribution.

Nipan or split jack *(Capparis lasiantha)*. Eaten with relish where it occurred.

Plumwood or true sandalwood *(Santalum lanceolatum)*. It is one of the most palatable of all native species and is regarded as excellent fodder. Does not occur in large quantities.

Red ash *(Alphitonia excelsa)*. Eaten readily by sheep and cattle. Occurs in limited quantity.

Vine tree or supple jack *(Ventilago viminalis)*. One of the most important fodder trees of the downs. Readily eaten as far as stock could reach it.

Whitewood *(Atalaya hemiglauca)*. Probably the most widespread top-feed species in the area. Is readily eaten by sheep and cattle.

Wilga *(Geijera parviflora)*. The form in the survey area was tree wilga and was thus readily eaten.

POISONOUS PLANTS

Poisonous plants include grasses, forbs, trees and vines and may occur in any land zone.

In general, poisoning of some type may be suspected when several animals simultaneously become ill or are found dead particularly if many are affected and the animals have not been subjected to any treatment such as shearing or dipping from which death may occur. Not only are toxic plants responsible for large stock losses but they may hinder the management of properties by rendering extensive areas of grazing land useless for all or part of the year. This is the case in the eucalypt associations of the north-east where large areas must be fenced to exclude stock from *Gastrolobium grandiflorum* (heart-leaf poison bush).

A large proportion of animals grazes pastures which contain plants known to be toxic. Many poisonous plants can be eaten with impunity if they form only a small fraction of the total feed. Usually, local stock seem to learn to avoid the harmful species but it is not so with stock introduced from another area.

Many factors combine to produce a situation where stock losses may occur. More important of these are the stage of growth of the plant, the condition and composition of the pasture, the kind and condition of the grazing animals and environmental conditions. Usually, most losses occur either during drought periods when local stock may eat shrubs and trees they ordinarily would not touch or when animals being driven long distances become hungry and stressed.

The opportunities and usefulness of treatment for poisonous plant cases are limited by many factors. Death may occur before any remedy is available or an antidotal remedy may not be known. Many plants cause such extensive damage to tissues that no remedy can offer any hope after symptoms appear. Manpower to handle the number of affected animals may also be limiting.

With poisonous plant cases prevention is better than cure. It is best to recognise a potential situation when losses may occur and devise management systems to minimize losses. A knowledge of toxic plants present in a district, the situation or conditions under which losses may occur and the kind of animal affected is essential for efficient management of an area.

Species known to contain toxins, shown to be toxic by feeding tests or suspected of being toxic on strong field evidence, have been indicated in the species list (Appendix III).There is no indication given if a plant has been suspected on weak or vague field evidence. Table 8.1 lists known toxic plants in the area together with the chemical classification of the toxin. Within this area most losses are caused by oxalate and nitrate poisoning. Everist (1974) has compiled all known data on poisonous plants in Australia. Detailed descriptions of plants as well as symptoms and treatments are given.

TIMBER TREATMENT

The area which has had timber treatment carried out on it is quite extensive. Most of the timber treatment has been done to increase the carrying capacity of the country. This has often been done by burning the cleared areas and sowing to buffel grass. Some areas have been left unburned. They also show a large increase in native pasture species. In the south, *Acacia aneura* (mulga) has been pushed for drought feeding. These mulga areas have regenerated well.

Table 8.1. Known poisonous plants

Common Name	Botanical Name	Oxalates	Nitrates	Essential Oils	Cyanogenetic	Others	Alkaloids	Other Known Toxins	Toxins Uncertain or Unknown
Annual saltbush	*Atriplex muelleri*	x	x						
Bathurst burr	*Xanthium spinosum*					x			x
Berrigan or emu bush	*Eremophila longifolia*								x
Birdsville indigo	*Indigofera linneai*								x
Bitter bark	*Alstonia constricta*						x		
Blackboy	*Xanthorrhoea* spp.								x
Boggabri	*Amaranthus mitchellii*	x	x						
Boobiala	*Myoporum acuminatum*			x					
Boonaree	*Heterodendrum oleifolium*				x				
Bottle tree	*Brachychiton rupestre*		x						
Button grass	*Dactyloctenium radulans*								x
Caltrop	*Tribulus terrestris*		x					x	
Caustic vine	*Sarcostemma australe*								x
Caustic weed	*Euphorbia drummondii*								x
Ellangowan poison bush	*Myoproum deserti*			x					
Fuchia bush	*Eremophila maculata*				x				
Gomphrena weed	*Gomphrena celosioides*								x
Hairy panic	*Panicum effusum*								x
Heart-leaf poison	*Gastrolobium grandiflorum*							x	
Kurrajong	*Brachychiton populneum*								x
Limestone fuchia bush	*Eremophila freelingii*			x					
Mexican poppy	*Argemone mexiciana*						x		
Mint weed	*Salvia reflexa*		x						
Morgan flower	*Morgania floribunda*								x
Mulga fern or rock fern	*Cheilanthes sieberi*							x	
Munyeroo	*Portulaca* sp.aff.P. *oleracea*	x	x						
Native couch grass	*Brachyachne convergens*				x				
Native indigo	*Indigofera australis*								x
Native tobacco	*Nicotiana velutina*						x		
New Zealand spinach	*Tetragonia tetragonioides*	x				x	x		
Noogoora burr	*Xanthium pungens*					x		x	
Poison pimelea	*Pimelea trichostachya*								x
Potato bush	*Solanum ellipticum*							x	
Prickly paddy melon	*Cucumis myriocarpus*								x
Purple plume grass	*Triraphis mollis*				x				
Red crumbweed	*Disphania microcephala*				x				
Red spinach	*Trianthema triquetra*	x	x						
Soda bush	*Threlkeldia proceriflora*	x							
Soft roly-poly	*Salsola kali*	x	x						
Supplejack	*Ventilago viminalis*							x	
Whitewood	*Atalaya hemiglauca*								x
Yellow wood sorrel	*Oxalis corniculata*	x							

Timber treatment has been mainly confined to three associations, these being the *Acacia cambagei* (gidgee), *A. harpophylla* (brigalow) and some of the Eucalyptus *(E.populnea, E. melanophloia)* associations. By far the greatest area has been cleared in the gidgee communities where up to 400 000 hectares have been cleared. Purcell (1964) has discussed the methods and results likely to be obtained by clearing the communities.

Extensive clearing by pulling has also taken place in the brigalow communities in the east. Most of these areas have been successfully sown to introduced pasture mainly buffel grass. In some areas brigalow suckers are a problem and pasture establishment is poor.

The eucalypt associations have been treated in two ways. One way is by pulling and only a limited area of country has been cleared in this way. Results are variable but regrowth from suppressed seedlings and suckers is such that extensive follow up treatments such as stickraking and ploughing have to be carried out. In addition large areas of these associations have been treated by ringbarking and in recent years by tree injection using chemicals such as "Tordon".

The results of these treatments are variable with some areas being effectively cleared while others have completely regenerated back to mature woodlands. The large numbers of suppressed seedlings present in these associations (especially in the *Eucalyptus melanophloia* association) are the major reasons for the failure of these treatments. Retreatment of an area is needed for several years after the initial treatment if all emerging seedlings are to be removed.

While the total area of mulga is relatively small, areas have been pushed for drought feeding. Generally these areas have regenerated well, but there are signs of some degradation (soil erosion) where the surface plant cover has been lost.

EROSION

Natural geological erosion is a feature of this area particularly on the uplands. Accelerated erosion often accompanies natural erosion and is due to man's direct or indirect interference with his environment. The susceptibility of an area to erosion is governed by soil type (texture, structure), surface vegetation cover and slope. Vegetation is probably of paramount importance in inhibiting erosion in that it provides essential cover against the erosive forces of wind and water. Removal or loss of this plant cover and associated organic matter (by timber clearing, cultivation, fire or overgrazing) exposes the soil surface and eventually leads to a decline in soil porosity and a deterioration in soil structure. This in turn is followed by increased runoff which promotes accelerated erosion.

Man has drastically altered his environment since early settlement through the introduction of the grazing animal and the management activities associated with them. Grazing pressures have resulted in changes in species composition both to ground cover and topfeed. Areas around watering points are usually overgrazed and when combined with the exaggerated trampling effects of stock at these points, predisposes the soil to erosion. Poor siting of fences and property roads can also lead to erosion.

Erosion can also be induced by drought, which, unless a destocking policy is introduced, forces unnaturally high grazing pressures to be exerted on the pasture. This results in loss of plant cover leaving the soil exposed and susceptible to erosion. Condon, Newman and Cunningham (1969) showed that the greatest damage to pastures and soils occurs during the early phase of a drought when stock numbers are still high.

Only small areas are cultivated as the area is only marginally suited to cropping. If fallowing techniques are used to control weeds and store additional water, a protective cover of stubble, grass strips and pasture rotation are necessary to minimise the erosive effects of high intensity rainfall on the gently sloping country. On the steeper slopes, pasture rotation, strip cropping and contour banks will be necessary management practices to protect these lands against erosion and loss of productivity.

Fire can be a valuable management tool to effect pasture changes and reduce woody species. The timing of firing and fire intensity are critical in that firing when the soils are dry can lead to wind erosion and water erosion if followed by high intensity rain. This applies especially to the sandier textured soils of the "desert".

Pests such as wild pigs and rabbits may contribute to the erosion problem but their effect in this area is very slight. Termites may influence the rate of erosion in some areas. They can denude an area of vegetation and their nests are extremely hard and impervious to rain. Runoff from those areas is high and sheet rilling may occur farther downslope. Termites are most active in the mulga and desert areas.

Skinner and Kelsey (1964) when investigating soil erosion in western Queensland found serious accelerated sheet erosion in the mulga lands. This has been confirmed by Dawson (1974) and Mills (in prep.) who also drew attention to scald and gully erosion on alluvial plains. Gunn (1974) reported the loss of some 3-8 cm of surface soil from some 30-70% of the mulga lands in the Balonne-Maranoa survey area. His analytical data indicated that the soils had <1% organic matter. Erosion leads to a further reduction in this already low nutrient pool and to difficulties in plant establishment and growth.

Dawson (1974) calculated the cost of losing these nutrients when the 0-10 cm layer over 1 hectare in the red earths is eroded. On 1974 values alone, this amounted to some $400 per hectare. It is both uneconomic and impractical to replace these nutrients artificially and replacement by natural cycling is unlikely in the short term.

Areas Affected

Data collected during the survey indicate that less than 5% of sites were suffering from serious erosion. These sites were mainly shallow red earths and texture contrast soils and were generally confined to Highlands land system and to the scarp retreat zone in the dissected residuals. A further 33% of sites was classified as being susceptible to erosion. In general, the land zones lying in the upper catchments are most liable to erode.

Table 8.2 shows the susceptibility of the land systems to erosion.

Erosion in the Upper Catchments

The main land zones seriously affected by erosion include the dissected residuals, which are inherently unstable, the hard mulga lands and the brigalow lands in the scarp retreat zones. They occur over 12% of the area. Erosion gradients in these areas are very suitable for serious erosion to occur. Sheet erosion, although not as obvious as gully erosion, is the most common form of erosion in these areas. Runoff from the dissected residuals is high, causing erosion problems downslope in the scarp retreat zones. The soils on the lower slopes are erosion prone due to their texture and structure. They are generally shallow red earths and texture contrast soils. Often a hard surface crust is present which reduces infiltration rates and leads to increased runoff.

Table 8.2 Production characteristics of the land systems.

Land System	Erosion Class	Natural Stability	Condition	Productivity Reaction to Use	Conservative Grazing Capacity	Comments
Soft Mulga						
M1 Arlington	1, 7	Stable	Good to fair	Stable to slightly downward	1 sheep/2.4 to 4 ha	Woody weeds (silver turkey bush) may be a problem in some areas. Subject to sheet erosion if overcleared. Maintain ground cover. Productivity could be improved by selective thinning of trees and shrubs in the dense woodlands.
M2 Bayswater	1, 7	Stable	Good to fair	Stable to slightly downward	1 sheep/2 to 4 ha	Woody weeds (sandalwood, Charleville turkey bush) occur throughout. Responds to run-on water.
Hard Mulga						
H1 Pinnacle	2, 7, 8	Slightly unstable	Mediocre to fair	Slightly downward to downward	1 sheep/4+ ha	Maintain ground cover. Runoff is excessive. Maintain existing trees and shrubs.
Dissected Residuals						
R1 Winooka	8, 9	Slightly unstable	Poor to mediocre	Downward	1 beast/32+ ha	Excessive runoff. Maintain plant cover. Productive on lower slopes. Use is limited by topography. Heart-leaf poison bush can be a problem.
R2 Andurba	8, 9	Slightly unstable	Poor to mediocre	Downward	1 beast/32+ ha	Excessive runoff. Maintain plant cover. Productive on lower slopes.
R3 Adori	2, 7	Slightly unstable	Fair	Slightly downward	1 beast/32+ ha	Maintain plant cover. Cypress pine seedlings and *Acacia triptera* thickets can reduce productivity.
R4 Noella	8, 9	Unstable	Mediocre	Downward	1 beast/32+ ha	High runoff. Maintain plant cover. Use is limited by topography. *Eremophila latrobei* forms dense stands.
Undulating Gidgee						
G1 Evora	1, 7	Stable	Good	Stable	1 sheep/1.2 ha developed	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Woody weeds (sandalwood) can be a problem in some areas.
G2 Blendon	1, 7	Stable	Fair	Stable to slightly downward	1 sheep/4+ ha undeveloped	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Woody weeds (sandalwood) can often be a problem.
G3 Woolga	1, 7	Stable	Good	Stable	1 sheep/4+ ha undeveloped	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Woody weeds usually not a problem. Regrowth of brigalow can be a problem.
Undulating Downs						
F1 Allaru	1, 7	Stable	Good	Stable	1 sheep/1.2 ha	Good cover of perennial grasses. Occasional scalding at base of slopes. No drought reserves. Little shade except for Mimosa bush and tree-lined creeks. Winter rain can reduce quality of the standing grass.
F2 Coreena	1, 7	Stable	Good	Stable	1 sheep/1.2 ha	Good cover of perennial grasses. Scalding at base of slope and on wooded sandstone outcrops. Drought reserves and shade slightly better than Allaru.
F3 Doncaster	1, 2, 7	Stable	Good to fair	Stable to slightly downward	1 sheep/1.2 ha	Usually good cover of perennial grasses. Lack of shade and drought reserves a disadvantage. Receives run-on water. Subject to more scalding than Allaru and Coreena.
Undulating Brigalow						
B1 Unavale	1, 7	Stable	Good to fair	Stable to slightly downward	1 beast/5 to 8 ha developed	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Brigalow regrowth can be a problem if not properly managed. Maintain grass cover to prevent sheet and gully erosion.
B2 Mareto	1, 7	Stable	Good to fair	Stable to slightly downward	1 beast/5 to 8 ha developed	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Brigalow, sandalwood regrowth is a problem in some areas. Maintain grass cover.

Table 8.2 Production characteristics of the land systems (cont'd)

Land System	Erosion Class	Natural Stability	Condition	Productivity Reaction to Use	Conservative Grazing Capacity	Comments
B3 Marsten	1, 7	Stable	Good to fair	Stable to slightly downward	1 beast/5 to 8 ha developed	Suitable for clearing and sowing to buffel grass. Leave sufficient shade areas. Any brigalow and Dawson gum regrowth will require treatment. Maintain grass cover as this system erodes on the steeper slopes.
B4 Highlands	2, 8, 9	Unstable	Poor	Downward	1 beast/24+ ha undeveloped	High runoff. Maintain plant cover. Avoid overgrazing. Gully erosion is a major problem.
B5 Stirton	1, 7	Stable	Good	Stable	1 beast/6+ ha	Not recommended for clearing due to whipstick nature of the brigalow. Low tree density, good native grass cover already exists.
Eucalypt Woodlands						
E1 Yalleroi	1, 7	Stable	Good to fair	Stable to downward	1 sheep/1.6-2.8 ha developed	Clearing of eucalypt woodlands not recommended due to regrowth problems and levels of pasture management at this stage. Buffel grass can be introduced by sowing seed under tree canopies. Responds to light falls of rain.
E2 Woloola	2, 7	Stable	Good to fair	Stable to downward	1 beast/20-40 ha undeveloped	Clearing of eucalypt woodlands not recommended due to regrowth problems and levels of pasture management at this stage. Buffel grass can be introduced by sowing seed under tree canopies. Responds to light falls of rain. *Sheet and gully erosion occurs* on crests throughout. Maintain plant cover.
E3 Lisgool	1, 2, 7	Stable	Good to fair	Stable to slightly downward	1 beast/20-40 ha	Clearing of eucalypt woodlands not recommended due to regrowth problems and levels of pasture management at this stage. Buffel grass can be introduced by sowing seed under tree canopies. Responds to light falls of rain. Buffel grass should establish on these sandy soils under trees. Acacia seedlings can be a problem.
E4 Kelpurn	1, 2, 7	Stable	Fair	Stable	1 beast/20-40 ha	Maintain plant cover. Limited potential for buffel grass as soils too sandy and infertile. Cypress pine seedlings can be a problem. Commercial timber available.
E5 Gartmore	2, 8, 9	Slightly unstable	Fair to mediocre	Stable to downward	1 beast/20-40 ha	Erosion is a problem. Sandalwood density is naturally high and Acacia seedlings reduce productivity.
E6 Grant	1, 7	Stable	Good	Stable	1 beast/20-40 ha	Heart-leaf poison bush limits production. Extensive area of spinifex. Water supplies are limited.
E7 Busthinia	1, 7	Stable	Good	Stable	1 beast/20-40 ha	Heart-leaf poison bush occurs in some areas. Extensive areas of spinifex. Seedlings (*Acacia* spp.) problem - reduce productivity in some areas.
Wooded Downs						
T1 Mackunda	1, 7	Stable	Good to fair	Stable	1 sheep/1.2 ha	Valuable for shade and drought reserves. Adjacent to open downs.
T2 Navena	1, 7	Stable	Good to fair	Stable	1 sheep/1.2 ha	Valuable in providing shade for adjacent open downs
Alluvial Plains - Open						
A1 Mineeda	1, 2, 7	Stable	Good to mediocre	Stable to slightly downward	1 sheep/1.2 ha	Usually good cover of perennial grasses. Scalding occurs throughout. Maintain plant cover.
Alluvial Plains - Wooded						
W1 Barroo	1, 2, 7	Stable	Good to fair	Stable to slightly downward	1 sheep/1.2-2 ha	Frequently flooded. Active river bank erosion. Scalding occurs on interchannel areas. Maintain plant cover. Fodder trees present.
W2 Nive	1, 7	Stable	Good to fair	Stable	1 sheep/2.4 ha	Subject to flooding Some active bank erosion. Valuable grazing throughout. Responds quickly to rain and run-on water

Table 8.2 Production characteristics of the land systems (cont'd)

Land System	Erosion Class	Natural Stability	Condition	Productivity Reaction to Use	Conservative Grazing Capacity	Comments
W3 Ravensbourne	1, 2, 7	Stable	Good to fair	Stable to slightly downward	1 sheep/1.2-2 ha	Braided channels. Flooded. Subject to scalding. Maintain plant cover.
W4 Jordan	1, 7	Stable	Good to fair	Stable to slightly downward	1 beast/24+ ha	Occasionally flooded. Some areas are suitable for clearing. Regrowth is a problem.
W5 Fanning	1, 7	Stable	Good	Stable	1 sheep/1.2-2 ha	Subject to overflow flooding. Good grazing of perennial grass.
Sandplains						
S1 Vinetree	1, 2, 7	Stable	Fair	Stable to slightly downward	1 sheep/1.6-2 ha	Valuable fodder trees throughout. Ridgee areas are suitable for clearing and sowing to buffel grass. Woody weeds are a problem throughout. Careful pasture management is essential to maintain productivity.
Miscellaneous						
L1 Thornhill	1, 2	Stable	Mediocre	Stable	-	Seasonally inundated. Porcupine spinifex as pasture species severely limits use. Claypans.
L2 Koorangie	1, 2	Stable	Poor	Stable	-	Seasonally inundated. Grazing following inundation.

The soft mulga lands also lie in the upper catchment. Generally this land zone is in a stable condition showing few signs of deterioration. Slopes are slight (<2%) and both good shrub and ground cover exist. Sheet erosion is present to some extent. Rilling and slight gully erosion do occur and have been caused by poor siting of fences and loss of plant cover along fire breaks.

Deterioration in the eucalypt woodlands ("the desert") is confined to minor sheet erosion with some gully erosion near scarp margins. Some sheet and slight gully erosion occur throughout the "desert" and problems mainly arise when the protective plant cover is lost or reduced. Generally the "desert" may be considered stable due to the protective plant cover of unpalatable species.

Erosion in the Lower Catchments

The undulating downs are stable but accelerated erosion will occur if the soil surface is bare and high intensity rainfall experienced particularly where the soil has been disturbed by fire ploughing or tracks.

The gidgee and brigalow areas on the undulating plains are stable at least in the short term. High salt levels are encountered in the soil profile at depth and it is conceivable that salting could occur downslope under certain conditions after scrub clearing. Salt crusts already are found on the soil surface in creeks in the undulating plains. However, rainfall is low and only in very wet years would there be much likelihood of salt movement.

The most obvious form of erosion in the lower catchments consists of scald formation along local alluvia and at the base of slopes in the undulating downs. A scald refers to the flat areas with hard setting, bare surfaces resulting from wind and water erosion. Infiltration rates are low and soil conditions are generally hostile to plant establishment and growth. Very high salt levels have been found in some scald profiles.

The total area of scalds is low due to the small area of alluvia and also the fact that many of these scalds are of a seasonal nature and tend to re-vegetate after good seasons.

Wind erosion is insignificant throughout the survey area.

The effects of flood erosion are evident on major streams and tributaries with active cutting of banks occurring to some extent.

Erosion Prevention and Control

Since only a very small part of the area suffers from serious erosion, erosion prevention should be the goal if the stability of these lands is to be maintained. Management of our lands should concentrate on maintaining a vegetative cover to the soil surface. This means flexibility in stocking rates will be necessary. This concept may be difficult to realise as conflict can arise between production/income and land stability. Considering the present state of the pastoral industry, the short term goals (financial returns) may prevail.

The total area requiring reclamation in the survey area is small and changes in management practices rather than mechanical practices are seen as being more applicable. This applies especially in the dissected residuals where minimum or no grazing should be followed in areas of severe erosion.

Basic findings of research by the New South Wales Soil Conservation Service apply to this area, especially regarding scald reclamation. The basic aim here is to retain moisture on

the soil surface and increase infiltration. Jones (1966, 1967, 1969) and Newman (1966) showed that ponding of water on scalded areas is an effective reclamation technique. Mechanical measures have been tried in this area by ripping, ploughing and sowing to buffel grass. Partial or total stock exclusion would be necessary to allow for proper plant establishment on treated areas. Reclamation techniques for arid areas have been documented by Dawson and Boyland (1974).

Sound property planning and management will ensure the stability of the land resource and maintain productivity. Careful selection of areas to be cleared will lessen the likelihood of degradation.

To maintain ground cover, pasture types should be managed according to their capabilities. Adequate subdivision is necessary to give flexibility in pasture management.

The risk of erosion will also be lessened if the siting of fences, roads, watering points and yards are planned according to the features of the landscape.

The New South Wales Soil Conservation Service has calculated stocking rates for land types in New South Wales. Whilst some doubt may arise to the validity of this formula, the principles still apply i.e. early reduction of stock numbers during a drought and stock numbers kept at a "safe" level.

The future stability of the land resources depends to a large extent on conservative management practices. There is a tendency to overstock in order to overcome in part, the effects of a depressed pastoral industry. An enlightened approach by legislators is required if properties are to remain economic units and the land resources to remain intact.

PESTS

Feral Pig

Feral pigs originating from accidental and deliberate release of domestic stock have become a serious menace, causing damage to crops, fencing, watering facilities, stock and native fauna (Pullar, 1953). Their widespread distribution has resulted from their ability to utilize an extremely varied food supply.

Mange, ticks, lice, kidney worm, anthrax and tuberculosis are diseases and parasites recorded in pigs under natural conditions (Pullar, 1950). Wild pigs are in frequent contact with stock and could spread exotic diseases if exotic diseases entered the country. Feral pigs have no economic value.

They can be controlled by shooting, poisoning and trapping. The bounty of 20 cents per pig ceased to operate in June 1976.

Bounties paid in the 4 shires between 1962/63 - 1975/76 are shown in Table 8.3.

Control of feral pigs by poisoning relies on a successful baiting programme.

The principles behind a baiting programme are:-

(1) simultaneous baiting, plus follow up campaigns, which require maximum landholder participation in contiguous areas.

(2) baiting of short, intense duration to minimize damage to rural industries and take advantage of climatic conditions and the vermin's biology.

Table 8.3. Bonuses paid annually for pigs/dingoes over the last 14 years for each Shire.

Year	Blackall		Jericho		Murweh		Tambo	
	Pigs	Dingoes	Pigs	Dingoes	Pigs	Dingoes	Pigs	Dingoes
	$	$	$	$	$	$	$	$
1962/63	870.20	260	105.80	1716	587.80	972	262.60	376
1963/64	947.80	174	81.20	2178	485.20	1238	210.60	290
1964/65	846.60	66	122.20	2230	445.20	1300	151.60	262
1965/66	461.00	186	102.20	2308	207.00	1868	174.80	290
1966/67	268.60	124	71.40	1968	82.00	1772	47.60	392
1967/68	563.60	138	76.60	1186	64.80	1156	93.40	256
1968/69	733.40	80	99.20	1008	174.40	1118	84.20	262
1969/70	479.40	18	124.80	1096	254.20	790	166.20	132
1970/71	354.20	54	55.80	974	237.60	410	207.40	252
1971/72	660.80	10	61.10	1042	244.40	158	615.60	218
1972/73	834.80	48	105.20	476	472.00	158	371.00	28
1973/74	654.20	32	21.00	250	350.80	108	425.00	20
1974/75	1206.40	-	29.60	118	822.20	42	691.40	6
1975/76	1041.80	58	85.20	342	818.20	122	399.20	8

Poisoning with 1080 (Sodium fluoroacetate) has gained widespread acceptance, with meat baits containing 80 mg. 1080 per 250 g. of meat being the recommended dose.

Trapping is efficient in terms of time and energy, but trapping is not widely used, due to the difficulties of trap design and cost, selection and cost of baits and location of traps.

Electric fences are gaining acceptance in some areas, notably grain areas. Fences could be used in conjunction with 1080 to restrict their movements and limit damage from animals that have escaped or recovered from a poisoning programme. Fences would also lessen the time in the collection of poisoned carcasses and limit the area denied to stock and working dogs.

Termites

Several genera of termites are represented in south-western Queensland. Two termite species construct compact nests at or just below the soil surface in south-western Queensland. These nests may be exposed by erosion. Plant growth and water penetration in these exposed areas is impeded for many years (Watson and Gay, 1970).

Termites invert the soil profile but plant nutrients in the colony are unavailable until the colonies die and the mounds eroded (Anon. 1971).

Disturbance and loss of mulga leads to an increase in grass growth, which results in an increase in insect populations (Watson *et al.* 1973). During periods of low rainfall when plant productivity falls to low levels, the combined grazing pressure of stock and termites leads to lasting denudation and erosion. If mulga remains, termites gather leaf litter, easing the grazing pressure on grasses.

Locusts *(Chortoicetes terminifera)*

The Australian plague locust, *Chortoicetes terminifera*, has a high potential for a rapid increase in numbers, in western Queensland. Depending on climatic conditions, swarming populations usually have two generations per year, with a 35-50 fold increase in one generation.

Swarming originates in well defined outbreak centres, characterized by a food-shelter and an oviposition habitat. Active locust stages accumulate in a food-shelter habitat, which consists of a patchwork of tall tussocky vegetation and low cover, frequently on heavy self-mulching soils. Bare ground, low vegetation cover and lighter soils, characterise areas of concentrated layering (Clark, 1947).

Food, temperature and wind influence movements. *C. terminifera* shows a preference for green, succulent grasses for food. Sudden changes in distribution and population densities occur after storms, indicating a requirement for high humidity for sustained flights. For this reason, flights often occur on nights after storms, provided a threshold temperature of 21^{o}C is reached (Clark, 1968, Clark *et al.* 1969).

Predators and parasites have little effect on insect populations when they are in plague proportions.

Corvus spp.

Five *Corvus* species occur in Australia. Of these, two crows and three ravens are opportune scavengers, often scavenging on afterbirth and other carrion waste in lambing paddocks. Rowley (1969) suggests that few healthy lambs are

killed by corvids, but many sick, weak and deserted lambs are in a condition predisposing them to serious attack. Mis-management and not predation is often the real cause of mortality to lambs.

Infection by *Clostridium* from peck wounds may be responsible for mortalities (Rowley, 1970, Smith, 1965). Dennis (1967) and Watson *et al.* (1967) suggest that the raven may transmit Ovine vibriosis between flocks and possibly between seasons.

Methods of control of *Corvus* spp. are:- shooting, blasting of roosts, scaring, trapping and poisoning.

Kangaroos

The three large macropods (the red, grey kangaroos and the wallaroo) have responded successfully to man's presence. Graziers have improved watering facilities, cleared the timber and encouraged grass growth, thus improving the habitat for large kangaroos (Wilson, 1974). They were considered a pest prior to 1971. Bounties were paid for scalps until 1946. A marsupial skin industry evolved with an estimated annual harvest of approximately 350 000 for the 30 years prior to 1950.

Kangaroos were taken off the list of pest fauna with a proclamation of the *"Fauna Conservation Act of 1950"* which initiated a policy of controlled harvesting, based on populations. By 1965,35% was harvested for both pet meat and skins (Kirkpatrick and McDougal, 1971, Livanes, 1971). The total harvest from 1961 to 1965 was approximately four million.

In late 1967, a field survey into kangaroo populations was undertaken. Restrictive measures were initiated to offset a 10% drop in adult numbers and a discernible increase in sub-adults taken in some areas. To regulate the harvest, a control on the number of chillers came into being (Kirkpatrick and McDougal, 1971).

The *"Fauna Conservation Act of 1974"* established permit fees of $25 and the issuing of tags to licensed shooters. The Act controls the number of premises suitable for chilled carcasses in all local authority areas. The legislation ensures kangaroo survival but permits commercial harvesting by declaring an open season on species with a recognised pest potential. A monitoring programme involving the collection and analysis of data on harvest size, distribution patterns and age composition controls the harvest (Kirkpatrick, 1974).

Studies by Griffith and Barker (1966) and Griffiths *et al.* (1974) showed grey kangaroos and sheep in a mulga-box community in south west Queensland had different specific food preferences at any one time. In drought, different plants were selected despite the reduced number of plant species available. Kangaroos preferred grasses while sheep preferred forbs.

Wedge Tailed Eagle *(Aquila audax)*

The diet of the wedge tailed eagle includes rabbits, young macropods, reptiles, birds, carrion, foxes and feral cats. However, kangaroos and lizards constitute the main diet in areas lacking rabbits.

Studies by Morris and Fox (1971) on the eating habits of the eagle indicate 55% of total prey species are exotic animals e.g. rabbits, foxes, lambs and cats. Predation of lambs by eagles is of minor significance. Of the 7% of lamb in the diet, Leopold and Wolfe (1969) suggest that half, and perhaps more, represents carrion.

The wedge tailed eagle is now protected.

Sawfly *(Platypsectra interrupta)*

Sawfly poisoning in cattle is confined mainly to the western slopes on the Great Dividing Range. The fly lays eggs on the leaves of eucalyptus trees, mainly silver-leaved ironbark. The larvae mature in late autumn and descend to the base of the tree where the cattle eat and acquire a taste for dead and decomposing larvae (Hungerford, 1975).

To avoid poisoning, cattle should be shifted from affected areas during these periods.

Fox *(Vulpes vulpes)*

Foxes are opportunist predators and scavengers utilizing carrion and afterbirth that is easily obtained in lambing paddocks (Rowley, 1970 and Alexander *et al*. 1967). Most deaths attributed to foxes are due to individual rogue killers. In a study in South Australia by Moore *et al*. (1966), 3% of lamb mortalities was attributed to primary predation by foxes.

Dingo *(Canis familiaris dingo)*

The dingo is a serious menace in sheep areas and can cause heavy stock losses. It has been trapped, shot, poisoned and areas fenced off to reduce these losses (Hardew, 1971). Baiting with 1080 (Sodium fluoroacetate) has gained wide acceptance, however, regular baiting is required to keep numbers down. Aerial baiting is practised using meat baits with a dose rate of 5 mg. 1080 per 250 g. of meat.

There has been a general reduction in bounties paid in the four shires over the 14 years 1962/63 to 1975/76. (See Table 8.3).

POSSIBLE AGRICULTURAL DEVELOPMENT

Pasture development of the undulating gidgee and undulating brigalow areas (scrubs) was minimal prior to World War II, due to the unavailability of suitable machinery. Clearing of these scrubs gained momentum in the post War period and continued until the collapse of the beef market in the early 1970s. With the dramatic fall in beef prices, the financial incentive for scrub clearing and pasture improvement was lost. Cleared scrubs were burnt and sown, almost exclusively to buffel grass. Aspects of development of these gidgee and brigalow lands have been reported by Bisset (1963), Purcell (1965) and Johnson (1964, 1968).

Buffel grass has also been successfully established on the sandplain country (Vinetree land system) and parts of the "desert". A programme of plant introduction and species evaluation has been initiated by the Agriculture Branch of this Department. In 1976 a programme of species evaluation was established by CSIRO. The plots are sited on the red earth soils of the Yalleroi sandplain. To date no new pasture species have been recommended for release in this area. Nutrient levels are the main limiting factors to successful pasture establishment in the desert. (See Soils Section).

Crops

Dryland cropping is a purely opportunistic venture. As available soil moisture is the main limitation to crop growth, cropping is necessarily confined to the grey and brown cracking clays. Cropping for grain and fodder crops is mainly centred on Augathella which enjoys a higher incidence of winter rainfall than the Blackall area.

Pressland and Batianoff (1976) in a study of soil moisture accretion during fallow in the Tambo-Augathella area, concluded that 2 or 3 cultivations decreased loss of soil water, through the transpiration of weeds and should increase the number of years a forage crop can be expected. They also recommended the first cultivation for winter crops to be following significant rain (>50 mm) in mid November-early January and once or twice again following subsequent rain in February-March.

Soil fertility is high in comparison to other soils of the area but low in relation to the cropping areas farther east e.g. Darling Downs. Applications of fertilizer and soil conservation measures would be required to maintain productivity. Crops should be securely fenced as damage by pigs and emus can be extensive.

Irrigation

Small areas have been irrigated in the past but rising costs and a fall in income has led to a cessation of these activities. Irrigation requires a high labour input. The establishment of an irrigation programme would place a severe strain upon an already depleted work force as the recent reduction in the rural work force has meant that most of the property work falls upon the basic family unit.

Large scale irrigation schemes are not possible due to a lack of suitable sites for dams. Private or on-property schemes are certainly feasible and would have to rely on the storage of surface runoff or local aquifers since the use of artesian water is restricted to domestic and stock purposes.

Irrigation research is centred at Richmond where runoff water is temporarily stored in a large but shallow dam before being used to irrigate short season summer crops. The ponded area of the shallow storage is also used to grow forage crops as the water line recedes (Weston, 1972).

Results are encouraging. Irrigated grain sorghum yields range up to 4000kg ha^{-1} depending on rainfall and irrigation strategy. Yields have not increased with application of nitrogen, phosphorus and sulphur fertilizers. However, continual cropping in the ponded area has shown a marked reduction in yield. This is attributed to an increase in soil bulk density limiting moisture storage and a decrease in available soil nitrogen (J.F. Clewett, 1977, personal communication).

The zero response of irrigated grain sorghum to nitrogen fertilizer conflicts with chemical analyses of downs soils in this survey and with those at the Richmond project. Chemical analyses show adequate levels of all nutrients except nitrogen which is generally low.

The soils of the sandplains and tableland country, although infertile, are physically suitable for horticultural crops. These areas include the sandplain adjacent to alluvia (Vinetree land system) and the desert (Grant, Busthinia, Yalleroi, Wololla land systems). These soils are porous; possess good infiltration rates; are well drained and are responsive to small inputs of moisture. Citrus and vegetable crops are already successfully grown along the sandplain. The disease risk from excess moisture is much less than on the coast. As these soils are infertile, fertilizer applications would be necessary.

Tourism and Recreation

Tourism and recreation are being developed and promoted to a large extent in the Augathella, Tambo, Blackall and Jericho districts. Access is good with Augathella, Tambo and Blackall being located on the Landsborough Highway, the main road from the south-east of the State to Longreach and Mount Isa. Jericho is on the Capricornia Highway.

The district provides a wide range of interests and activities and has a number of historical buildings and monuments. Approximately 65 km east of Blackall, a spring marks a resting and watering point for the Cobb and Co. mail run from Jericho to Tambo.

Blackall was selected as the site for the first artesian bore in Queensland. Drilling of the "Pioneer bore" commenced in 1885. Two operating artesian bores supply Blackall with water at a temperature of 60°C. The "Pigurra" bore and the wool scour bore are two flowing bores near Blackall. The wool scour is the only operational scour in Queensland outside Ipswich.

Tambo Station, Mt. Enniskillen, Landsdowne, Elizabeth Creek (Minnie Downs) and Greendale properties were established in the Tambo district soon after the first settlers arrived in 1862. Minnie Downs was the earliest stud property established in the west and Northampton Downs was the first property to install machine shears this being in the 1920s.

The original Tambo post office, built in 1866, is located in the town's main street. A timber slab hut, believed to have been an outstation on Terrick as early as 1880, has been reconstructed in Blackall. Jackie Howe's record of 321 sheep shorn in one day, with hand blades, at "Alice Downs" station in 1892, is also of historical significance to Blackall.

The district has a number of natural scenic attractions such as the rugged valleys, gorges, scarps and waterholes of the Great Dividing Range. These include the Mt. Edinburgh Gorge water-hole, "Boss's Gorge" on "Gilford", the springs at "Tralee" and the Yalleroi springs near "Valparaiso". The Tambo-Springsure road encounters a gorge on the east side of the range. Scenic scarps over 100 m in height are common but most are inaccessible.

On the "Alice Tableland" to the north of Blackall, species of wild flowers bloom after winter rains.

Many aboriginal archaeological sites occur especially in areas displaying sandstone cliffs. These include drawings near "Cutchie" springs and the "Blacks Palace" also used as a burial site. Other sites exist but must be protected from any damage which may occur from uncontrolled visitors.

The waterholes of the Barcoo River provide fishing for "yellow belly". Shooting for wild pigs, goats and foxes is good in some areas. Permission to shoot on properties and the possession of a permit is required for kangaroo shooting. Most native birds, reptiles and native mammals are protected.

Many properties have the potential to cater for tourists. The station can provide people with a variety of interests relating to property management.

Generally, the towns provide good facilities for the traveller with reasonable hotel and motel accommodation, camping and caravan parks. The enthusiast must be reasonably self sufficient in remote areas.

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LIST OF ABBREVIATIONS, SYMBOLS, RATING AND TERMS*

A.D. Moist - Air dried moisture (see Appendix II)
Av. H_2O - Available water (see Appendix II)
A.P. - Acid extractable P (see Appendix II)
A.W.C. - Available soil water capacity. The difference between equilibrium moisture contents at suctions of 0.33 bar and 15 bar

Available Water Rating - Available water %

>16	Very high
13-16	High
9-12	Medium
5-8	Low
<5	Very low

Biomass - Total weight of aerial and underground organs of a plant
B.P. - Bicarbonate extractable P (see Appendix II)
C - Organic carbon (see Appendix II)
Ca - Calcium
$CaCO_3$ - Calcium carbonate, lime (see Appendix II)
C.E.C. - Cation exchange capacity (see Appendix II)
Cl - Chloride (see Appendix II)
Claypan - Areas (sometimes scalded) with hard, massive, surface soil which are predominantly clayey
C/N - Ratio of % organic carbon to % total nitrogen
Condition - The character of the vegetal cover and the soil under man's use, in relation to its potential

Condition Classes -

Condition	Description
Excellent	No erosion. Few or no bare spaces. General ground cover greater than 50 per cent. Very high proportion of valuable pasture species.
Very good	No erosion. Some bare spaces. General ground cover greater than 30 per cent. High proportion of valuable pasture species.
Good	Occasional minor sheeting by wind or water erosion with some bare spaces - (10 to 30 per cent). General ground cover 20-30 per cent. Moderate to high proportion of valuable pasture species.
Fair	Some minor sheeting by wind or water erosion with some rilling and gullying - frequent bare spaces (30-50 per cent). General ground cover 10-20 per cent. Moderate proportion of valuable pasture species.
Mediocre	Frequent moderate sheeting by wind or water erosion (50-60 per cent bare space) with moderate rilling and gullying. General ground cover 5-10 per cent. Moderate to low proportion of valuable pasture species.
Poor	Frequent moderate and severe sheeting by wind or water erosion (60-70 per cent bare spaces) with severe rilling and gullying throughout. General ground cover less than 5 per cent. Low proportion of valuable pasture species.
Very poor	Extensive moderate and severe sheeting by wind or water, or scalding (70-90 per cent bare space) with extensive moderate and severe rilling and gullying, especially on drainage lines and flats.

* This is not a complete list of terms but rather a list of terms used which are not adequately defined in the concise Oxford Dictionary.

Edaphic	-	Conditions of the plant environment that are determined by the physical, chemical and biological characteristics of the soil
E.C.	-	Electrical conductivity mS/cm (see Appendix II).

Erosion Class -

Class 1	Little or no erosion
2	Wind erosion - scalding with little or no drift
3	Wind erosion or scalding with moderate or plentiful drift
4	Wind erosion - wind sheeting with little drift
5	Wind erosion - wind sheeting with moderate to plentiful drift
6	Wind erosion - drift and dune activation
7	Water erosion - sheet erosion with or without associated rilling and gullying
8	Water erosion - gully erosion with or without associated sheet erosion
9	Water erosion - gullying and sheet erosion and lower slopes of steep rocky hills and ranges
10	Special class - sandhill - claypan complex
11	Special class - sloping scalds
12	Special class - scalding and hummocking

E.S.P.	-	Exchangeable sodium percentage. Ratio of exchangeable sodium to cation exchangeable capacity expressed as %
Ex	-	Exchangeable
Ferricrete	-	A ferruginous natural material formed in a zone of iron oxide or hydroxide accumulation in the earth's crust
Floristics	-	The kinds of species included in a community or a region
Fluctuating climax	-	A term used to denote a condition which appears relatively stable but which in reality is in a state of unstable equilibrium
Forb	-	Herbs other than grass like plants and ferns
F.S.	-	Fine sand
G.C.	-	Grazing Capacity
Gilgai	-	Small scale surface undulations, the alternate hummocks and hollows of which show some degree of regularity
Grove	-	Clumps of trees or shrubs roughly aligned with the contour forming a banded pattern
Ht	-	Height
K	-	Potassium
K (Total)	-	Potassium (Total) xray fluorescence. See Appendix II.
K Rating	-	Exchangeable K, m equiv/100 g soil

m equiv per 100 g	Rating
<.15	Very low
.15-.24	Low
.25-.34	Fair
.35-.54	Very fair
>.55	High

Crack and Isbell (1970) use value of 0.2 m equiv/100 g ex.K as critical deficiency level.

Land system	-	An area or group of areas throughout which there is a recurring pattern of topography soils and vegetation.
Land unit	-	A group of related sites associated with a particular landform within a land system and wherever the land unit recurs it has the same sites and similar, within defined limits, soils, vegetation and topography.

Land zone - A broad grouping of land systems based on similarity of physiography, soils, vegetation and geomorphology.

Mantled pediment - Gently undulating to undulating bedrock plains sloping away from adjacent hills which carry a veneer of transported detritus the thickness of which varies from place to place.

m equiv/100 g - milli equivalents per 100 grams

Mesic - Moist

Mg - Magnesium

N - Nitrogen (see Appendix II)

Nitrogen Ratings -

Rating	% Total N
Very low	<0.05%
Low	0.05-0.09
Fair	0.10-0.14
Very fair	0.15-0.24

Na or Na+ - Sodium

Org C - Organic carbon

P - Phosphorus
Phosphorus (acid extraction N/100 H_2SO_4).
See Appendix II
Phosphorus (bicarbonate extraction).
See Appendix II
Phosphorus (Total) X-ray fluorescence

Phosphorus Ratings -

Acid Extraction		Bicarbonate Extraction	
<11	Very low	<11	Very low
11-20	Low	11-20	Low
21-35	Fair	21-30	Fair
36-45	Very fair	31-40	Very fair
46-100	High	>40	High

PFC - Projective foliage cover

pH Ratings -

Rating	pH
Extremely acid	<4.5
V. strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Med. acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Mildly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
V. strongly alkaline	>9.0

PPF - Principal profile form (Northcote, 1971)

RP - Representative profile

Run-on area - An area which benefits from runoff water either by the water lying for a period or by water moving over the area.

Saline - Northcote and Skene (1972)
Saline subsoil - >0.3% NaCl or >0.18% Cl.

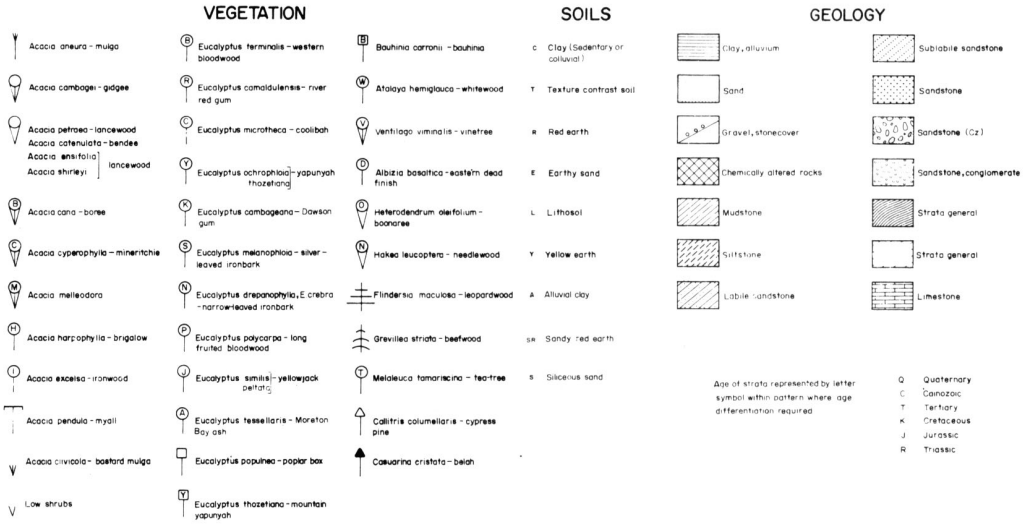
Salinity Ratings

Rating	E.C.	% Cl
Very low	<0.015	0.01
Low	0.16-0.45	0.01-0.03
Medium	0.46-0.90	0.04-0.06
High	0.91-2.0	0.07-0.20
Very high	>2.0	

Saltpan - The term has been applied to soils with loose, puffy surface soil containing visible salt crystals. They commonly have a surface crust which is easily broken.

Sandplain	-	Gently undulating to flat plains with well sorted fine to medium quality sand with reddish coating of iron oxides with increasing clay admixtures in sub-surface horizons. Little if any dune development.
Scald	-	Those areas which are bare because of wind and water erosion.
Si	-	Silt
Silcrete	-	A siliceous natural material formed in a zone of silica accumulation in the earth's crust.
SMU	-	Soil mapping unit
Sodic	-	Northcote and Skene (1972) sodic - E.S.P. 6-14 strongly sodic - E.S.P. >14
Species diversity	-	An indication of the richness and evenness of the flora of a particular region.

SYMBOLS



SOIL ANALYTICAL METHODS

by C.R. Ahern

SAMPLE PREPARATION

All samples were dried at 40°C in a forced air draught. Gravel was sieved out using a 2 mm sieve, while samples not containing gravel were ground to less than 2 mm. All determinations were carried out using the less than 2 mm soil fraction. All results are reported on an air dry basis except where indicated.

PARTICLE SIZE DISTRIBUTION

Particle size distributions were determined by a modification of the hydrometer method of Piper (1942). The modifications were that the soils were dispersed with sodium hexametaphosphate and sodium hydroxide and samples high in gypsum were sieved with 0.2 mm sieve after an initial boiling treatment prior to an acid treatment. Results are reported on an oven dry basis.

With soils containing carbonate, the sum of particle sizes may be less than 100% where acid treatment was used.

ELECTRICAL CONDUCTIVITY

A 1:5 soil:deionized water suspension was shaken for an hour and the electrical conductivity (E.C.) was measured at 25°C.

A 1:50 soil:water suspension was generally used on soils with E.C. greater than 1 mS/cm, particularly if gypsum was suspected of being present.

Soluble salts can be estimated approximately from electrical conductivity readings by using the factor of Piper (1942).

% T.S.S. = E.C. mS/cm x 0.336 at 25°C.

pH

After determination of electrical conductivity, the pH of the same 1:5 suspension was measured with a glass electrode and saturated calomel reference electrode.

CHLORIDES

After conductivity and pH readings were complete, potassium alum was added to the 1:5 soil water suspension. Chlorides were determined on the stirred suspension with a specific ion electrode (Haydon, Williams and Ahern, 1974).

CALCIUM CARBONATE

Calcium carbonate was determined on all samples which effervesced in HCl. The acid neutralization method described by U.S. Salinity Laboratory Staff (1954) was used. Results obtained by this method may be somewhat high, because soil constituents other than lime may react with the acid.

ORGANIC CARBON

The wet oxidation method of Walkley and Black (1934) was used on a finely ground sample. The reduced chromic ion (Cr^{+++}) was read colorimetrically (Sims and Haby, 1971). Results reported are uncorrected Walkley and Black values.

TOTAL NITROGEN

The sample was finely ground. Selenium catalyst was used in a semi-micro Kjeldahl digestion. An Auto Analyser system was used for estimation of ammonium in the digests.

EXTRACTABLE PHOSPHORUS

Acid Extractable P (0.01 N H_2SO_4) was determined by the Kerr and von Stieglitz (1938) method. Readings were carried out using an Auto Analyser technique.

Bicarbonate Extractable P (0.5 M Na HCO_3 adjusted to pH 8.5), was determined by the Colwell (1963) method.

TOTAL PHOSPHORUS, TOTAL POTASSIUM, TOTAL SULPHUR

About 3 g of soil sample were very finely ground and pelleted with boric acid. The pellet was then exposed to a beam of X-rays in a Phillips 1410 vacuum X-ray spectrograph. Simple linear calibration was used to obtain percentage phosphorus, potassium and sulphur from fluorescent intensities.

EXCHANGEABLE CATIONS

A method similar to that of Loveday (1974) was used.

After pre-washing with 60% ethanol, exchangeable cations were removed with 1N NH_4 Cl at pH 8.5 in 60% ethanol. Absorbed ammonium was removed with 1N sodium sulphate.

Ammonium and chloride in the sodium sulphate leachate were determined on an auto analyser using colorimetric methods similar to those described by Loveday (1974). The difference in milli-equivalents was reported as the cation exchange capacity (CEC).

Measurements for soil with low CEC are not as precise as those for soils of high CEC. Calculated ratios such as CEC/clay may have considerable error when CEC is low, particularly if clay percentage is also low.

Exchangeable calcium may be slightly inflated on soils containing gypsum.

REPLACEABLE POTASSIUM

The method used was described by von Stieglitz (1953). Five g of soil were shaken for 4 hours in 200 ml of 0.05M hydrochloric acid. The suspension was then centrifuged and potassium concentration determined by flame photometer.

MOISTURE CHARACTERISTICS

Moisture percentage at matric potentials of -0.33 and -15 bar was determined on samples ground to less than 2 mm. A pressure plate apparatus of Soil Moisture Equipment Co. of California was used. Results are reported on an oven dry basis.

"Available soil water capacity" was approximated by the difference between these two laboratory measurements.

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PLANT SPECIES LIST

by G.R. Beeston

Two species lists have been prepared. The first a scientific name - common name list covers all species identified in the area during the study. An assessment of toxicity and palatability together with distribution is also given for each species, where possible. The second lists the common name and equivalent scientific name for selected species.

A. Species, species distribution, toxicity, palatability and common name

The families are arranged alphabetically and the genera are listed alphabetically within the family and the species alphabetically within the genus.

The presence of species in the various land zones are indicated by x.

Land zones are represented by the columns as indicated:-

1	Soft Mulga Lands	7	Timbered Downs
2	Hard Mulga Lands	8	Alluvial Plains - Woodlands
3	Dissected Residuals	9	Alluvial Plains - Open
4	Undulating Gidgee	10	Sandplain
5	Undulating Brigalow	11	Eucalypt Woodlands
6	Undulating Downs	12	Miscellaneous

Each species has been rated according to its palatability and toxicity. Palatability varies and may be dependent on the stage of growth of the plant, the composition of the pasture, the availability of more palatable species and the type of animal. The following abbreviations are used for the three classes of palatability:

H-high M-medium L-low or unknown * - in the drying off state.

Toxicity of the various species to animals are indicated as follows:

T-shown to be toxic by feeding trials.
C-known to contain toxins but has not been implicated in field cases of poisoning.
S-suspected on strong field evidence.
U-the plant is not known to be toxic and has not been suspected on reliable field evidence.
*-toxic when it is the only component of the diet.

NOTE: Plants known to be toxic are not always dangerous and may be useful components of the pasture, refer Poisonous Plants section.

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
ACANTHACEAE															
DIPTERACANTHUS PRIMULACEUS				X											
JUSTICIA PROCUMBENS				X			X		X			X	L	S	
AIZOACEAE															
TRIANTHEMA PORTULACASTRUM				X									L	S/C	BLACK PIGWEED
TRIANTHEMA TRIQUETRA				X	X	X	X	X	X				*M	T	RED SPINACH
ZALEYA GALERICULATA						X							L	S	HOGWEED
AMARANTHACEAE															
ACHYRANTHES ASPERA					X										CHAFF-FLOWER
ALTERNANTHERA DENTICULATA		X				X			X				L	S	LESSER JOYWEED
ALTERNANTHERA NODIFLORA						X		X					L	S	COMMON JOYWEED
ALTERNANTHERA PUNGENS								X					L	S	KHAKI-WEED
AMARANTHUS MITCHELLII				X	X	X	X						*H	T	BOGGABRI
GOMPHRENA CELOSIOIDES								X					L	T	GOMPHRENA WEED
PTILOTUS EXALTATUS				X	X								M	U	FOX BRUSH OR PRINCE-OF-WALES FEATHERS
PTILOTUS EXALTATUS VAR. BIPINNATUS				X											PRINCE-OF-WALES FEATHERS
PTILOTUS EXALTATUS VAR. SEMILANATUS															PRINCE-OF-WALES FEATHERS
PTILOTUS OBOVATUS							X						M	U	
PTILOTUS OBOVATUS VAR. PARVIFLORUS			X												
PTILOTUS POLYSTACHYUS										X			M	U	FOX BRUSH OR PUSSY TAILS
AMARYLLIDACEAE															
CALOSTEMMA LUTEUM								X	X						WILD DAFFODIL
APOCYNACEAE															
ALSTONIA CONSTRICTA			X	X	X			X		X	X		M	T	BITTER BARK
CARISSA OVATA	X	X	X	X	X	X		X		X	X		H		CURRANT BUSH OR BLACKBERRY
CARISSA LANCEOLATA											X		H		CONKER BERRY OR BOORUM BUSH
CERBERA SP.	X														
PARSONSIA EUCALYPTOPHYLLA					X								H	U/S	GARGALOO
ASCLEPIADACEAE															
SARCOSTEMMA AUSTRALE			X										M	T	CAUSTIC-VINE
BIGNONIACEAE															
PANDOREA DORATOXYLON			X										L	U	WONGA VINE
PANDOREA PANDORANA			X												WONGA VINE
BORAGINACEAE															
HELIOTROPIUM STRIGOSUM	X												L	U	
HELIOTROPIUM TENUIFOLIUM											X		L	U	
CACTACEAE															
OPUNTIA INERMIS					X	X	X	X		X			L	U	COMMON PRICKLY PEAR
OPUNTIA TOMENTOSA					X	X		X					L	U	VELVETY TREE PEAR
CAMPANULACEAE															
WAHLENBERGIA SP.							X	X		X	X				AUSTRALIAN BLUEBELL
CAPPARIDACEAE															
APOPHYLLUM ANOMALUM			X	X	X	X	X	X		X	X		H	U	BROOM BUSH
CAPPARIS LASIANTHA			X	X	X	X	X	X		X	X		H	U	NIPAN OR SPLIT JACK
CAPPARIS LORANTHIFOLIA				X									M	U	NARROW-LEAF BUMBLE
CAPPARIS MITCHELLII								X		X			H	U	BUMBLE OR WILD ORANGE
CAPPARIS SPINOSA VAR. NUMMULARIA								X	X				H	U	FLINDERS ROSE
CARYOPHYLLACEAE															
POLYCARPAEA BREVIFLORA											X		L	U	
CASUARINACEAE															
CASUARINA CRISTATA					X								H/M	U	BELAH
CASUARINA CUNNINGHAMIANA					X			X							RIVER OAK
CASUARINA INOPHLOIA			X												THREADY-BARK OAK
CASUARINA LUEHMANNII											X		M	U	BULL OAK
CELASTRACEAE															
DENHAMIA OBSCURA	X									X	X				
MAYTENUS CUNNINGHAMII			X					X			X				
CHENOPODIACEAE															
ATRIPLEX ELACHOPHYLLA						X							M	U	A SALTBUSH
ATRIPLEX MUELLERI				X		X	X	X	X				*H	T	ANNUAL SALTBUSH
ATRIPLEX SEMIBACCATA							X	X	X				M	U	CREEPING SALTBUSH
ATRIPLEX VESICARIA					X										BLADDER SALTBUSH
BASSIA ANISACANTHOIDES				X	X	X			X				H	C	YELLOW BURR
BASSIA BICORNIS								X					L	U	GOATHEAD BURR
BASSIA BIRCHII	X			X	X	X	X				X		L	U	GALVANIZED BURR
BASSIA CALCARATA				X		X		X	X	X			H	C	RED BURR
BASSIA CONVEXULA											X		M	U	COPPER BURR
BASSIA CORNISHIANA				X	X						X		L	U	CARTWHEEL BURR
BASSIA DIVARICATA					X								L	U	COPPER BURR
BASSIA LANICUSPIS										X			L	U	WOOLLY SPINED BURR
BASSIA PARADOXA											X		M	U	CURIOUS SALTBUSH
BASSIA QUINQUECUSPIS				X	X	X	X	X	X	X			L	S/U	PRICKLY OR BLACK ROLY-POLY
BASSIA TETRACUSPIS						X	X		X				L	U	BRIGALOW OR DOG BURR
BASSIA TRICUSPIS				X	X								L	U	GIANT RED BURR
BASSIA VENTRICOSA				X	X	X	X			X			L	U	

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
CHENOPODIUM RHADINOSTACHYUM	X												M	C	GREEN CRUMBWEED
CHENOPODIUM TRIGONON			X										M	U	FISH-WEED
ENCHYLAENA TOMENTOSA		X	X	X	X		X		X				M	C	RUBY SALTBUSH
MAIREANA CORONATA					X			X					M	X	
MAIREANA TOMENTOSA	X			X											
MAIREANA VILLOSA				X					X				L	U	A COTTON BUSH
RHAGODIA LINIFOLIA			X	X											
RHAGODIA NUTANS			X		X								M	U	CLIMBING SALTBUSH
RHAGODIA PARABOLICA			X	X					X				M	U	
RHAGODIA SPINESCENS			X		X								M	U	A BERRY SALTBUSH
SALSOLA KALI	X		X	X	X	X	X	X	X				H/M	T	SOFT ROLY-POLY
THRELKELDIA PROCERIFLORA					X								M	T	SODA BUSH
CLEOMACEAE															
CLEOME VISCOSA			X		X		X						L	U	TICK-WEED
COCHLOSPERMACEAE															
COCHLOSPERMUM RETICULATUM										X					
COMMELINACEAE															
COMMELINA CYANEA			X										H	U	SCURVY-WEED OR WANDERING JEW
COMPOSITAE															
BRACHYSCOME CILIARIS				X									H	U	NATIVE DAISY
CALOTIS HISPIDULA							X						H	U	BOGAN-FLEA OR BINDY-EYE
CASSINIA LAEVIS										X				S	WILD ROSEMARY OR COUGH BUSH
CENTIPEDA THESPIDIOIDES							X						L	U	DESERT SNEEZEWEED
FLAVERIA AUSTRALASICA				X	X										SPEEDY WEED
GLOSSOGYNE TENUIFOLIA		X		X		X	X						M	U	NATIVE COBBLER'S PEG
HELICHRYSUM RAMOSISSIMUM										X			H	U	YELLOW BUTTONS
HELICHRYSUM SEMIAMPLEXICAULE		X					X		X	X			M	U	
HELIPTERUM FLORIBUNDUM						X							M	U	PAPER DAISY
MINURIA INTEGERRIMA							X						M	U	SMOOTH MINURIA
OLEARIA SUBSPICATA										X			L	U	TURKEY BUSH
PTERIGERON ADSCENDENS					X								H	U	
PTEROCAULON SPHACELATUM							X			X			L	U	A RAGWEED
RUTIDOSIS LEUCANTHA		X								X				U	
SONCHUS OLERACEUS					X										
VERONIA CINEREA							X			X					VERONIA
VITTADINIA TRILOBA						X							M	S	FUZZWEED
XANTHIUM CHINENSIS					X								L	T	NOOGOORA BURR
XANTHIUM SPINOSUM					X								L	T	BATHURST BURR
CONVOLVULACEAE															
BONAMIA MEDIA										X			M	U	
CONVOLVULUS ERUBESCENS		X			X		X		X	X			H	U	AUSTRALIAN BINDWEED
EVOLVULUS ALSINOIDES	X			X	X	X			X	X			H	U	
IPOMOEA LONCHOPHYLLA					X								H	C	COW VINE
POLYMERIA MARGINATA				X	X		X	X	X				L	U	
CRUCIFERAE															
LEPIDIUM ROTUNDUM	X												H	U	A PEPPERCRESS
STENOPETALUM NUTANS										X			H	U	
CUCURBITACEAE															
CUCUMIS MYRIOCARPUS					X								L	T	PRICKLY PADDY MELON
MUKIA MADERASPATANA					X								M	U	
CUPRESSACEAE															
CALLITRIS COLUMELLARIS		X					X			X			M	U	CYPRESS PINE
CUSCUTACEAE															
CUSCUTA AUSTRALIS			X				X	X							AUSTRALIAN DODDER
CYPERACEAE															
BULBOSTYLIS BARBATA										X	X		L	U	A SEDGE
CYPERUS BETCHEI	X														
CYPERUS BIFAX			X	X	X	X	X	X					H	U	DOWNS NUT-GRASS
CYPERUS BREVIBRASTEATUS		X													
CYPERUS DIFFORMIS							X	X					L	U	
CYPERUS EXALTATUS							X	X					L	U	
CYPERUS FULVUS										X			M	U	
CYPERUS GILESII				X			X				X		L	U	
CYPERUS GRACILIS		X		X			X								SLENDER SEDGE OR WHISKER GRASS
CYPERUS IRIA							X	X					L	U	
CYPERUS LEIOCAULON		X													
CYPERUS SUBPINNATUS										X					
CYPERUS SUBPINNATUS VEL AFF		X													
CYPERUS VICTORIENSIS			X		X		X						H	U	CHANNEL NUTGRASS
FIMBRISTYLIS DICHOTOMA	X	X					X			X			M	U	
FIMBRISTYLIS NELSONII										X					
SCHOENUS KENNYI		X													
SCLERIA SPHACELATA										X					
DICRASTILIDACEAE															
CHLOANTHES PARVIFLORA		X													
SPARTOTHAMNELLA JUNCEA		X								X			H	U	
SPARTOTHAMNELLA PUBERULA			X							X					
DYSPHANIACEAE															
DYSPHANIA MYRIOCEPHALA	X												M	T	RED CRUMBWEED
EHRETIACEAE															
EHRETIA MEMBRANIFOLIA			X							X			H	C	PEACH BUSH

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
EPACRIDACEAE															
LEUCOPOGON MITCHELLII			X										L	U	
MELICHRUS URCEOLATUS			X												
ERYTHROXYLACEAE															
ERYTHROXYLUM AUSTRALE			X		X										
EUPHORBIACEAE															
BERTYA OLEIFOLIA			X												
CROTON PHEBALIOIDES					X										
EUPHORBIA DRUMMONDII						X	X	X	X		X		M	T	CAUSTIC WEED
EUPHORBIA MITCHELLIANA											X				
PETALOSTIGMA PUBESCENS			X					X			X		M	U	QUININE BERRY
PHYLLANTHUS FUERNROHRII								X		X					
PHYLLANTHUS MADERASPATENSIS					X	X		X		X	X		M	U	
RICINOCARPOS BOWMANII			X								X				
RICINOCARPOS LEDIFOLIUS			X												WEDDING BUSH
FLINDERSIACEAE															
FLINDERSIA MACULOSA				X	X	X	X	X		X			H	U	LEOPARDWOOD
GENTIANACEAE															
CENTAURIUM SPICATUM								X			X				NATIVE CENTAURY
GERANIACEAE															
ERODIUM CRINITUM	X												H	U	BLUE CROWFOOT
ERODIUM CYGNORUM SSP. GLANDULOSUM	X														
GOODENIACEAE															
DAMPIERA DISCOLOR			X												
GOODENIA GLABRA	X														
GOODENIA HEDERACEA											X		M	U	
GOODENIA LUNATA						X							M	U	
GOODENIA STRANGFORDII						X			X						
GOODENIA SUBINTEGRA	X												M	U	SILKY GOODENIA
GOODENIA SPP.			X		X						X				
SCAEVOLA OVALIFOLIA											X		L	U	
SCAEVOLA SPINESCENS				X									L	U	
GRAMINEAE															
ANCISTRACHNE UNCINULATA								X					H	U	HOOKY GRASS
ARISTIDA ANTHOXANTHOIDES					X	X				X			M	U	YELLOW THREEAWN
ARISTIDA ARMATA	X							X		X					NUMBER 8 WIRE GRASS
ARISTIDA BENTHAMII	X														WIRE GRASS
ARISTIDA BIGLANDULOSA								X						U	TWO-GLAND THREEAWN
ARISTIDA BROWNIANA			X					X		X	X		M	U	ERECT KEROSENE GRASS
ARISTIDA CALYCINA	X				X			X			X				NUMBER 8 WIRE GRASS
ARISTIDA CAPUT-MEDUSAE			X		X			X			X				MANY HEADED WIREGRASS
ARISTIDA CONTORTA	X		X								X		M	U	KEROSENE GRASS OR SILVER GRASS
ARISTIDA DISSIMILIS			X												
ARISTIDA GLUMARIS	X	X											L	U	A WIRE GRASS
ARISTIDA GRACILIPES			X								X				SLENDER WIRE GRASS
ARISTIDA HELICOPHYLLA											X		L	U	
ARISTIDA INAEQUIGLUMIS										X					
ARISTIDA INGRATA								X			X		M	U	
ARISTIDA JERICHOENSIS	X				X					X	X		M	U	COMMON WIRE GRASS
ARISTIDA JERICHOENSIS VAR. SUBSPINULIFERA			X								X				
ARISTIDA LATIFOLIA				X	X	X	X	X		X			M	U	FEATHERTOP WIRE GRASS
ARISTIDA LEICHHARDTIANA		X													
ARISTIDA LEPTOPODA			X	X	X	X	X		X	X					WHITE SPEAR GRASS
ARISTIDA MURICATA								X							
ARISTIDA PRUINOSA												X	L	U	A WIRE GRASS
ARISTIDA PSAMMOPHILA											X				WIRE GRASS
ARISTIDA RAMOSA				X				X			X				WIRE GRASS
ARISTIDA VAGANS											X				WIRE GRASS
ARISTIDA SP. AFF INAEQUIGLUMIS										X					
ASTREBLA ELYMOIDES				X	X	X	X	X	X				H	U	HOOP MITCHELL GRASS
ASTREBLA LAPPACEA				X	X	X	X	X	X	X			H	U	CURLY MITCHELL GRASS
ASTREBLA PECTINATA						X							H	U	BARLEY MITCHELL GRASS
ASTREBLA SQUARROSA				X		X	X	X	X	X			H	U	BULL MITCHELL GRASS
BOTHRIOCHLOA ERIANTHOIDES						X									SATIN TOP GRASS
BOTHRIOCHLOA EWARTIANA					X	X	X	X	X	X	X		H	U	DESERT BLUE GRASS
BRACHIARIA GILESII						X							H	U	HAIRY-EDGED ARMGRASS
BRACHIARIA MILIIFORMIS		X				X							H	U	GREEN SUMMER GRASS OR ARM GRASS
BRACHYACHNE CONVERGENS				X	X			X	X				H	T	NATIVE COUCH GRASS OR SPIDER GRASS
CENCHRUS CILIARIS	X	X		X	X	X	X	X	X	X	X		H		BUFFEL GRASS
CHLORIS DIVARICATA											X		H	U	SLENDER CHLORIS
CHLORIS PECTINATA		X			X	X		X	X				H	U	COMB CHLORIS
CHLORIS SCARIOSA										X			L	U	LARGE-FLOWER CHLORIS OR WINDMILL GRASS
CHLORIS VENTRICOSA	X				X			X					H	U	TALL CHLORIS
CHLORIS VIRGATA	X				X	X						X	L	U	FEATHERTOP RHODES GRASS
CHRYSOPOGON FALLAX	X		X		X		X	X	X	X	X		H	U	GOLDEN-BEARD GRASS
CLEISTOCHLOA SUBJUNCEA											X				
CYMBOPOPON BOMBYCINUS											X				SILKY HEADS
CYMBOPOGON OBTECTUS											X		M	U	SILKY-HEADS
CYMBOPOGON REFRACTUS								X			X				BARB-WIRE GRASS
CYNODON DACTYLON						X		X					H	U	COUCH GRASS
DACTYLOCTENIUM RADULANS		X		X	X	X	X	X	X				H	T	BUTTON GRASS
DICHANTHIUM AFFINE					X								H	U	DWARF BLUEGRASS
DICHANTHIUM SERICEUM				X	X	X	X	X	X	X			H	U	QUEENSLAND BLUEGRASS
DIGITARIA AMMOPHILA						X			X				H	U	SILKY UMBRELLA GRASS
DIGITARIA BICORNIS										X	X				

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
DIGITARIA BROWNII	X	X		X	X			X		X	X		H	U	COTTON PANIC GRASS OR SILVER GRASS
DIGITARIA COENICOLA										X			H	U	FINGER PANIC GRASS
DIGITARIA DIMINUTA	X	X											H	U	
DIGITARIA DIVARICATISSIMA		X		X	X	X		X			X		H	U	BLOW-AWAY GRASS
DIPLACHNE MUELLERI						X							M	U	WATER GRASS OR BEETLE GRASS
ENNEAPOGON AVENACEUS	X			X	X	X	X	X	X	X			H	U	RIDGE GRASS
ENNEAPOGON LINDLEYANUS			X	X	X			X			X				A BOTTLE WASHER GRASS
ENNEAPOGON OBLONGUS											X				
ENNEAPOGON PALLIDUS				X	X			X		X	X				
ENNEAPOGON POLYPHYLLUS	X	X		X	X	X	X	X		X	X		M	U	A BOTTLE-WASHER GRASS
ENTEROPOGON ACICULARIS	X	X		X	X	X	X	X		X	X		H	U	CURLY WINDMILL GRASS OR SPIDER GRASS
ERAGROSTIS AUSTRALASICA											X		M	U	SWAMP CANE GRASS
ERAGROSTIS CUMINGII								X					M	U	CUMING'S LOVEGRASS
ERAGROSTIS ELONGATA		X									X		M	U	COMMON LOVEGRASS
ERAGROSTIS ERIOPODA	X												M	U	WOOLLYBUTT GRASS
ERAGROSTIS JAPONICA										X	X		L	U	DELICATE LOVEGRASS
ERAGROSTIS LANIFLORA												X	M	U	HAIRY-FLOWERED WOOLLYBUTT
ERAGROSTIS LACUNARIA	X	X	X	X	X	X		X		X	X		M	U	PURPLE LOVEGRASS
ERAGROSTIS LEPTOCARPA	X							X				X	L	U	DROOPING LOVEGRASS
ERAGROSTIS MOLYBDEA								X					M	U	A LOVE GRASS
ERAGROSTIS SETIFOLIA					X	X	X	X					M	U	NEVERFAIL GRASS
ERAGROSTIS SORORIA			X					X			X		M	U	
ERAGROSTIS SPECIOSA											X	X	L	U	HANDSOME LOVEGRASS
ERAGROSTIS TENELLULA								X					M	U	DELICATE LOVEGRASS
ERIACHNE ARISTIDEA											X	X	M	U	THREEAWNED WANDERRIE
ERIACHNE BENTHAMII												X			
ERIACHNE MUCRONATA	X		X					X			X		M/H	U	ROCKGRASS
ERIACHNE OBTUSA			X								X		M	U	NORTHERN WANDERRIE
ERIOCHLOA PSEUDOACROTRICHA		X		X	X	X	X	X	X				H	U	EARLY SPRING GRASS
EULALIA FULVA			X			X		X	X		X		H	U	SILKY BROWNTOP
HETEROPOGON CONTORTUS			X			X	X	X	X	X	X		M	U	BUNCH SPEAR-GRASS OR BLACK SPEAR GRASS
ISEILEMA MEMBRANACEUM				X	X				X				H	U	SMALL FLINDERS GRASS
ISEILEMA VAGINIFLORUM						X							H	U	RED FLINDERS GRASS
LEPTOCHLOA CILIOLATA				X											
LEPTOCHLOA DIGITATA						X		X					M	U	UMBRELLA CANE GRASS
LEPTOCHLOA PEACOCKII					X										
MONACHATHER PARADOXA	X												H	U	MULGA OATS OR BANDICOOT GRASS
PANICUM DECOMPOSITIUM	X	X		X		X		X	X		X	X	M	S	NATIVE OR WILD MILLET
PANICUM EFFUSUM	X	X	X		X			X			X		H	T	HAIRY PANIC
PANICUM SIMILE											X				
PANICUM QUEENSLANDICUM				X		X	X	X			X				YABILA GRASS
PANICUM WHITEI					X	X							M	U	PEPPER GRASS
PARANEURACHNE MUELLERI											X				
PASPALIDIUM CAESPITOSUM	X	X	X	X	X	X		X							BRIGALOW GRASS
PASPALIDIUM CONSTRICTUM			X	X	X						X		M	U	BELAH GRASS
PASPALIDIUM JUBIFLORUM						X		X					H	U	WARREGO SUMMER GRASS
PASPALIDIUM RARUM		X									X		H	U	
PEROTIS RARA								X		X	X	X	L	U	COMET GRASS
SCHIZACHYRIUM FRAGILE											X				
SETARIA AUSTRALIENSE			X							X					
SETARIA SURGENS											X				
SPOROBOLUS ACTINOCLADUS				X	X	X	X	X	X	X		X	H	U	KATOORA
SPOROBOLUS AUSTRALASICUS				X									H	U	
SPOROBOLUS CAROLI	X	X		X	X	X	X	X	X	X	X		H	U	FAIRY GRASS
SPOROBOLUS MITCHELLII								X					L	U	RAT'S-TAIL GRASS
SPOROBOLUS SCABRIDUS		X											H	U	
THELLUNGIA ADVENA				X	X	X							M	U	COOLIBAH GRASS
THEMEDA AUSTRALIS	X		X		X	X	X	X			X		H	U	KANGAROO GRASS
THEMEDA AVENACEA						X							H	U	NATIVE OAT GRASS
THYRIDOLEPIS MITCHELLIANA	X	X									X		H	U	MULGA MITCHELL GRASS
THYRIDOLEPIS XEROPHILA	X														A MULGA MITCHELL GRASS
TRAGUS AUSTRALIANUS			X	X	X	X	X	X	X	X	X		M	U	SMALL BURR GRASS
TRIODIA LONGICEPS												X			PORCUPINE GRASS
TRIODIA MITCHELLII			X					X			X				BULL SPINIFEX
TRIODIA PUNGENS			X								X				SOFT SPINIFEX
TRIPOGON LOLIIFORMIS	X	X			X	X		X		X	X	X	H	U	FIVE-MINUITE GRASS
TRIRAPHIS MOLLIS	X				X		X	X			X		H	T	PURPLE PLUME GRASS
URANTHOECIUM TRUNCATUM						X							M	U	FLAT-STEM GRASS
VETIVERIA FILIPES								X							
HALORAGIDACEAE															
HALORAGIS HETEROPHYLLA	X														
HALORAGIS ODONTOCARPA	X														MULGA NETTLE
JUNCACEAE															
JUNCUS SP						X									A RUSH
LABIATE															
AJUGA AUSTRALIS					X								L/M	U	AUSTRALIAN BUGLE
PROSTANTHERA COLLINA			X												
PROSTANTHERA EUPHRASIOIDES			X												
PROSTANTHERA SUBORBICULARIS		X											L	U	MINTBUSH
SALVIA REFLEXA				X			X						M	T	MINTWEED
TEUCRIUM RACEMOSUM						X		X					L	S	GREY GERMANDER
LEGUMINOSAE															
ACACIA ADSURGENS	X														
ACACIA ANEURA	X	X	X								X	X	H	Y	MULGA
ACACIA APREPTA		X													
ACACIA BANCROFTII			X				X				X				
ACACIA BLAKEI			X								X				
ACACIA BURROWII	X														
ACACIA BUXIFOLIA			X												BOX-LEAF ACACIA

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
ACACIA CAMBAGEI	X			X	X	X	X	X		X	X		L	U	GIDGEE
ACACIA CANA				X		X	X	X					H	U	BORFE
ACACIA CATENULATA			X										M	U	BENDEE
ACACIA CLIVICOLA	X	X											L	U	BASTARD MULGA
ACACIA COWLEANA											X				
ACACIA COMPLANATA			X								X				FLAT STEMMED WATTLE
ACACIA CONFERTA											X				
ACACIA CORIACEA			X					X			X				DESERT OAK
ACACIA CURVINERVIA											X				
ACACIA DEANEI	X				X						X				GREEN WATTLE
ACACIA DECORA			X					X			X				PRETTY WATTLE
ACACIA DIETRICHIANA			X												
ACACIA DORATOXYLON VAR. ANGUSTIFOLIA											X				
ACACIA EXCELSA	X		X			X	X	X		X	X	X	M	U	IRONWOOD
ACACIA FARNESIANA				X	X	X	X	X	X		X		H	U	MIMOSA BUSH
ACACIA GNIDIUM											X				
ACACIA HARPOPHYLLA	X	X	X	X	X	X		X		X	X		L	C	BRIGALOW
ACACIA IXIOPHYLLA											X				FLAT-TOP WATTLE
ACACIA LEIOCALYX											X				EARLY-FLOWERING BLACK WATTLE
ACACIA LEPTOSTACHYA			X								X				
ACACIA LONGISPICATA			X				X				X				
ACACIA MACRADENIA			X				X				X				ZIG-ZAG WATTLE
ACACIA MELLEODORA			X								X				
ACACIA MICROSPERMA			X										M	U	BOWYAKKA
ACACIA OSWALDII								X			X		M	C	NELIA
ACACIA PENDULA				X		X	X						H	U	MYALL
ACACIA PETRAEA	X												L	C	LANCEWOOD
ACACIA PLATYCARPA											X				
ACACIA RESINICOSTATA											X				
ACACIA SALICINA				X			X	X		X			M	U	DOOLAN
ACACIA SHIRLEYI			X		X						X				LANCEWOOD
ACACIA STENOPHYLLA	X							X	X			X	M	U	BELALIE
ACACIA STIPULIGERA											X				
ACACIA TENIUSSIMA			X								X				
ACACIA TRIPTERA			X												
ACACIA VICTORIAE						X	X						H	U	GUNDA-BLUEY
ACACIA SP.											X				
AESCHYNOMENE INDICA									X				L/M	S	BUDDA-PEA
ALBIZIA BASALTICA	X			X	X	X	X	X		X	X		H	U	DEAD FINISH
BAUHINIA CARRONII				X	X	X	X	X		X	X		H	U	BAUHINIA
ATYLOSIA MARMORATA											X				
CASSIA ARTEMISIOIDES	X	X		X	X						X		L	U	SILVER CASSIA
CASSIA BARCLAYANA								X						C	ANT BUSH OR PEPPER-LEAF SENNA
CASSIA CIRCINNATA											X		L	U	
CASSIA COSTATA											X		L	U	BEAN BUSH
CASSIA NEMOPHILA VAR. NEMOPHILA	X			X	X	X		X		X	X		L	U	DESERT CASSIA OR BUTTER BUSH
CASSIA NOTABILIS											X				BEETLE BUSH OR FIRE BUSH
CASSIA OLIGOPHYLLA	X			X	X	X		X		X	X		L	U	
CASSIA PHYLLODINIA											X		M	U	
CASSIA PUMILA											X				
CASSIA STURTII	X										X		M	U	
CROTALARIA DISSITIFLORA						X			X				M	S	GREY RATTLEPOD
CROTALARIA LINIFOLIA											X			S	
CROTALARIA MITCHELLII								X					L/M	S	YELLOW RATTLEPOD
DAVIESIA FILIPES											X				
DESMODIUM BRACHYPODUM								X	X						
DESMODIUM CAMPYLOCAULON									X				H	U	
DESMODIUM FILIFORME											X				
DESMODIUM VARIANS					X	X					X				
DICERMA BIARTICULATUM SSP. BIARTICULATUM VAR. BIARTICULATUM											X				
ERYTHRINA VERSPERTILIO											X		M	S	BAT-WING CORAL TREE
GASTROLOBIUM GRANDIFLORUM			X										H	T	HEART-LEAF POISON BUSH
GLYCINE CLANDESTINA						X							H	U	TWINING GLYCINE
GLYCINE TABACINA								X	X		X		H	U	GLYCINE PEA
GLYCINE TOMENTELLA			X					X			X		H	U	WOOLLY GLYCINE
HOVEA LONGIFOLIA			X								X				LONG LEAVED HOVEA
INDIGOFERA AUSTRALIS		X											L	T	AUSTRAL OR NATIVE INDIGO
INDIGOFERA HIRSUTA								X		X					HAIRY INDIGO
INDIGOFERA LINIFOLIA											X		M	S	NATIVE INDIGO
INDIGOFERA LINNEAI											X		H	T	BIRDSVILLE INDIGO
INDIGOFERA PARVIFLORA		X		X									M	U	SMALL FLOWERED INDIGO
INDIGOFERA TINCTORIA			X												INDIGO
JACKSONIA TURNERANA											X				DWARF DOGWOOD
NEPTUNIA DIMORPHANTHA						X		X	X				M	U	A NATIVE SENSITIVE PLANT
NEPTUNIA GRACILIS				X		X							H	U	NATIVE SENSITIVE PLANT
PETALOSTYLIS LABICHEOIDES			X								X		M/L	U	BUTTERFLY BUSH
PSORALEA PATENS									X		X		M/L	U	
PSORALEA TENAX						X			X						EMU FOOT
RHYNCHOSIA MINIMA					X	X	X		X	X	X		H	U	
SESBANIA CANNABINA						X							L/M	U	SESBANIA PEA
TEPHROSIA FILIPES											X				
TEPHROSIA LEPTOCLADA											X				
LILIACEAE															
DIANELLA REVOLUTA											X				BLUE FLAX LILY
DIANELLA SP. AFF. LAEVIS											X		L	S	
LAXMANNIA GRACILIS											X				
TRICORYNE ELATIOR											X				
LORANTHACEAE															
AMYEMA MAIDENII				X									H	U	A MISTLETOE

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
AMYEMA QUANDANG				X									H	U	A MISTLETOE
LYSIANA LINEARIFOLIA	X												H	U	A MISTLETOE
MALVACEAE															
ABUTILON FRASERI				X		X							L	U	A FLANNEL-WEED
ABUTILON LEUCOPETALUM				X									L	U	LANTERN BUSH
ABUTILON MALVIFOLIUM				X	X	X	X		X				M	U	
ABUTILON OTOCARPUM	X		X	X						X	X		M	U	FLANNEL-WEED OR DESERT CHINESE LANTERN
ABUTILON OXYCARPUM	X	X		X	X		X			X	X		L	U	A FLANNEL-WEED
ABUTILON OXYCARPUM VAR. SUBSAGITTATUM				X											
GOSSYPIUM AUSTRALE											X		L		
HIBISCUS BRACHYSIPHONIUS						X									
HIBISCUS STURTII	X	X			X								M	U	
HIBISCUS TRIONUM				X	X	X				X			L	U	BLADDER KETMIA
MALVASTRUM AMERICANUM				X	X	X	X	X	X	X			M	C	MALVASTRUM
MALVASTRUM COROMANDELIANUM											X				
SIDA ATHEROPHORA											X				
SIDA CORDIFOLIA											X				
SIDA CORRUGATA						X							M	U	CORRUGATED SIDA
SIDA CUNNINGHAMII	X							X					M	U	
SIDA FIBULIFERA				X	X	X	X	X	X		X		M	U	SILVER SIDA
SIDA FILIFORMIS	X		X					X		X			M	U	
SIDA GONIOCARPA								X	X				L	U	
SIDA PLATYCALYX	X												L	U	LIFESAVER BURR OR RING BURR
SIDA SPINOSA								X		X	X				SPINY SIDA
SIDA TRICHOPODA	X			X	X	X	X	X					H	U	HIGH SIDA
SIDA VIRGATA						X								U	
MELIACEAE															
OWENIA ACIDULA					X								H	U	EMUAPPLE
MYOPORACEAE															
EREMOPHILA BIGNONIIFLORA								X	X				H	S	GOORAMURRA
EREMOPHILA BOWMANII	X	X	X										L	U	SILVER TURKEY BUSH
EREMOPHILA ELDERI			X												
EREMOPHILA FREELINGII											X		L	T	LIMESTONE FUCHIA BUSH
EREMOPHILA GLABRA	X		X	X	X	X		X			X		M	U	BLACK FUCHSIA
EREMOPHILA GILESII	X	X										X	L	U	CHARLEVILLE TURKEY BUSH
EREMOPHILA LATROBEI	X	X	X										M	T	
EREMOPHILA LONGIFOLIA	X					X		X			X		H	T	BERRIGAN
EREMOPHILA MACULATA				X	X	X		X		X			H	T	FUCHSIA BUSH
EREMOPHILA MITCHELLII	X	X	X	X	X	X	X	X		X	X	X	L	U	SANDALWOOD
EREMOPHILA OBOVATA											X		L	U	
EREMOPHILA OPPOSITIFOLIA			X												
EREMOPHILA OPPOSITIFOLIA VAR. RUBRA			X		X								L	U	MOUNTAIN SANDALWOOD
EREMOPHILA POLYCLADA								X					H	U	LIGNUM FUCHSIA
MYOPORUM ACUMINATUM				X		X	X	X				X	H	T	BOOBIALA OR WATER BUSH
MYOPORUM DESERTI	X	X	X	X	X	X		X			X		H	T	ELLANGOWAN POISON BUSH
MYRTACEAE															
ANGOPHORA COSTATA			X								X		L	U	RUSTY GUM
ANGOPHORA MELANOXYLON								X					L	U	ROUGH-BARK APPLE
BAECKEA DENSIFOLIA			X												
CALYTRIX LONGIFLORA											X				FRINGE MURTLE
CALYTRIX MITCHELLII			X												
EUCALYPTUS BAKERI			X										L	U	
EUCALYPTUS BROWNII											X		L	U	
EUCALYPTUS CAMALDULENSIS	X					X		X			X		L	U	RIVER RED GUM
EUCALYPTUS CAMBAGEANA	X	X			X								L	U	DAWSON GUM OR BLACKBUTT
EUCALYPTUS CLOEZIANA											X		L	U	
EUCALYPTUS CREBRA			X								X		L	U	NARROW-LEAVED IRONBARK
EUCALYPTUS DEALBATA								X			X		L	U	TUMBLE-DOWN GUM
EUCALYPTUS DECORTICANS			X										L	U	GUM-TOPPED IRONBARK
EUCALYPTUS DICHROMOPHLOIA											X		L	U	GUM-TOPPED BLOODWOOD
EUCALYPTUS DREPANOPHYLLA			X								X		L	U	GREY IRONBARK
EUCALYPTUS EXSERTA	X		X								X		L	U	BENDO
EUCALYPTUS MELANOPHLOIA	X		X		X		X	X			X		L	U	SILVER-LEAVED IRONBARK
EUCALYPTUS MICROCARPA	X		X										L	U	BROWN BOX
EUCALYPTUS MICROTHECA								X	X				M	U	COOLIBAH
EUCALYPTUS OLEOSA			X										L	U	GIANT MALLEE
EUCALYPTUS PANDA											X		L	U	TUMBLE-DOWN IRONBARK
EUCALYPTUS PAPUANA			X					X			X		M	U	DESERT GUM
EUCALYPTUS PELTATA			X								X		L	U	RUSTY JACKET
EUCALYPTUS PELTATA SPP LEICHHARDTII											X		L	U	
EUCALYPTUS POLYCARPA	X	X	X					X			X	X	L	U	LONG FRUITED BLOODWOOD
EUCALYPTUS POPULNEA	X	X	X		X			X		X	X	X	L	U	POPLAR BOX
EUCALYPTUS SETOSA											X		L	U	ROUGH-LEAVED BLOODWOOD
EUCALYPTUS SIMILIS											X		L	U	DESERT YELLOW JACKET
EUCALYPTUS TERETICORNIS											X		L	U	BLUE GUM
EUCALYPTUS TERMINALIS	X						X						L	U	WESTERN BLOODWOOD
EUCALYPTUS TESSELLARIS	X							X		X	X		L	U	MORETON BAY ASH OR CARBEEN
EUCALYPTUS THOZETIANA	X		X		X								L	U	MOUNTAIN YAPUNYAH
EUCALYPTUS TRACHYPHLOIA			X								X		L	U	BROWN BLOODWOOD
EUCALYPTUS WATSONIANA								X			X		L	U	WATSON'S YELLOW BLOODWOOD
EUCALYPTUS WHITEI					X						X		L	U	WHITE'S IRONBARK
EUCALYPTUS SP. AFF WHITEI											X		L	U	
FENZLIA MICROPHYLLA			X												
LEPTOSPERMUM ATTENUATUM			X										L	U	A WILD MAY
LEPTOSPERMUM SERICATUM			X												
LYSICARPUS ANGUSTIFOLIUS			X								X				BUDGEROO
MELALEUCA LINEARIFOLIA								X					L	U	A PAPER-BARK TEA-TREE
MELALEUCA NODOSA			X								X				PRICKLY LEAVED PAPER BARK

Family/Species	Land Zone 1 2 3 4 5 6 7 8 9 10 11 12	Palat.	Toxity	Common Name
MELALEUCA TAMARASCINA	X			
MELALEUCA UNCINATA	X			
MICROMYRTUS HEXAMERA	X	L	U	
MICROMYRTUS LEPTOCALYX	X			
THRYPTOMENE PARVIFLORA	X			
NAJADACEAE				
NAJAS TENUIFOLIA	X			
NYCTAGINACEAE				
BOERHAVIA DIFFUSA	X X X X X X X X X	H	S	TAR-VINE
OLACACEAE				
XIMENIA AMERICANA	X			
OLEACEAE				
JASMINUM LINEARE	X X X			JASMINE VINE
NOTALEA MICROCARPA	X			
NOTALEA OVATA	X	L	U	NATIVE OLIVE
NOTALAEA PUNCTATA	X			
ONAGRACEAE				
LUDWIGIA PEPLOIDES SSP. MONTEVIDENSIS	X			
OENOTHERA BIENNIS	X			EVENING PRIMROSE
OXALIDACEAE				
OXALIS CORNICULATA	X X X X X	M	T	YELLOW WOOD SORREL
PAPAVERACEAE				
ARGEMONE OCHROLEUCA		L	T	MEXICAN POPPY
PITTOSPORACEAE				
BURSARIA INCANA	X X X X	M	U	PRICKLY PINE/BLACKTHORN
PLANTAGINACEAE				
PLANTAGO PRITZELII	X	H	U	A PLANTAIN
PLUMBAGINACEAE				
PLUMBAGO ZEYLANICA	X			
POLYGALACEAE				
COMESPERMA SYLVESTRE	X			
POLYGONACEAE				
MUEHLENBECKIA CUNNINGHAMII	X X	M	U	LIGNUM
POLYGONUM ORIENTALE	X			
RUMEX CRYSTALLINUS	X			
PORTULACACEAE				
CALANDRINIA BALONENSIS	X			BROAD LEAVED PARAKEELYA
CALANDRINIA COLUMNIFERA	X			
CALANDRINIA COLUMNIFERA SSP. MONTEVIDENSIS	X			
CALANDRINIA PUMILA	X			
PORTULACA DIGYNA	X			
PORTULACA FILIFOLIA	X	M	C	A PIGWEED
PORTULACA SP. AFF OLERACEA	X X X X X X X	H	T	MUNYEROO
PORTULACA SP.				
PROTEACEAE				
CONOSPERMUM SPHACELATUM	X			
GREVILLEA GLAUCA	X			
GREVILLEA JUNCIFOLIA	X	L	U	HONEYSUCKLE OAK
GREVILLEA PARALLELA	X			
GREVILLEA STENOBOTRYA	X	M	U	
GREVILLEA STRIATA	X X X	H	U	BEEFWOOD
HAKEA CHORDOPHYLLA	X	M	U	BOOTLACE TREE OR BULLOAK
HAKEA DIVARICATA	X X	L	U	
HAKEA FRASERI	X			CORKWOOD OAK
HAKEA LEUCOPTERA	X X X	M	U	NEEDLEWOOD
PERSOONIA FALCATA	X X			A GEEBUNG
PERSOONIA SERICEA	X			
STENOCARPUS SALIGNUS	X			
XYLOMELUM PYRIFORME	X			WOODY PEAR
RHAMNACEAE				
ALPHITONIA EXCELSA	X X X	H	U	RED ASH,SOAP TREE, PINK ALMOND
POMADERRIS LANIGERA	X			
VENTILAGO VIMINALIS	X X X X X X X X	H	T*	SUPPLEJACK OR VINETREE
ZIZIPHUS MAURITIANA	X			
RUBIACEAE				
CANTHIUM BUXIFOLIUM	X			
CANTHIUM VACCINIIFOLIUM	X			
CANTHIUM OLEIFOLIUM	X	H	U	MYRTLE TREE
RUTACEAE				
BORONIA BIPINNATA	X			ROCK BORONIA
ERIOSTEMON DIFFORMIS	X	L	U	
GEIJERA PARVIFLORA	X X X X X X X X X X	H	U	WILGA
PHEBALIUM GLANDULOSUM	X	L	U	
SANTALACEAE				
EXOCARPOS CUPRESSIFORMIS	X			
EXOCARPOS SPARTEUS	X			
SANTALUM LANCEOLATUM	X X X X X X	H	U	PLUMWOOD

Family/Species	Land Zone 1	2	3	4	5	6	7	8	9	10	11	12	Palat.	Toxity	Common Name
SAPINDACEAE															
ATALAYA HEMIGLAUCA				X	X	X	X	X		X	X		H	T	WHITEWOOD
DODONAEA BORONIIFOLIA			X								X		L	U	A HOPBUSH
DODONAEA FILIFOLIA			X												
DODONACA LANCEOLATA											X				
DODONAEA PEDUNCULARIS											X				
DODONAEA TENUIFOLIA	X												L	U	A HOPBUSH
DODONAEA TRIANGULARIS			X												
DODONAEA VISCOSA			X				X				X				STICKY HOPBUSH
DODONAEA VISCOSA							X				X				A HOPBUSH
VAR. ARBORESCENS															
F. ARBORESCENS															
DODONAEA VESTITA			X												A HOPBUSH
DODONAEA SP. AFF. ANGUSTISSIMA			X		X						X		L	U	A HOPBUSH
HETERODENDRUM DIVERSIFOLIUM					X								H	U	SCRUB BOONAREE
HETERODENDRUM OLEIFOLIUM				X	X	X	X	X		X	X		H	T	BOONAREE
SAPOTACEAE															
PLANCHONELLA COTINIFOLIA			X												
VAR. PUBESCENS															
SCROPHULARIACEAE															
BUCHNERA RAMOSISSIMA											X				
MORGANIA FLORIBUNDA							X						L	T	MORGAN FLOWER OR BLUE ROD
STRIGA CURVIFLORA											X				
SOLANACEAE															
NICOTIANA VELUTINA										X			L	T	A NATIVE TOBACCO
SOLANUM CLEISTOGAMUM											X				
SOLANUM ELLIPTICUM			X										L	T	POTATO-BUSH
SOLANUM ESURIALE		X		X	X	X	X	X	X	X	X		H	S	QUENA
SOLANUM FEROCISSIMUM			X								X		L	S	NARROWLEAVED GIN'S WHISKER
SOLANUM PARVIFOLIUM					X										
SOLANUM TETRATHECUM			X												
STACKHOUSIACEAE															
STACKHOUSIA MURICATA			X												
STERCULIACEAE															
BRACHYCHITON POPULNEUM	X	X			X			X			X		H	T	KURRAJONG
BRACHYCHITON AUSTRALE	X			X							X		H		BROAD-LEAF BOTTLE TREE
BRACHYCHITON RUPESTRE			X	X	X	X					X		H	T	BOTTLE TREE
KERAUDRENIA COLLINA											X		L	U	
WALTHERIA INDICA											X				
STYLIDIACEAE															
STYLIDIUM EGLANDULOSUM											X				A TRIGGER PLANT
STYLIDIUM ERIORRHIZUM											X				A TRIGGER PLANT
TETRAGONIACEAE															
TETRAGONIA TETRAGONIOIDES							X				X		*H	T	NEW ZEALAND SPINACH
THYMELAEACEAE															
PIMELEA MICROCEPHALA						X							L		FLAX WEED
PIMELEA NEO-ANGLICA					X		X						L	T	POISON PIMELEA
PIMELEA TRICHOSTACHYA											X		L		FLAXWEED
TYPHACEAE															
TYPHA ANGUSTIFOLIA					X		X						M	U	BULLRUSH
UMBELLIFERAE															
AMMI MAJUS				X											
DAUCUS GLOCHIDIATUS					X	X							H	U	WILD CARROT
TRACHYMENE OCHRACEA					X										
VERBENACEAE															
CLERODENDRUM FLORIBUNDUM	X									X	X		M	S	LOLLYBUSH
CLERODENDRUM LANCEOLATUM											X				
PHYLA NODIFLORA			X												
VERBENA OFFICINALIS					X										COMMON VERBENA
VERBENA TENUISECTA			X		X										
XANTHORRHOEACEAE															
LOMANDRA LEUCOCEPHELA							X			X	X				A MAT RUSH
LOMANDRA LONGIFOLIA			X							X			M	S	LONG-LEAVED MAT RUSH
XANTHORRHOEA SP.										X			L	S	GRASSTREE
ZYGOPHYLLACEAE															
TRIBULUS TERRESTRIS					X								H	T	CALTROP
MARSILEACEAE															
MARSILEA DRUMMONDII							X	X			X		M	T	NARDOO
SINOPTERIDACEAE															
CHEILANTHES DISTANS	X		X	X	X								M	S	ROCKFERN
CHEILANTHES SIEBERI	X	X	X		X					X			M/H	T	MULGA FERN OR ROCK FERN

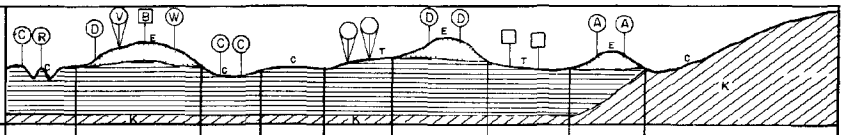
B. Common names - scientific names for the more common species

Common Name	Scientific Name
Ant bush or pepper-leaf senna	*Cassia barclayana*
Annual saltbush	*Atriplex muelleri*
Austral or native indigo	*Indigofera australis*
Australian bindweed	*Convolvulus erubescens*
Australian bluebell	*Wahlenbergia* sp.
Australian bugle	*Ajuga australis*
Australian dodder	*Cuscuta australis*
Barb-wire grass	*Cymbopogon refractus*
Barley Mitchell grass	*Astrebla pectinata*
Bastard mulga	*Acacia clivicola*
Bathurst burr	*Xanthium spinosum*
Bat-wing coral tree	*Erythrina verspertilio*
Bauhinia	*Bauhinia carronii*
Bean bush	*Cassia pleurocarpa*
Beefwood	*Grevillea striata*
Beetle bush or fire bush	*Cassia notabilis*
Belah	*Casuarina cristata*
Belah grass	*Paspalidium constrictum*
Belalie	*Acacia stenophylla*
Bendee	*Acacia catenulata*
Bendo	*Eucalyptus exserta*
Berrigan	*Eremophila longifolia*
Berry saltbush	*Rhagodia spinescens*
Birdsville indigo	*Indigofera linnèai*
Bitter bark	*Alstonia constricta*
Black fuchsia	*Eremophila glabra*
Black pigweed	*Trianthema portulacastrum*
Bladder ketmia	*Hibiscus trionum*
Bladder saltbush	*Atriplex vesicaria*
Blow-away grass	*Digitaria divaricatissima*
Blue crowfoot	*Erodium crinitum*
Blue flax lily	*Dianella revoluta*
Blue gum	*Eucalyptus tereticornis*
Bogan-flea or bindy-eye	*Calotis hispidula*
Boggabri	*Amaranthus mitchellii*
Boobiala or water bush	*Myoporum acuminatum*
Boonaree	*Heterodendrum oleifolium*
Bootlace tree or bulloak	*Hakea chordophylla*
Boree	*Acacia cana*
Bottle tree	*Brachychiton rupestre*
Bottle washer grass	*Enneapogon lindleyanus*
Bottle-washer grass	*Enneapogon polyphyllus*
Bowyakka	*Acacia microsperma*
Box-leaf acacia	*Acacia buxifolia*
Brigalow	*Acacia harpophylla*
Brigalow or dog burr	*Bassia tetracuspis*
Brigalow grass	*Paspalidium caespitosum*
Broad-leaf bottle tree	*Brachychiton australe*
Broom bush	*Apophyllum anomalum*
Brown bloodwood	*Eucalyptus trachyphloia*
Brown box	*Eucalyptus microcarpa*
Budda-pea	*Aeschynomene indica*
Budgeroo	*Lysicarpus angustifolius*
Buffel grass	*Cenchrus ciliaris*
Bull Mitchell grass	*Astrebla squarrosa*
Bull Oak	*Casuarina luehmannii*
Bull spinifex	*Triodia mitchellii*
Bulrush	*Typha angustifolia*
Bumble or wild orange	*Capparis mitchellii*
Bunch spear-grass or black spear-grass	*Heteropogon contortus*
Butterfly bush	*Petalostylis labichoides*
Button grass	*Dactyloctenium radulans*
Caustic-vine	*Sarcostemma australe*
Caltrop	*Tribulbus terrestris*
Cartwheel burr	*Bassia cornishiana*
Caustic weed	*Euphobria drummondii*
Climbing saltbush	*Rhagodia nutans*
Chaff-flower	*Achyranthes aspera*
Channel nutgrass	*Cyperus victoriensis*
Charleville turkey bush	*Eremophila gilesii*
Cherry wood	*Exocarpos aphyllus*
Comb chloris	*Chloris pectinata*
Comet grass	*Perotis rara*
Common joyweed	*Alternanthera nodiflora*
Common lovegrass	*Eragrostis elongata*
Common prickly pear	*Opuntia inermis*
Common sida	*Sida rhombifola*
Common verbena	*Verbena officinalis*
Common wire grass	*Aristida jerichoensis*
Conker berry or borrum bush	*Carissa lanceolata*
Coolibah	*Eucalyptus microtheca*
Coolibah grass	*Thellungia advena*
Coonta	***Ehretia saligna***
Copper burr	***Bassia divaricata***
Copper burr	***Bassia convexula***
Corkwood oak	***Hakea ivoryi***
Corrugated sida	***Sida corrugata***
Cotton bush	***Maireana villosa***
Cotton panic grass or silver grass	***Digitaria brownii***
Couch grass	***Cynodon dactylon***
Cow vine	***Ipomoea lonchophylla***
Creeping saltbush	***Atriplex semibaccata***
Cuming's lovegrass	***Eragrostis cumingii***
Curious saltbush	***Bassia paradoxa***
Curly Mitchell grass	***Astrebla lappacea***
Curly windmill grass; spider grass	***Enteropogon acicularis***
Currant bush or blackberry	Carissa ovata
Currawang	Acacia sparsiflora
Cypress pine	Callitris columellaris
Daisy burr	Canthium latifolium
Dawson gum or blackbutt	Eucalyptus cambageana
Dead finish	Albizia basaltica
Delicate lovegrass	Eragrostis tenellula
Delicate lovegrass	Eragrostis japonica
Desert blue grass	Bothriochloa ewartiana
Desert cassia or butter bush	Cassia nemophila
Desert gum	Eucalyptus pruinana
Desert oak	Acacia coriacea
Desert sneezeweed	*Centipeda thespidioides*
Desert spurge	*Euphorbia eremophila*
Desert yellow jacket	*Eucalyptus similis*
Doolan	*Acacia salicina*
Downs nut-grass	*Cyperus bifax*
Drooping lovegrass	*Eragrostis leptocarpa*
Dwarf bluegrass	*Dichanthium affine*
Dwarf dogwood	*Jacksonia turnerana*
Dwarf mulga grass	*Neurachne munroi*
Early-flowering black wattle	*Acacia leiocalyx*
Early spring grass	*Eriochloa pseudoacrotricha*
Ellangowan poison bush	*Myoporum deserti*
Emu apple	*Owenia acidula*
Emu foot	*Pioralea tenax*
Erect kerosene grass	*Aristida browniana*
Evening primrose	*Oenothera biennis*
Fairy grass	*Sporobolus caroli*
Feathertop Rhodes grass	*Chloris virgata*
Feathertop wire grass	*Aristida latifolia*
Finger panic grass	*Digitaria coenicola*
Fish-weed	*Chenopodium trigonon*
Five-minute grass	*Tripogon loliiformis*
Flannel-weed	*Abutilon oxycarpum*
Flannel-weed	*Abutilon fraseri*
Flannel-weed or desert Chinese lantern	*Abutilon otocarpum*
Flat stemmed wattle	*Acacia complanata*
Flat-stem grass	*Uranthoecium truncatum*
Flat-top wattle	*Acacia ixiophylla*
Flaxweed	*Pimelea trichostachya*
Flaxweed	*Pimelea microcephala*
Flinders rose	*Capparis spinosa*
Fox brush or Prince of Wales feathers	*Ptilotus exaltatus*
Fox brush or pussy tails	*Ptilotus polystachyus* var. *parviflorus*
Fringed baeckea	*Baeckea diosmifolia*
Fringed murtle	*Calytrix longiflora*
Fuchsia bush	*Eremophila maculata*
Fuzzweed	*Vittadinia triloba*
Galvanized burr	*Bassia birchii*
Gargaloo	*Parsonsia eucalyptophylla*
Geebung	*Persoonia falcata*
Giant red burr	*Bassia tricuspis*
Gidgee	*Acacia cambagei*
Glycine pea	*Glycine tabacina*
Goathead burr	*Bassia bicornis*
Golden-beard grass or blue grass	*Chrysopogon fallax*
Gomphrena weed	*Gomphrena celosioides*
Gooramurra	*Eremophila bignoniiflora*
Grasstree	*Xanthorrhoea* sp.
Green crumbweed	*Chenopodium rhadinostachyum*
Green summer grass or arm grass	*Brachiaria miliiformis*
Green wattle	*Acacia deanei*
Grey-beard grass	*Amphipogon caricinus*
Grey germander	*Teucrium racemosum*
Grey ironbark	*Eucalyptus drepanophylla*
Grey rattlepod	*Crotalaria dissitiflora*
Grey scurf pea	*Psoralea cinerea*
Gum-topped bloodwood	*Eucalyptus dichromophloia*
Gum-topped box	*Eucalyptus moluccana*
Gundabluey	*Acacia victoriae*
Hairy-edged arm grass	*Brachiaria gilesii*
Hairy-flowered woollybutt	*Eragrostis laniflora*
Hairy indigo	*Indigofera hirsuta*
Hairy panic	*Panicum effusum*
Handsome lovegrass	*Eragrostis speciosa*
Heart-leaf poison bush	*Gastrolobium grandiflorum*
High sida	*Sida trichopoda*
Hogweed	*Trianthema galericulata*
Honeysuckle oak	*Grevillea juncifolia*
Hooky grass	*Ancistrachne uncinulata*
Hoop Mitchell grass	*Astrebla elymoides*
Hopbush	*Dodonaea angustissima*
Hopbush	*Dodonaea boronifolia*
Hopbush	*Dodonaea cuneata*
Hopbush	*Dodonaea petiolaris*
Hopbush	*Dodonaea tenuifolia*
Hopbush	*Dodonaea* spp.aff.*attenuata*
Ironwood	*Acacia excelsa*
Indigo	*Indigofera tinctoria*
Kangaroo grass	*Themeda australis*
Katoora	*Sporobolus actinocladus*
Kerosene grass or silver grass	*Aristida contorta*
Khaki-weed	*Alternanthera pungens*
Knotty-butt neverfail grass	*Eragrostis xerophila*
Kurrajong	*Brachychiton populneum*
Lancewood	*Acacia petraea*
Lancewood	*Acacia shirleyi*
Lantern bush	*Abutilon leucopetalum*
Large-flower chloris or windmill grass	*Chloris scariosa*
Leopardwood	*Flindersia maculosa*
Lesser joyweed	*Alternanthera denticulata*
Livesaver burr or ring burr	*Sida platycalyx*
Lignum	*Muehlenbeckia cunninghamii*
Lignum fuchsia	*Eremophila polyclada*

Common Name	Scientific Name
Limestone fuchia bush	*Eremophila freelingii*
Lollybush	*Clerodendrum floribundum*
Long fruited bloodwood	*Eucalyptus polycarpa*
Long leaved hovea	*Hovea longifolia*
Long leaved mat rush	*Lomandra longifolia*
Love grass	*Eragrostis molybdea*
Malvastrum	*Malvastrum americanum*
Many headed wire grass	*Aristida caput-medusae*
Mat rush	*Lomandra leucocephela*
Mexican poppy	*Argemone ochroleuca*
Milkwood	*Cerbra* sp.
Mimosa bush	*Acacia farnesiana*
Mintbush	*Prostanthera suborbicularis*
Mintweed	*Salvia reflexa*
Mistletoe	*Amyema quandang*
Mistletoe	*Amyema maidenii*
Mistletoe	*Lysiana linearifolia*
Moreton Bay ash or carbeen	*Eucalyptus tessellaris*
Morgan flower or blue rod	*Morgania floribunda*
Morning glory or convolvulus	*Ipomoea muelleri*
Mountain sandalwood	*Eremophila oppositifolia* var.rubra
Mountain yapunyah	*Eucalyptus thozetiana*
Mulga	*Acacia aneura*
Mulga fern or rock fern	*Cheilanthes sieberi*
Mulga Mitchell grass	*Thyridolepis xerophila*
Mulga Mitchell grass	*Thyridolepis mitchelliana*
Mulga oats or bandicoot grass	*Monachather paradoxa*
Munyeroo	*Portulaca* sp.aff. *P.oleracea*
Myall	*Acacia pendula*
Myrtle tree	*Canthium oleifolium*
Nardoo	*Marsilea drummondii*
Narrow-leaf bumble	*Capparis loranthifolia*
Narrow-leaved gin's whisker	*Solanum ferocissimum*
Narrow-leaved ironbark	*Eucalyptus crebra*
Native centaury	*Centaurium spicatum*
Native cobbler's peg	*Glossogyne tenuifolia*
Native couch grass or spider grass	*Brachyachne convergens*
Native daisy	*Brachyscome ciliaris*
Native indigo	*Indigofera linifolia*
Native or wild millet	*Panicum decompositium*
Native oat grass	*Themeda avenacea*
Native olive	*Notalea ovata*
Native sensitive plant	*Neptunia dimorphantha*
Native sensitive plant	*Neptunia gracilis*
Native tobacco	*Nicotiana velutina*
Neddlewood	*Hakea leucoptera*
Nelia	*Acacia oswaldii*
Neverfail grass	*Eragrostis setifolia*
New Zealand spinach	*Tetragonia tetragonioides*
Nipan or split jack	*Capparis lasiantha*
Noogoora burr	*Xanthium chinense*
Northern wanderrie	*Eriachne obtusa*
Number 8 wire grass	*Aristida calycina*
Number 8 wire grass	*Aristida armata*
Paper-bark tea-tree	*Melaleuca linearifolia*
Paper daisy	*Helipterum floribundum*
Peach bush	*Ehretia membranifolia*
Peppercress	*Lepidium strongylophyllum*
Peppercress	*Lepidium rotundum*
Pepper grass	*Panicum whitei*
Pigweed	*Portulaca filifolia*
A plantain	*Plantago pritzelii*
Plumwood	*Santalum lanceolatum*
Porcupine grass	*Triodia longiceps*
Pretty wanderrie	*Eriachne pulchella*
Pretty wattle	*Acacia decora*
Prickly leaved paper bark	*Melaleuca nodosa*
Prickly or black roly-poly	*Bassia quinquecuspis*
Prickly paddy melon	*Cucumis myriocarpus*
Prickly pine/blackthorn	*Bursaria incana*
Prince-of-Wales feathers	*Ptilotus exaltatus*
Purple lovegrass	*Eragrostis lacunaria*
Purple plume grass	*Triraphis mollis*
Poison pimelea	*Pimelea neo-anglica*
Poplar box	*Eucalyptus populnea*
Potato bush	*Solanum ellipticum*
Queensland bluebush	*Chenopodium auricomum*
Queensland bluegrass	*Dichanthium sericeum*
Quena	*Solanum esuriale*
Quinine berry	*Petalostigma pubescens*
Ragweed	*Pterocaulon sphacelatum*
Rat's-tail grass	*Sporobolus mitchellii*
Red ash, soap tree, pink almond	*Alphitonia excelsa*
Red burr	*Bassia calcarata*
Red crumbweed	*Dysphania myriocephala*
Red Flinders grass	*Iseilema vaginiflorum*
Red spinach	*Trianthema triquetra*
Ridge grass	*Enneapogon avenaceus*
River oak	*Casuarina cunninghamiana*
River red gum	*Eucalyptus camaldulensis*
Rock boronia	*Boronia bipinnata*
Rockfern	*Cheilanthes distans*
Rockgrass	*Eriachne mucronata*
Rough-bark apple	*Angophora melanoxylon*
Rough-leaved bloodwood	*Eucalyptus setosa*
Round-leaf toadflax	*Maireana aphylla*
Ruby saltbush	*Enchylaena tomentosa*
Rush	*Juncus* sp.
Rusty gum	*Angophora costata*
Rusty jacket	*Eucalyptus peltata*
Saltbush	*Atriplex elachophylla*
Sandalwood	*Eremophila mitchellii*
Satin top grass	*Bothriochloa erianthoides*
Scrub boonaree	*Heterodendrum diversifolium*
Scruvy-weed or wandering jew	*Commelina cyanea*
Sedge	*Bulbostylis barbata*
Sesbania pea	*Sesbania cannabina*
Slender chloris	*Chloris divaricata*
Slender sedge or whisker grass	*Cyperus gracilis*
Slender rat's-tail grass	*Sporobolus elongatus*
Slender wire grass	*Aristida gracilipes*
Silky browntop	*Eulalia fulva*
Silky goodenia	*Goodenia subintegra*
Silky heads	*Cymbopogon obtectus*
Silky heads	*Cymbopogon bombycinus*
Silky umbrella grass	*Digitaria ammophila*
Silver cassia	*Cassia artemisioides*
Silver-leaved ironbark	*Eucalyptus melanophloia*
Silver sida	*Sida fibulifera*
Silver turkey bush	*Eremophila bowmanii*
Small burr grass	*Tragus australianus*
Small Flinders grass	*Iseilema membranaceum*
Small flowered indigo	*Indigofera parviflora*
Smooth minuria	*Minuria integerrima*
Soda bush	*Threlkeldia proceriflora*
Soft roly-poly	*Salsola kali*
Soft spinifex	*Triodia pungens*
Speedy weed	*Flaveria australasica*
Spiny sida	*Sida spinosa*
Spreading sneezeweed	*Centipeda minima*
Sticky hopbush	*Dodonaea viscosa*
Sticky indigo	*Indigofera colutea*
Sturt's desert rose	*Gossypium sturtianum*
Summer grass	*Digitaria ciliaris*
Supplejack or vinetree	*Ventilago viminalis*
Swamp cane grass	*Eragrostis australasica*
Tall chloris	*Chloris ventricosa*
Tar-vine	*Boerhavia diffusa*
Thready-bark oak	*Casuarina inophloia*
Three-awned wanderrie	*Eriachne aristidea*
Tick-weed	*Cleome viscosa*
Trigger plant	*Stylidium eglandulosum*
Trigger plant	*Stylidium eriorrhizum*
Tumble-down gum	*Eucalyptus dealbata*
Tumble-down ironbark	*Eucalyptus panda*
Turkey bush	*Olearia subspicata*
Twining glycine	*Glycine clandestina*
Two-gland wire grass	*Aristida biglandulosa*
Umbrella cane grass	*Leptochloa digitata*
Velvety tree pear	*Opuntia tomentosa*
Vernonia	*Vernonia cineria*
Warrego summer grass	*Paspalidium jubiflorum*
Water grass or beetle grass	*Diplachne muelleri*
Wedding bush	*Ricinocarpos bowmanii*
Wedding bush	*Ricinocarpos ledifolius*
Watson's yellow bloodwood	*Eucalyptus watsoniana*
Western bloodwood	*Eucalyptus terminalis*
White's ironbark	*Eucalyptus whitei*
White spear grass	*Aristida leptopoda*
Whitewood	*Atalaya hemiglauca*
Wild daffodil	*Calostemma luteum*
Wild carrot	*Daucus glochidiatus*
Wild may	*Leptospermum attenuatum*
Wild may	*Leptospermum flavescens*
Wild rosemary or cough bush	*Cassinia laevis*
Wilga	*Geijera parviflora*
Wire grass	*Aristida pruinosa*
Wire grass	*Aristida psammophila*
Wire grass	*Aristida ramosa*
Wire grass	*Aristida glumaris*
Wire grass	*Aristida benthamii*
Wire grass	*Aristida vagans*
Wonga vine	*Pandorea pandorana*
Woollybutt grass	*Eragrostis eriopoda*
Wonga vine	*Pandorea doratoxylon*
Woody pear	*Xylomelum pyriforme*
Woollybutt wanderrie	*Eriachne helmsii*
Woolly glycine	*Glycine tomentella*
Woolly spined burr	*Bassia lanicuspis*
Yabila grass	*Panicum queenslandicum*
Yellow burr	*Bassia anisacanthoides*
Yellow buttons	*Helichrysum ramosissimum*
Yellow everlasting	*Helichrysum bracteatum*
Yellow pea	*Vigna luteola*
Yellow rattlepod	*Crotalaria mitchellii*
Yellow three-awn	*Aristida anthoxanthoides*
Yellow wood sorrel	*Oxalis corniculata*
Zig-zag wattle	*Acacia macradenia*

by E.J. Turner and G.R. Beeston

S1 Vinetree (370 km²)



Land Unit and/or Associated Land System	W1, W2, W3	85	87	84	86	89	88	75	T, F, G Land Zones
Site and/or special comment		25, 62, 67, 68, 79	81	15, 73, 80, 204	63, 78, 295	85	82, 83, 351	105, 314, 328, 335	
Est. % of Land System	<1	60	<1	<5	20	<1	10	<2	

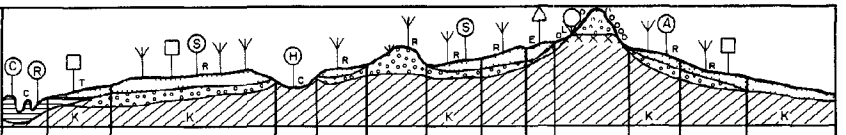
LANDFORM. Flat to very gently undulating plains on the outer margins of major alluvia.

GEOLOGY Recent alluvia, overlain by Quaternary deposits, Qs / Ca

SOILS Deep to very deep, earthy sands and texture contrast soils, Uc 1 23, Uc 5 11 (Duck Creek), Db 4 13, Dr 2 13, Db 1 13 (Garfield, Champion) Associated are deep, grey cracking clays in drainage depressions, Ug 5 26 (Sumnervale)

VEGETATION Gidgee, sandalwood open woodland and eastern dead finish/whitewood/boonaree/vinetree/wilga/bauhinia/sandalwood tall shrubland to low woodland and poplar box, wilga open woodland

M1 Arlington (3830 km²)



Land Unit and/or Associated Land System	W1—3	56	52	54	52	H1	52	55	E4	R1, 4	53	52	E—G Land Zones
Site and/or special comment		186, 225, 345	138, 152, 155, 167, 168, 170,187, 191, 202, 203, 209—15, 217—19	137, 153, 346				154			147		
Est. % of Land System		<5	80	5		<1		5	<1		<2		

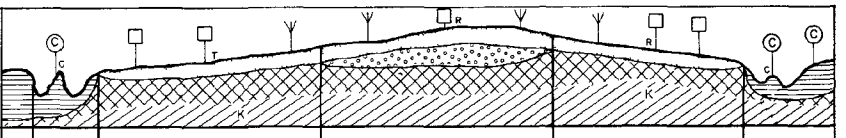
LANDFORM Flat to very gently undulating plains with slopes < 1½%. Grades into alluvial plains on lower slopes.

GEOLOGY Superficial Quaternary sandplain derived from Cainozoic and Mesozoic sediments. Qs.

SOILS Predominantly deep, red earths Gn 2.12 (Khyber, Yo Yo). Textures range from sandy loam to sandy clay loam at the surface to light clays at depth. Associated are texture contrast soils on upper slopes, Dr 2.12, Db 1.42 (Thrungli) and minor areas of gilgaied cracking clays, Ug 5.21 (Mendip) where the Qs cover has been removed.

VEGETATION: Mulga low open woodland with emergent poplar box or mulga/poplar box open woodland to poplar box/sandalwood open woodland. Occasionally gidgee low open woodland and brigalow open woodland.

M2 Bayswater (400 km²)



Land Unit and/or Associated Land System	A1	W3	56	52	56	W3
Site and/or special comment			186, 225, 345	205—15, 217—19		
Est. % of Land System	5	5	85	5		

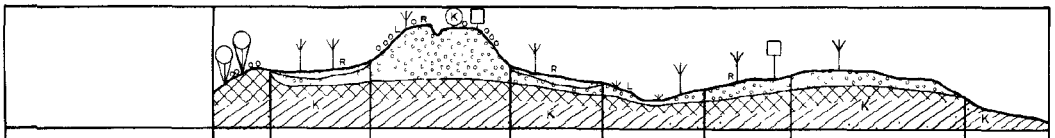
LANDFORM Flat to very gently sloping plains (run-on areas) with slopes < 1%.

GEOLOGY Superficial Quaternary sand deposits derived from Cainozoic and Mesozoic sediments. Qs and some alluvial deposits Ca.

SOILS Deep, loamy red earths Gn 2 12 (Khyber) and associated texture contrast soils Dr 2 13, Db 2 43 (Champion Cunnalama). Variable soil reaction.

VEGETATION Mulga low open woodland with emergent poplar box to poplar box - sandalwood open woodland. Occasionally gidgee low open woodland.

H1 Pinnacle (800 km²)



Land Unit and/or Associated Land System	R4	M1	58	M1	59	M1		G1, G3, B5
Site and/or special comment			206, 222, 228, 344	208—221	207			
Est. % of Land System			60	20	20			

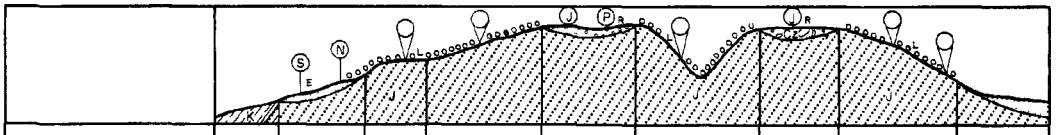
LANDFORM Gently undulating plains with convex slopes, grading to low ridges and dissected low hills.

GEOLOGY Remnants of Tertiary land surface, overlain in part by Quaternary deposits Qs / T

SOILS Very shallow to shallow, red earths Gn 2.12, Um 1.43 (Millray, Lumeah) on upper slopes and crests, with moderately deep, red earths down slope. Laterite is common on dissected hills. Ironstone gravel occurs on soil surface and may be present in the profile.

VEGETATION Mulga open scrub to low open woodland with emergent Dawson gum or mulga open woodland. Minor areas of mulga/bastard mulga tall open shrubland.

R1 Winooka (2020 km²)



Land Unit and/or Associated Land System	G, E, B Land Zones	63	95	62	64	62	64	62	M, H, R2, 3 Land Zones
Site and/or special comment		293, 308, 310, 318	110	43, 45, 113, 121, 146, 254, 257	61, 75	288, 309			
Est. % of Land System		25	<1	70	<5				

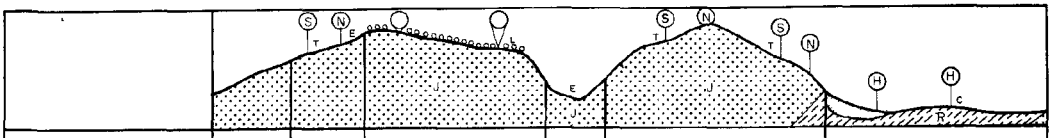
LANDFORM Scarps, cuestas, gently undulating tops of dissected tablelands, mesas and buttes, gorges. Slopes range from less than 5% on tableland tops to 50% on scarps.

GEOLOGY Various geology beds including eroded Tertiary and various Jurassic beds.

SOILS Very shallow, acid, lithosols, Uc 1. (Neverfail). On lower slopes, shallow to moderately deep texture contrast soils and sandy yellow earths occur, Dy 2.41, Gn 2.21 (Caldervale, Sydenham). On flat tops and isolated mesas, moderately deep to deep, earthy sands and yellow earths, Uc 5.22, Gn 2.22 (Carbean, Devenish). Ironstone gravel, rock outcrops are common.

VEGETATION Bendee, lancewood low woodland to woodland on upper slopes with silver-leaved ironbark and narrow-leaved ironbark open woodland on the lower slopes. Minor occurrences of yellowjack, tea-tree, *Acacia* spp. tall open shrubland on mesas tops.

R2 Andurba (530 km²)



Land Unit and/or Associated Land System	R1, E4	63	62	65	63	B3
Site and/or special comment		293, 308, 310, 318	43, 45, 113, 121, 146, 254, 257	343		
Est. % of Land System		75	15	<10		

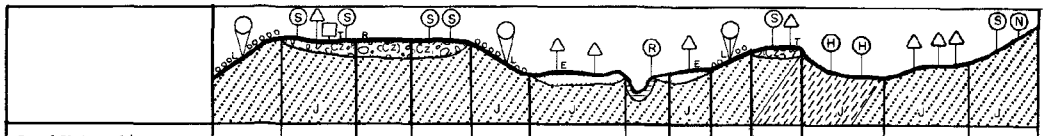
LANDFORM Dissected terrain of the Great Dividing Range complex.

GEOLOGY Little weathered quartz sandstones of the lower Jurassic beds. Jlb, Jlp.

SOILS Very shallow rocky soils, Uc 1 (Neverfail) grading to earthy sands on valley floors. Extensive outcrops.

VEGETATION Lancewood, bendee low woodland to woodland on the scarps with silver-leaved ironbark (open) woodland, to wedding bush shrubland on valley floors.

R3 Adori (40 km²)



Land Unit and/or Associated Land System	62	66	67	66	62	E4	W2	E4	62	66	B1	E4	R2
Site and/or special comment	121, 257, 288, 309	338	356										
Est. % of Land System	5	80	10			<5							

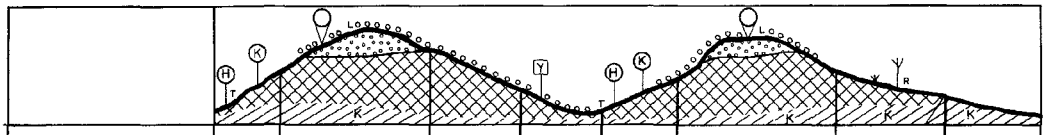
LANDFORM: Mesas and buttes with slopes < 1% on mesa tops to 15% on scarps.

GEOLOGY Poorly consolidated clayey sandstones. Cz.

SOILS: Shallow, acid, sandy surfaced texture contrast soils, Dy 2.41, Dy 3.41 (Caldervale) and shallow red earths Gn 2.12 (Milray). Sheet erosion is common on the red earths with gully erosion prominent near mesa edges.

VEGETATION Silver-leaved ironbark, cypress pine open woodland to bendo / *Acacia triptera* tall open shrubland.

R4 Noella (210 km²)



Land Unit and/or Associated Land System	28	61	96	29	30	61	H1, 59	G3, B5
Site and/or special comment	108	375	G15	111	180, 188		207	
Est. % of Land System	<2	40	30	20	<2		<5	

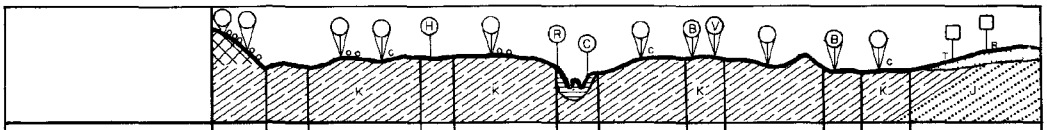
LANDFORM. Scarps, undulating tops of dissected tablelands, mesas and buttes. Slopes range from < 5% on undulating tops to 50 - 60% on scarp faces.

GEOLOGY. Chemically altered Cretaceous sediments in part overlain by Tertiary Glendower Formation, with superficial Quaternary covering.

SOILS Shallow, acid, loamy lithosols, Um 1.43 (Lumeah). Much gravel, weathered rock and silcrete present.

VEGETATION: Bendee low woodland on the tops of tablelands. Mulga, bastard mulga, bowyakka tall open shrubland with lancewood on the scarps. Mountain yapunyah, brigalow, blackbutt open woodland on the lower slopes.

G1 Evora (2830 km²)



Land Unit and/or Associated Land System	R Land Zone	F Land Zone	15	18	15	W3, W1	15	T2, T1	15	14	15	E Land Zone
Site and/or special comment			20, 33, 66, 71, 136, 139, 144, 156, 158, 159, 166, 175, 189, 200	7, 36, 38, 41, 104, 123, 124, 133, 134, 145, 193	233, 236, 237, 238, 239, 241, 242, 298					69,70, 177, 341, 352		
Est. % of Land System			90	5		2		<1		2		

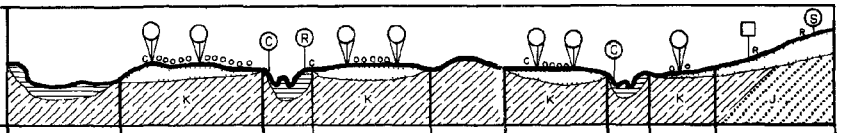
LANDFORM Gently undulating plains with slopes ranging from 0 5 to 3%.

GEOLOGY Fresh, labile Cretaceous sediments which may be overlain in part by Quaternary sand cover. Kla, Klc, ± Qs.

SOILS: Deep, alkaline, brown and grey cracking clays with soft, weakly self-mulching surfaces, Ug 5 31, Ug 5.32, Ug 5.22 (Romulus). Gilgais are weakly to moderately developed. Textures are medium to heavy clays. Stone cover variable.

VEGETATION: Gidgee, wilga open woodland to low open woodland or gidgee, sandalwood open woodland to low open woodland. Occasionally gidgee tall shrubland.

G2 Blendon (520 km²)



Land Unit and/or Associated Land System	L Land Zone	16	W3	16	F Land Zone	16	W3	16	E Land Zone
Site and/or special comment		249, 252, 385, 386, 387							
Est. % of Land System		85	5						10

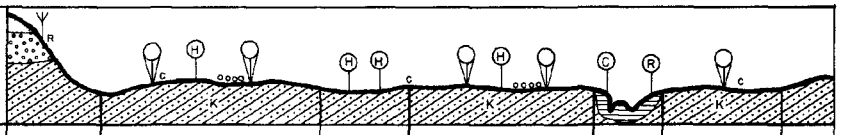
LANDFORM Flat to very gently undulating plains with slopes 0.5 - 1%.

GEOLOGY Fresh, labile Cretaceous sediments with Quaternary sand cover. Qs / Kla. Some local alluvial influence, Qa.

SOILS Deep, alkaline, brown, cracking clays, Ug 5.31 (Romulus) with weak to moderate gilgai development. Stone cover is more pronounced than in G1, with parent material outcropping in places, layering of soils occurs near alluvia. Closely associated are texture-contrast soils, Dr 2.43, Dy 2.43 (Cunnalama).

VEGETATION Gidgee low woodland with the shrub layer consisting mainly of sandalwood.

G3 Woolga (520 km²)



Land Unit and/or Associated Land System	H, M Land Zones	17	31	17	W3	17	T1
Site and/or special comment		243, 342, 347	244, 245, 246				
Est. % of Land System		85	<10		<2		5

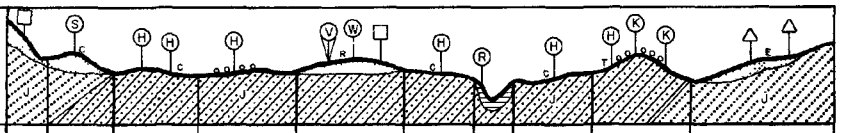
LANDFORM Gently undulating plains with slopes < 1%.

GEOLOGY: Fresh, labile Cretaceous sediments, Winton Formation. Kw.

SOILS. Deep, alkaline, brown cracking clays, Ug 5.31, Ug 5.32, Ug 5.36 (Romulus) with soft, self-mulching surfaces. Gilgai development is variable and stone cover is light except in the scarp retreat zone.

VEGETATION: Gidgee, brigalow, sandalwood low woodland to woodland.

B1 Unavale (2480 km²)



Land Unit and/or Associated Land System	E1 - 2	21	18	19	20	18	W2	18	30	E4
Site and/or special comment		115, 266, 334	7, 36, 38, 41,104,123, 124, 133, 134, 145	135, 271, 272, 289, 333, 340	107			193, 194, 229	109, 179, 180, 188	
Est. % of Land System		5	65	10	<5		<5		<10	<5

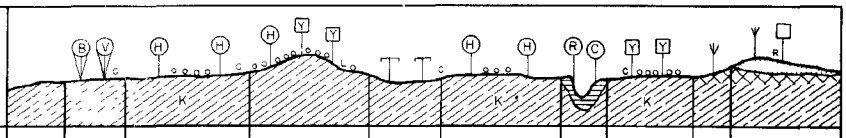
LANDFORM· Gently undulating plains, with ridges following the resistant sandstone beds.

GEOLOGY Predominantly Jurassic sandstones, Birkhead Formation, Jmb, which may be overlain by Quaternary sands, Qs.

SOILS. Moderately deep to deep, grey and brown cracking clays with weak to moderate gilgai development. Stone cover is light. Ug 5.13, Ug 5.14, Ug 5.31, Ug 5.21 (Mendip, Connemarra). Associated are shallow clays, Uf 6.34 (Bayrick) on strike ridges and loamy red earths Gn 2.12 (Khyber) on crests. Texture contrast soils, Dy 2.43, Db 1.13, (Cunnalama) are associated throughout.

VEGETATION. Brigalow, belah open woodland to woodland and brigalow, sandalwood low open woodland to woodland. Silver-leaved ironbark/ eastern dead finish, low woodland on ridges.

B2 Mareto (510 km²)



Land Unit and/or Associated Land System	F3, T2	57	22	23	6	22	W3	24	H1	M1
Site and/or special comment		177	178, 182, 183	184	112, 161, 264			192		
Est. % of Land System		<5	75	10	<2		<2	5		

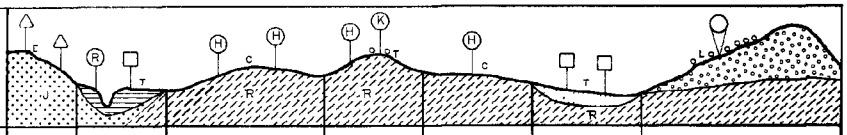
LANDFORM. Gently undulating plains with slopes to 2%.

GEOLOGY· Fresh, tabile Cretaceous sediments. Klc, Kld.

SOILS: Deep, grey and brown cracking clays with weak gilgai development, Ug 5.13, Ug 5 31 (Mendip, Connemarra). Associated are brown plastic clays, Uf 6.31, (Bayrick) on ridges. Stone pavements are common in the open glade areas and on r dges.

VEGETATION. Brigalow, boonaree tall shrubland with brigalow, mountain yapunyah low woodland on low rises. Occasionally mountain yapunyah woodland on flat run-on areas.

B3 Marsten (450 km²)



Land Unit and/or Associated Land System	E4 or R1	W2	25	26	25	33	R Land Zone
Site and/or special comment			47, 49, 50, 52, 265, 305	51, 53, 306		382	
Est. % of Land System	<1	<2	60	<20		15	

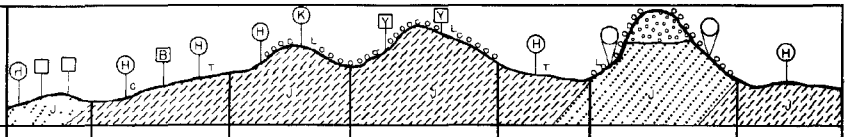
LANDFORM Flat to gently undulating plains with slopes to 3%.

GEOLOGY Triassic Moolayember Formation covered in part by Quaternary sands Rm + Qs. Stone cover is light except in scarp retreat zone.

SOILS Deep, grey and brown cracking clays with weak to moderate gilgai development, Ug 5.11, Ug 5.31 (Mendip). Associated are texture contrast soils on low ridges, Db 2.13, Dv 2.12 (Cunnalama, Thrungli).

VEGETATION Brigalow, sandalwood woodland and brigalow, Dawson gum open woodland on rises. Poplar box woodland on sandy flats.

B4 Highlands (890 km²)



Land Unit and/or Associated Land System	E5	28	30	29	28	R Land Zone	B1
Site and/or special comment		37, 40, 108	109, 179, 180, 188	111			
Est. % of Land System	5	65	20	10			

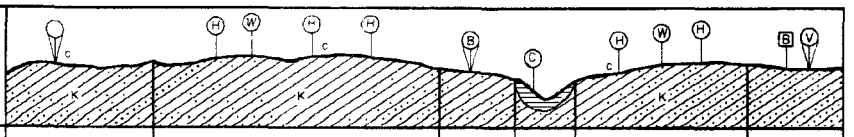
LANDFORM Undulating plains, scarp retreats of dissected residuals. Slopes vary from 2% to 20%.

GEOLOGY Eroded sediments of Jurassic sandstones Juw. Weathered and fresh sediments may be exposed. Quaternary sand deposits occur in some areas. Stone cover is common.

SOILS A mosiac of very shallow to shallow, brown clays, Uf 6 31 (Windeyer) and texture contrast soils Db 1 32, Dr 2.12 (Thrungli) with lithosols Um 1 (Neverfail) on ridges. Exposed rocks and stone pavements are common throughout. Sheet and gully erosion are common.

VEGETATION Sparse herbfields with scattered brigalow and sandalwood to brigalow tall shrubland and emergent Dawson gum. Mountain yapunyah open woodland on stony hills.

B5 Stirton (280 km²)



Land Unit and/or Associated Land System	17	31	14	W3	31	T1
Site and/or special comment	243, 342, 347	244, 245, 246	341, 352			
Est. % of Land System	<1	95	<1	<1		<1

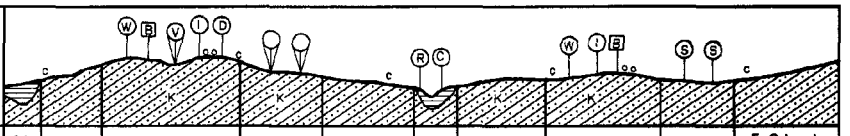
LANDFORM: Gently undulating plains with slopes < 2%.

GEOLOGY: Fresh, labile Cretaceous sediments, Winton Formation, Kw.

SOILS: Moderately deep, grey cracking clays with incipient gilgai development Ug 5.11 (Mendip). Associated are shallow plastic clays on upper slopes, Uf 6.31 (Bayrick). Scattered pebble cover occurs throughout.

VEGETATION: Brigalow tall open shrubland with emergent whitewood.

T1 Mackunda (1660 km²)



Land Unit and/or Associated Land System	A1, S1	1	9	11	12	3	13	9	11	F, G Land Zones
Site and/or special comment		16, 19, 23, 28, 29, 65, 88, 92, 93	22, 26, 27, 89, 142 144, 234, 235	91	173, 205	100	90		190	
Est. % of Land System		<5	75	<5	<5	<1	<5		10	

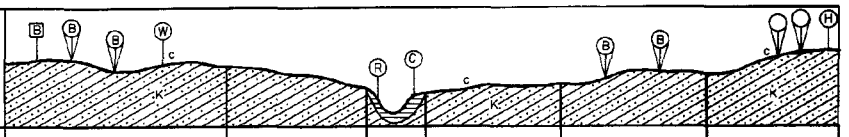
LANDFORM: Gently undulating plains with slopes to 3%.

GEOLOGY: Fresh, labile sediments of Cretaceous Mackunda Formation, Klm.

SOILS: Shallow, alkaline, plastic clays and associated texture contrast soils, Uf 6.31 (Bayrick). Occasional sandstone floaters on soil surface. Deeper, gilgaied clays, Ug 5.21 (Landsdowne) and Ug 5.31 (Romulus) occur downslope. Weathered limestone outcrops occur throughout.

VEGETATION: Mitchell grass wooded open tussock grassland to tall shrubland of vine tree/eastern dead finish/bauhinia and western bloodwood. Silver-leaved ironbark open woodland in some areas. Small areas of gidgee low open woodland also occur.

T2 Navena (530 km²)



Land Unit and/or Associated Land System	14	F1—3	3	F1—3	14	G1, 3 B2, 5
Site and/or special comment	69, 70, 177, 341, 352		100			
Est. % of Land System	85	<15	<1			

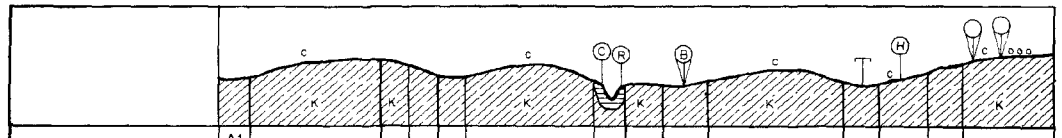
LANDFORM: Flat to gently undulating plains with slopes < 2%.

GEOLOGY: Fresh Cretaceous sediments.

SOILS: Moderately deep to deep, grey and brown cracking clays with soft, self-mulching surfaces, Ug 5.26 (Warrah). Profile is alkaline throughout with lime and gypsum present in the profile. Ironstone pebbles scattered on soil surface.

VEGETATION: Mitchell grass, boree wooded open tussock grassland to boree woodland or boonaree woodland.

F1 Allaru (2660 km²)



Land Unit and/or Associated Land System	A1 S1 T1	1	T2	1	2	1	3	4	5	1	6	8	F2	G Land Zone
Site and/or special comment		16, 19, 23, 28, 29, 65, 88, 92, 93, 99, 101, 103, 127, 130, 141, 143, 163			18, 30, 94, 128, 132		100	24 31 64, 102, 164	32, 161, 264		112, 165, 185	87, 97 174, 199, 250		
Est. % of Land System	<1	80	<1		<1		<5	<5	<5		<1	<1	<1	

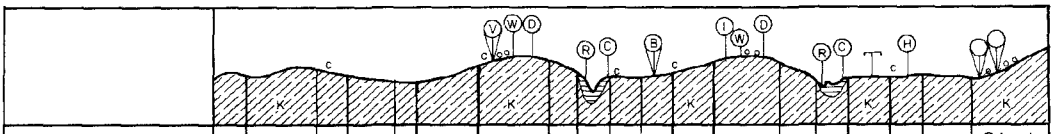
LANDFORM Gently undulating plains with long slopes ranging from 0 5 to 2%, and averaging 1½%.

GEOLOGY· Fresh, labile sediments of the Cretaceous Allaru Mudstones. Kla.

SOILS Moderately deep to deep, alkaline, grey and brown cracking clays with strongly self-mulching surfaces, Ug 5.22, Ug 5.24, Ug 5.26, Ug 5.32 (Northampton). Linear gilgais may develop upslope, Ug 5.13, Ug 5.22 (Landsdowne) and mottling occurs under myall/boree clumps, Ug 5.26, Ug 5.22 (Warrah). Gravel beds may occur on local alluvia. Scalds occur on local alluvia, Ug 5.24 (Tambo).

VEGETATION Mitchell grass open tussock grassland to tussock grassland with Mimosa bush conspicuous along drainage lines. River red gum/ coolibah fringe local creeks. Sparse herbfields occur on scalded areas Myall / boree / brigalow may occur as isolated clumps.

F2 Coreena (1540 km²)



Land Unit and/or Associated Land System	F1	1	T2	1	2	1	7	1	3	4	5	1	7	1	W3	6	8	F3	G Land Zone
Site and/or special comment		16, 19, 23, 28, 29, 65, 88, 92, 93, 99, 101, 103, 127		130, 141, 143, 163	18, 30, 94, 128		95, 98, 176, 296		100	31, 64, 102, 164	32, 164, 264					112, 165, 185	87, 97, 174, 199		
Est. % of Land System		70	<1		<1		<10		<5	<5	<5				<1	<2	<1		

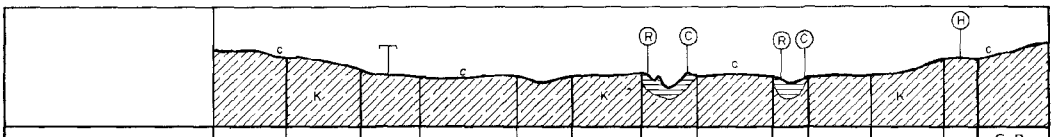
LANDFORM Gently undulating plains with long slopes ranging 0.5 to 2% and averaging 1½%. Rubbly outcrops occur on crests.

GEOLOGY Fresh, labile sediments of the Cretaceous Coreena Member, Klc.

SOILS Moderately deep to deep, alkaline, grey and brown cracking clays with strongly self-mulching surfaces, Ug 5.21, Ug 5.22, Ug 5.32 (Northampton). Linear gilgais may develop up slope, Ug 5.22 (Landsdowne). Shallow, plastic clays occur on the sandstone outcrops Uf 6 31 (Bayrick). Scalds occur on local alluvia, Ug 5.24, Ug 5.34 (Tambo).

VEGETATION. Mitchell grass open tussock to tussock grassland with Mimosa bush, gundabluey conspicuous in places. Wooded open tussock grassland or tall open shrubland occur on the rubbly sandstone outcrops (trees include boonaree, whitewood, ironwood, bauhinia and eastern dead finish).

F3 Doncaster (650 km²)



Land Unit and/or Associated Land System	T2, F2	1	6	4	2	A1	W1, W3	4	3	4	1	8	G, B Land Zones
Site and/or special comment		16, 19, 23, 28, 29, 65, 88, 92, 93	112, 165, 185	24, 31, 64, 102, 164	18, 30, 94, 128, 132				100		99, 101, 103, 127, 130, 141	87, 97, 174, 199	
Est. % of Land System		60	<2	<15	<1	<10	<5		<5			<1	

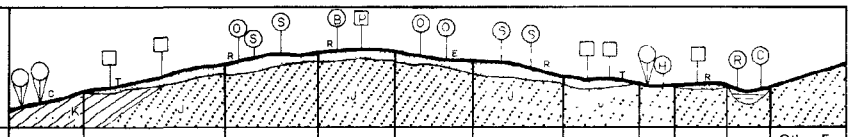
LANDFORM Flat to very gently undulating plains with long slopes to 1%

GEOLOGY Fresh, labile sediments of Cretaceous Doncaster Member Kld

SOILS Moderately deep to deep alkaline grey and brown cracking clays Ug 5 21 Ug 5 31 (Northampton) with extensive scalding on local alluvia and run-on areas. Ug 5 27 Ug 5 24 Ug 5 34 (Tambo)

VEGETATION Mitchell grass open tussock grassland to tussock grassland *Bass a* sparse herbfields occur on the extensive scalds Mimosa bush and needlewood are common on lower slopes Coolibah/river red gum fringe local creeks

E1 Yalleroi (2390 km²)



Land Unit and/or Associated Land System	G Land Zone	33	32	34	35	32	33	G1, B1	33	W2	Other E Land Systems, R, B
Site and/or special comment		11, 34, 299, 303, 353	4, 9, 10, 12, 35, 72, 74, 255, 304, 312, 313	300, 301, 302	247						
Est. % of Land System		30	50	10	<5			<2		<5	

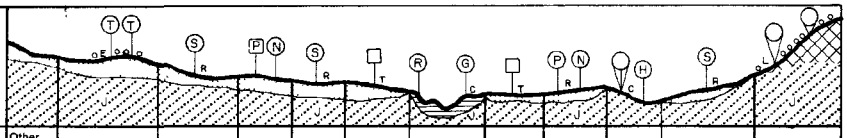
LANDFORM Flat to very gently undulating plains with slight slopes and an indistinct drainage pattern.

GEOLOGY Quaternary sandplain derived from Mesozoic sediments Qs

SOILS Moderately deep, texture contrast soils on lower slopes, Dy 3 22, Dy 4 43, Dr 2 43 (Stratford, Thrungli, Cunnalama) grading to moderately deep to deep, red earths on upper slopes and crests, Gn 2 12 (Erne, Rosefield). Associated are minor areas of grey cracking clays where the underlying sediments have been exposed, Ug 5 21 (Romulus, Mendip).

VEGETATION. Silver-leaved ironbark open woodland to woodland on upper slopes with poplar box open woodland to woodland on lower slopes. Minor areas of desert gum-bloodwood woodland and desert oak/Hakea open woodland. Occasionally brigalow or gidgee tall open shrubland in depressions.

E2 Wololla (2800 km²)



Land Unit and/or Associated Land System	Other E Land Systems	36	37	38	93	39	W2, W4	39	38	G2, B1	37	R Land Zone
Site and/or special comment		258, 259, 323	270, 276, 284, 315, 319, 321	58, 76, 311	364	57, 280, 320, 324					322	
Est. % of Land System		<2	45	15	<2	35	<2			<2		

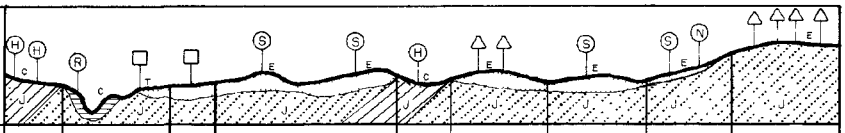
LANDFORM Gently undulating plains with slopes < 3%. Drainage system well developed

GEOLOGY Quaternary sandplain derived from Cainozoic and Mesozoic sediments Qs

SOILS Moderately deep to deep texture contrast soils on lower slopes, Dr 2 33, Dy 5 42 (Lancevale, Stratford, Rosemount) grading to red earths Gn 2.12 (Tilbury) and yellow earths Gn 2 22 (Carbean) on upper slopes and crests. Pisolitic ironstone occurs on the soil surface and throughout the profiles of shallow, strongly acid earths on crests, Gn 2 21 (Sydenham)

VEGETATION Silver-leaved ironbark open woodland to woodland on upper slopes with poplar box open woodland in drainage lines. Desert gum open woodland on shallow low rises and tea-tree open shrubland on interfluves and stony crests

E3 Lisgool (210 km²)



Land Unit and/or Associated Land System	B1	W2	33	40	B1	43	40	63	E4
Site and/or special comment			11, 34, 299, 303	44, 122, 290, 292		117, 307, 337, 339		293, 308, 310, 318	
Est. % of Land System		5	5	70	<1	5		15	

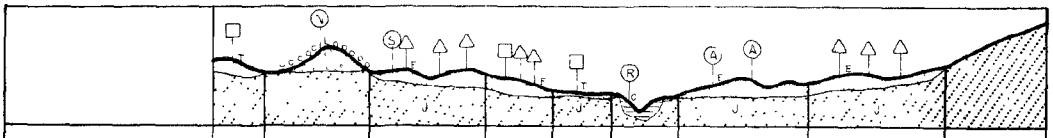
LANDFORM Gently undulating plains with slopes becoming steeper near the associated scarps.

GEOLOGY Quaternary sandplain derived from Mesozoic sediments. Qs.

SOILS Moderately deep to deep, loose surfaced, sandy yellow earths and associated texture contrast soils, Gn 2 21 (Sydenham) and Dy 5.51 (Rosemount), with minor earthy sands, Uc 5.11 (Tarabah).

VEGETATION Silver-leaved ironbark, budgeroo woodland with poplar box open woodlands along drainage lines. Minor occurrences of cypress pine woodland on low sandy rises. Minor area of narrow-leaved ironbark woodland to open woodland in scarp retreat zone.

E4 Kelpurn (1160 km²)



Land Unit and/or Associated Land System	E3, 5 B1	41	43	42	44	W2	75	43	R1, 2, 3 M1
Site and/or special comment		120, 348	117, 307 337, 339	42, 46, 106 116, 292	336, 355		105 314 328		
Est. % of Land System		<1	60	20	10	<5	<5		

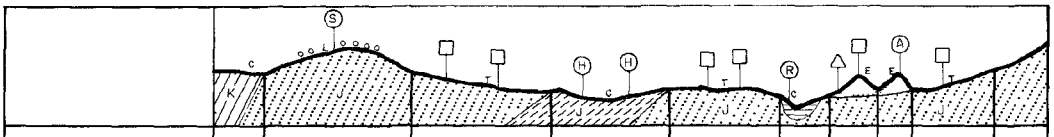
LANDFORM Gently undulating to undulating plains with occasional low rocky rises

GEOLOGY Jurassic Hutton Sandstones Jlh overlain in part by Quaternary deposits, Qs

SOILS Deep to very deep, earthy sands, sandy surfaced texture contrast soils and siliceous sands Uc 5 21, Uc 1 21 (Tarabah) and Dy 5 51, Dr 4 12 (Rosemount). Gravel pavements occur on remnants of Tertiary hills Shallow texture contrast soils with gravel layers below the A horizon occur near local alluvia. Db 2 43, Dr 2 43 (Cunnalama)

VEGETATION Cypress pine woodland with silver-leaved ironbark and poplar box, sandalwood open woodland throughout Minor areas of narrow-leaved ironbark, budgeroo open woodland on low stony hills

E5 Gartmore (1510 km²)



Land Unit and/or Associated Land System	G1, F3 or M1	40	45	B1	45	W2	42	75	45	B4, R1
Site and/or special comment		294	354	104			106, 116, 282	145, 314, 328, 335		
Est. % of Land System		<5	60	30		<5	<1	<1		

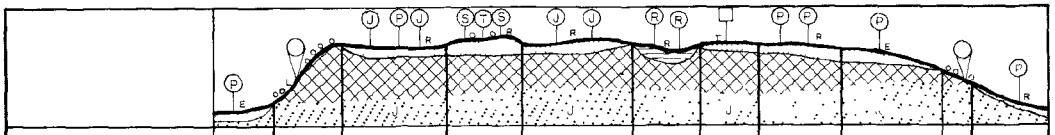
LANDFORM Gently undulating to undulating plains, grading into scarp retreat zones of dissected residuals.

GEOLOGY Jurassic Hooray Sandstones which may be overlain in part by Quaternary deposits. Jkh± Qs cover.

SOILS Moderately deep to deep, texture contrast soils, Db 1 33 (Jericho) with moderately deep brown clays in brigalow areas Uf 6 31 (Windeyer). Uc 1 occurs on stony crests and scarps. These soils are subject to erosion.

VEGETATION Poplar box shrubby open woodland with brigalow low open woodland occurring throughout. Minor areas of lancewood open woodland on low rises

E6 Grant (740 km²)



Land Unit and/or Associated Land System	E7	R1	94	49	94	48	51	46	47	R1	E7
Site and/or special comment			273, 275	274		266	358	253, 269, 277	262 265, 268		
Est. % of Land System		<5	50	20		1	<2	<10	<10		

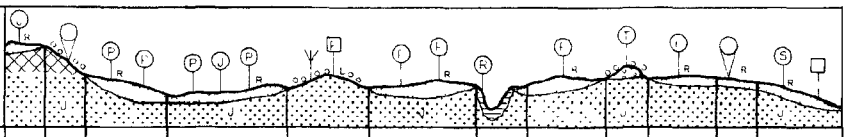
LANDFORM Flat to very gently undulating tops of tablelands and mesas

GEOLOGY Jurassic Ronlow Beds overlain by Quaternary sand deposits Q, Jkr

SOILS Predominantly deep sandy red earths Gn 2 12 (Alice) associated with shallow red earths and [illegible] on low rises Gn 2 12, Um 1 41 ((Milray). Ironstone shot occurs on soil surface Pisolitic ironstone may occur on surface and at base of profile

VEGETATION Groved yellowjack bloodwood woodland with [illegible] Occasionally poplar box desert gum open woodland and silver-leaved ironbark woodland

E7 Busthmia (1840 km²)



Land Unit and/or Associated Land System	E6	R1	46	47	50	47	W2	46	36	46	62	E1, 2, 3
Site and/or special comment			86, 253, 269, 277	262, 265, 268	248				258, 259, 323		254	
Est. % of Land System			25	60	<1		<5		<5		<5	

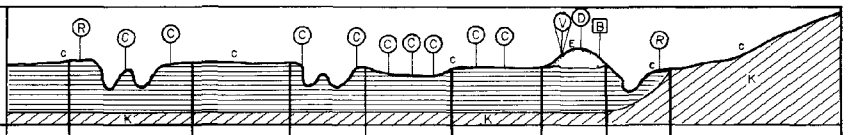
LANDFORM Gently undulating to undulating plains which merge into the Alice Tableland

GEOLOGY Quaternary sand deposits formed by fluvial and aeolian reworking of colluvium of the adjacent elevated tableland. Qs.

SOILS Moderately deep to deep, sandy red earths Gn 2 12 (Alice) with shallow variants on low crests, Gn 2 11 (Rosefield). Um 5 31 (Milray) occur on low rises of weathered rock. These are subject to severe erosion

VEGETATION Groved,bloodwood, yellowjack shrubby open woodland with tea-tree, bendo shrubby open woodland.

W1 Barcoo (80 km²)



Land Unit and/or Associated Land System	A1	68	69	68	70	79	S1	68	T, F, G Land Zones
Site and/or special comment		151	148, 149, 278		150	357			
Est. % of Land System	<10	10	>40		<5	20	<10		

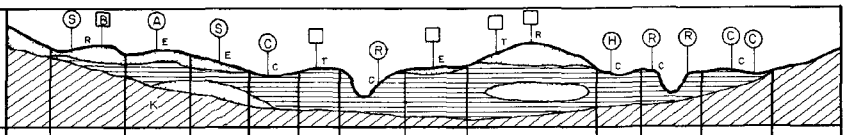
LANDFORM Flat alluvial plains with braided channels and deep waterholes.

GEOLOGY Recent alluvia. Qa

SOILS Predominantly alluvial grey clays with a surface crust of silt and sand. Sand seams occur in profiles, Ug 5.17 (Duneira). Associated are very deep clays subject to scalding, Ug 5.15, Ug 5.24 (La Plata). Associated are poorly drained, grey clays in the coolibah depressions, Ug 5, 17 (Duneira).

VEGETATION Coolibah / river red gum shrubby to grassy open woodland on the channels and alluvial plains with open herbfields on the scalded, interchannel areas.

W2 Nive (1430 km²)



Land Unit and/or Associated Land System	E Land Zone	76	75	74	78	44	71	72	73	77	71	79	W4, M1
Site and/or special comment		330	105, 314, 328, 335, 350	59, 77, 125	349	355, 356	17, 39, 359	118, 119, 126, 172, 195, 271, 317, 327	157, 169, 283 331	329		337	
Est. % of Land System		<2	<5	15	<1	<1	10	20	30	<10		<5	

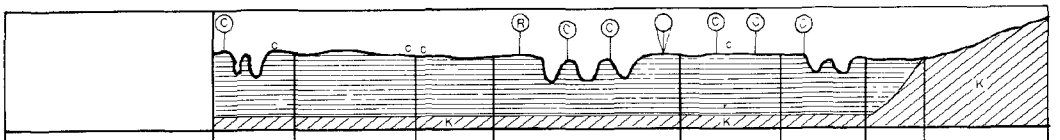
LANDFORM Predominantly single channel creeks and flat alluvial plains draining the desert country

GEOLOGY Recent alluvium which may be overlain in part by sand deposits Qs / Qa

SOILS Predominantly coarse textured soils Loose sandy red earths and earthy sands on levee remnants Gn 2 12 Uc 1 43, Uc 5 11 (Duck Creek, Rosefield) grading to moderately deep texture contrast soils Dy 3 43 Dr 2 43 (Jericho) Soils on lower slopes include gilgaied grey cracking clays Ug 5 21 (Tumbar) and Ug 5 17 (Duneira)

VEGETATION River red gum tea-tree river oak shrubby open woodland on the channel with poplar box silver-leaved ironbark open woodland to woodland on upper slopes Moreton Bay ash angophora open woodland on sand sheets Coolibah and brigalow open woodland to woodland occur on the flood plain.

W3 Ravensbourne (950 km²)



Land Unit and/or Associated Land System	W1	84	69	80	81	80	A1	T, F, G Land Zones
Site and/or special comment		15, 73, 80, 160, 204	148, 149, 278	14	13			
Est. % of Land System	10	35	5	30	20			

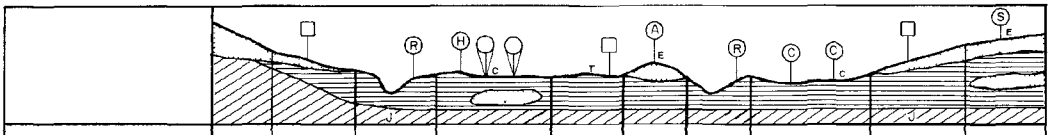
LANDFORM Flat alluvial plains with braided channels.

GEOLOGY Recent alluvia. Qa.

SOILS Deep to very deep, alkaline, grey cracking clays Ug 5.11, Ug 5.24 (Sumnervale, Douglas Ponds) with scalds occurring on interchannel areas Ug 5.24 (La Plata). Deep, mottled, grey clays occur in coolibah drainage depressions.

VEGETATION Coolibah / river red gum low open to open woodland on the channels. Mitchell grass wooded open tussock grassland to tussock grassland or herbfield on the alluvial plains.

W4 Jordan (410 km²)



Land Unit and/or Associated Land System	E2, E7	73	83	82	72	75	83	79	73	74
Site and/or special comment		157, 169, 283	316	256, 263, 281, 282	118, 126, 172, 291, 317	105, 314, 328		357		125
Est. % of Land System		15	10	60	<5	<5		<1		<5

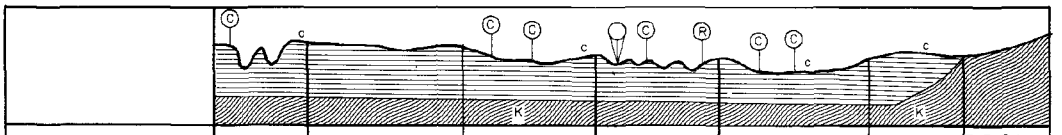
LANDFORM Flat alluvial plains with main channel Gilgaied plains subject to seasonal flooding

GEOLOGY Recent alluvia Qa, with some sand deposits Qs

SOILS Deep, grey cracking clays, Ug 5 21, Ug 5 22 (Tumbar) with moderate gilgai development Closely associated are texture contrast soils which occur on outer margins and are not subject to flooding, Dy 2 43, Dr 2 43 (Jericho) Earthy sands occur on levee remnants or sand sheets, Uc 5 11 (Duck Creek).

VEGETATION Gidgee, sandalwood low woodland with poplar box, sandalwood woodland on levees. Coolibah, brigalow woodland occurs on flood plain.

W5 Fanning (80 km²)



Land Unit and/or Associated Land System	W1	84	81	W3	81	69	T, F, G Land Zones
Site and/or special comment		15, 73, 80, 84, 160, 204, 216	13			148, 149, 278	
Est. % of Land System	5	5	80	5		5	

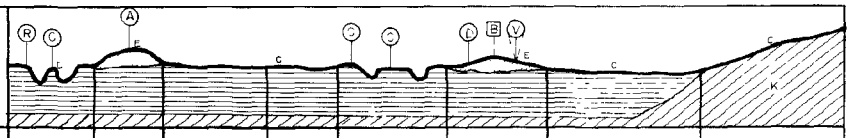
LANDFORM Flat plains adjacent to major alluvia broad drainage depressions

GEOLOGY Recent alluvia Qa

SOILS Deep, greyish brown cracking clays Ug 5 22 (Douglas Ponds) Mottling is common at depth Scalding occurs throughout Ug 5 24 (La Plata).

VEGETATION Coolibah open woodland

A1 Mineeda (820 km²)



Land Unit and/or Associated Land System	W3	75	84	4	W1	S1	84	T, F, G Land Zones
Site and/or special comment		105, 314, 328, 335, 350	15, 73, 80, 84, 160, 204, 216	31, 64, 102				
Est. % of Land System	<5	<2	80	5	<5	<2		

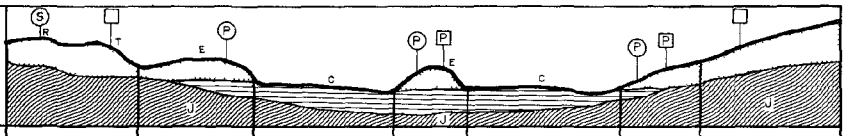
LANDFORM Flat plains adjacent to major drainage lines Subject to occasional flooding. Slopes ~ 1%.

GEOLOGY Recent alluvia, Qa.

SOILS Deep to very deep, brown and grey cracking clays with self-mulching surfaces, Ug 5 31, Ug 5 32, Ug 5 21 (Douglas Ponds). Scalding occurs throughout, Ug 5 34 (La Plata).

VEGETATION Mitchell grass open tussock grassland to tussock grassland Sparse herbfields occur on the scalded areas

L1 Thornhill (30km²)



Land Unit and/or Associated Land System	E2	91	90	91	90	91	E2
Site and/or special comment		261	260				
Est. % of Land System		20	80				

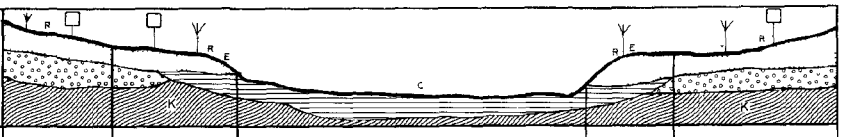
LANDFORM Flat claypans receiving run-on water from adjacent "desert" country Low wind-blown sand rises occur throughout.

GEOLOGY Recent alluvia with sand deposits Qa Qs

SOILS Deep, alluvial texture contrast soils and mottled, grey clays in the depressions, Dy 5 23 (Garfield), Ug 5 24 (Duneira) Associated are deep, siliceous sands on low rises. Uc 5 11 (Duck Creek)

VEGETATION Porcupine spinifex hummock grassland in the claypan with bloodwood woodland and occasionally desert gum open woodland on sandy rises.

L2 Koorangie (5km²)



Land Unit and/or Associated Land System	M1	56	92	56	M1
Site and/or special comment		376	377		
Est. % of Land System		10	90		

LANDFORM Flat claypans with distinct lunettes.

GEOLOGY Recent alluvia, intermixed with sand deposits Qa, Qs

SOILS Poorly drained mottled grey clays Ug 5 2 with texture contrast soils on low sandy rises Dy 2.

VEGETATION Sparse herbfields fringed by mulga open woodland

LAND UNITS

by E.J. Turner, G.R. Beeston and C.R. Ahern

LAND UNIT 1

LANDFORM: Gently undulating plains with long slopes to 2%.

GEOLOGY: Fresh sediments of the Cretaceous *Rolling Downs Group. Winton Formation, Mackunda Formation, Allaru Mudstone, Coreena Member, Doncaster Member.* Labile sandstones, mudstones and siltstones.

SOILS: Moderately deep to deep, grey and brown cracking clays with strongly self-mulching surfaces. The surface soil may exhibit a thin surface crust. The profile is neutral to slightly alkaline at the surface usually becoming strongly alkaline at depth. $CaCO_3$ and gypsum are present in the profile. Linear gilgais may develop on mid slopes. Ug 5.21, Ug 5.22, Ug 5.26, Ug 5.31, Ug 5.32.

Organic carbon (C) and total nitrogen (N) levels are low to fair. Replaceable and exchangeable potassium (K) levels are high. Acid extractable phosphorus (A.P.) varies from low to very high, while bicarbonate extractable phosphorus (B.P.) is low to fair. The soils have high cation exchange capacity (C.E.C.) and clay content and are predominantly montmorrillonitic.

They have very high available soil water capacity (A.W.C.) values. Very high salt content may occur beyond 30 cm due to gypsum but chloride levels are low to medium.

Northampton - Representative soil analysis: 16, 28, 103, 130.

VEGETATION: Mitchell grass open tussock grassland to tussock grassland. *Astrebla* species predominate, short grasses and forbs occur. Trees are rare. Low shrubs do occur, but a low shrub layer is not well developed.

LOW SHRUB LAYER: Ht 2 m, PFC <2%.

Frequent spp: *Acacia farnesiana, A. victoriae, Heterodendrum oleiofolium, Acacia pendula.*

GROUND LAYER: Ht 1 m, PFC (variable) 30 $\pm$ 20%.

Predominant spp: *Astrebla eleymoides, A. lapaccea.*

FORBS:

Frequent spp: *Boerhavia diffusa, Malvastrum americanum, Polymeria marginata, Sida fibulifera.*

Infrequent spp: *Abutilon malvifolium, Atriplex muelleri, Bassia calcarata, B. quinquicuspis, B. tetricuspis, B. anisacanthoides Convolvulus erubescens, Crotalaria dissitiflora, Daucus glachidiatus, Desmodium varians, D. campylacaulon, Euphorbia drummondii, Flaveria australasica, Glycine clandestina, Goodenia strangfordii, G. lunatus, Ipomoea lonchophylla, Opuntia inerme, Oxalis corniculata, Portulaca* sp. aff. *oleracea, Phyllanthus maderaspatensis, Psoralea tenax, Rhynchosia minima, Salsola kali, Sida trichopoda, Solanum esuriale, S. quadriloculatum, Tribulus terrestris, Teucrinum racemosum, Verbena officinalis.*

GRAMINOIDS:

Infrequent spp: *Aristida obscura, A. leptopoda, Brachyachne convergens, Bothriochloa erianthoides, Cenchrus ciliaris, Chloris virgata, Cyperus bifax, Dactyloctenium radulans, Dicanthium sericium, Digitaria ammophila, D. divaricatissima, Enneapogon avenaceus, E. polyphyllus, Enteropogon acicularis, Eragrostis setifolia, Eriochloa pseudoacrotricha, Heteropogon contortus, Panicum queenslandicum, P. decompositum, Paspalidium caespitosum, Themeda australis, Tragus australianus, Thellungia advena, Sporobolus caroli.*

LAND UNIT 1 (Cont'd)

LAND USE: Condition good, trend stable, high A.W.C., generally fair fertility; not susceptible to wind erosion but sheet and gully erosion can occur if the soil surface is bare and high intensity rains experienced; topfeed limited to *Acacia farnesiana*, perennial grasses vary according to the season, few poisonous plants.

LAND UNIT 2

LANDFORM: Minor drainage lines in the gently undulating downs with slopes 0.5-1%.

GEOLOGY: Fresh sediments of the Cretaceous *Rolling Downs Group*.

SOILS: Deep, grey and brown, medium to heavy cracking clays with self-mulching surfaces. The soil surface may have deposits of sand and ironstone pebbles present. Soil profile is alkaline to strongly alkaline throughout with $CaCO_3$ and gypsum present. Ug 5.21, Ug 5.22, Ug 5.24, Ug 5.26.
C and N have low values while K and A.P. are high. B.P. is fair and A.W.C. is high. Subsoils are saline and sodic.

Northampton - Representative soil analysis: 30.

VEGETATION: Mitchell grass open tussock to tussock grassland. *Acacia farnesiana* forms a well defined shrubby layer.

LOW SHRUB LAYER: Ht 1-1.5 m, PFC 1-5%.

Frequent spp: *Acacia farnesiana*.
Infrequent spp: *Capparis spinosa*.

GROUND LAYER: Ht <1 m, PFC 35 $\pm$ 15%.

Predominant spp:

FORBS:

Frequent spp: *Alternanthera nodiflora, Malvastrum americanum, Verbena officinalis*.
Infrequent spp: *Boerhavia diffusa, Convolvulus erubescens, Goodenia strongiophylla, Hibiscus trionum, Neptunia dimorphantha, Polymeria marginata, Pterigeron adscendens, Rhynchosia minima, Sida fibulifera, Sida trichopoda, Xanthium chinensis*.

GRAMINOIDS:

Frequent spp: *Aristida leptopoda, Astrebla lappacea, Cyperus bifax, Dichanthium sericeum, Enneapogon avenaceus, Eriochloa pseudoacrotricha*.
Infrequent spp: *Astrebla elymoides, Astrebla squarrosa, Brachiaria gilesii, Cenchrus ciliaris, Cynodon dactylon, Dactyloctenium radulans, Diplachne muelleri, Enneapogon polyphyllus, Enteropogon acicularis, Eragrostis setifolia, Eulalia fulva, Leptochloa digitata, Panicum decompositum, Panicum queenslandicum, Sporobolus caroli, S. mitchellii, Themeda avenacea*.

LAND USE: Condition good, trend stable, high A.W.C., generally fair to good fertility; not susceptible to wind erosion but slight gully erosion can occur; topfeed limited to *Acacia farnesiana*, perennial grasses vary according to the season, few poisonous plants.

LAND UNIT 3

LANDFORM: Narrow alluvial plains with single channel creeks draining the gently undulating plains.

GEOLOGY: Local alluvia derived from sediments of the Cretaceous *Rolling Downs Group*.

SOILS: Deep to very deep, medium to heavy cracking clays. Soils are alkaline throughout and ironstone gravel may occur in the profile. Ug 5.21.

Northampton - 100.

LAND UNIT 3 (Cont'd)

VEGETATION: River red gum fringing open woodland. *Eucalyptus camaldulensis* (river red gum) predominates. Frequently a low shrubby layer of *Acacia farnesiana*. Ground cover is composed mainly of grasses and sedges.

TREE LAYER: Ht 20 m, PFC <1%; 50/ha.

Predominant spp: *Eucalyptus camaldulensis*.

LOW SHRUBBY LAYER: Ht <2m, PFC <1%.

Frequent spp: *Acacia farnesiana*.

GROUND LAYER: Ht <1m, PFC 40%.

FORBS:

Infrequent spp: *Euphorbia drummondi, Hibiscus trionum, Malvastrum americanum, Salsola kali, Sonchus oleraceus, Xanthium chinensis*.

GRAMINOIDS:

Frequent spp: *Brachiaria miliiformis, Chloris virgata, Cyperus bifax, Leptochloa digitata, Paspalidium caespitosum*.
Infrequent spp: *Cyperus victoriensis, Dicanthium sericeum, Diplachne muelleri, Enteropogon acicularis, Paspalidium jubiflorum*.

LAND USE: Condition good, trend stable, generally fair to good fertility; subsoils saline and sodic; not susceptible to wind erosion but slight water erosion can occur; topfeed limited, perennial grasses vary according to the season, few poisonous plants.

LAND UNIT 4

LANDFORM: Flat plains with deflated, scalded areas.

GEOLOGY: Sediments of the Cretaceous *Rolling Downs Group*.

SOILS: Deep to very deep, scalded grey and brown clays with a thin, hard surface crust. Soils are neutral to alkaline at the surface and mainly strongly alkaline at depth. Ironstone pebbles usually are present on the soil surface with lime in the profile. Ug 5.24, Ug 5.27, Ug 5.34.
C and N are very low and K is very fair to high. P is variable with A.P. and B.P. low to high. A.W.C. is medium at the surface but increases to very high at depth. Very high salt levels are common and profiles may be strongly sodic throughout. Magnesium is the dominant cation with calcium less than 25% of the exchange capacity resulting in poorer physical properties and lowered water penetration. This all indicates that some of the more scalded areas will be difficult to revegetate.

Tambo - Representative soil analysis: 102, 64.

VEGETATION: Sparse herbfield. Forbs or grasses may predominate depending on seasonal conditions.

GROUND LAYER: Ht <0.5 m, PFC 1-5%.

FORBS:

Frequent spp: *Boerhavia diffusa, Maireana coranata, Portulaca* sp. aff. *oleracea, Salsola kali, Trianthema triquetra*.
Infrequent spp: *Atriplex elachophylla, A. muellerii, Bassia anisacanthoides, B. calcarata*.

GRAMINOIDS:

Frequent spp: *Aristida anthoxanthoides, Astrebla lappacea, Sporobolus actinocladus*.
Infrequent spp: *Aristida leptopoda, Brachyachne convergens, Cenchrus ciliaris, Chloris pectinata, Dactyloctenium radulans, Enneapogon avenaceus, Eulalia fulva, Panicum whitei, Tragus australianus, Tripogon loliiformis*.

LAND USE: Condition fair, trend stable to slightly downward; low to fair fertility, commonly high salts and strongly sodic throughout. High exchangeable Mg; scalding and sheet erosion; some sites will be difficult to revegetate due to salts and physical condition of the soil; topfeed absent; grasses annual to none; few poisonous plants.

LAND UNIT 5

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Sediments of the Cretaceous *Rolling Downs Group*.

SOILS: Deep, grey, cracking soils with self-mulching surfaces. Mottling may occur at depth. Profile is alkaline throughout with $CaCO_3$ and gypsum present. Ug 5.22, Ug 5.31.
C and N values are low and K is high. A.P. is high while B.P. is very fair. Very high salts (gypsum) may occur below the surface.

Warrah - Representative soil analysis: 161.

VEGETATION: Boree open woodland. *Acacia cana* (boree) predominates. A shrub layer is not well defined but scattered shrubs do occur. Ground layer is variable and fluctuates with seasonal conditions between an annual grassland and forbland.

TREE TALL SHRUB LAYER: Ht 8-12 m, PFC <5%; 200/ha.

Predominant spp: *Acacia cana*.

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%.

Frequent spp: *Acacia farnesiana, Apophyllum anomalum, Heterodendrum oleifolium*.

GROUND LAYER: Ht 0.5-0.75 m, PFC 20-25%.

FORBS:

Frequent spp: *Bassia quinquicuspis, Boerhavia diffusa, Malvastrum americanum, Rhagodia nutans, Salsola kali, Sida fibulifera, Solanum esuriale, Tribulus terrestris*.

GRAMINOIDS:

Frequent spp: *Aristida leptopoda, Astrebla lappacea, Cenchrus ciliaris, Digitaria ammophila, Enneapogon avenaceus, Panicum decompositum*.

LAND USE: Condition fair to good, trend stable; good fertility; salinity at depth due to gypsum; topfeed not abundant, grasses mainly annuals.

LAND UNIT 6

LANDFORM: Lower slopes and minor drainage lines in gently undulating downs, slopes <1%.

GEOLOGY: Sediments of Cretaceous *Rolling Downs Group*.

SOILS: Moderately deep to deep, grey and brown cracking clays with soft, self-mulching surfaces. A colour change to yellowish brown occurs in the lower profile. Profile is strongly alkaline throughout with $CaCO_3$ and gypsum present. Ug 5.24.
C and N are low and K is fair. A.P. is high but B.P. is low on an alkaline soil. High salts may occur at depth.

Warrah - Representative soil analysis: 112.

VEGETATION: Myall open woodland to wooded tussock grassland. *Acacia pendula* (myall) predominates. Scattered shrubs do occur. Ground layer is variable fluctuating between grassland and forbland depending on seasonal conditions.

TREE TALL SHRUB LAYER: Ht 6 $\pm$ 4 m, PFC <5-10%. 125/ha *Acacia pendula;* 50/ha shrubs.

Frequent spp: *Apophyllum anomalum, Heterodendrum oleifolium*.
Infrequent spp: *Acacia cambagei, Bauhinia carronii, Eremophila maculata, E. mitchellii, Geijera parviflora, Hakea leucoptera, Myoporum acuminatum, M. deserti*.

GROUND LAYER: Ht 0.5-1 m, PFC 20 $\pm$ 15%.

FORBS:

Frequent spp: *Atriplex muelleri, Bassia quinquicuspis, Malvastrum americanum, Polymeria marginata, Rhagodia spinescens*.

LAND UNIT 6 (Cont'd)

Infrequent spp: *Astrebla squarrosa, Cenchrus ciliaris, Chloris pectinata, Dichanthium sericeum, Enteropogon acicularis, Panicum decompositum, Sporobolus caroli.*

LAND USE: Condition fair to good, trend stable; fertility fair but very low bicarb P; topfeed not abundant but present; grasses are variable depending on seasonal conditions, poisonous plants are present.

LAND UNIT 7

LANDFORM: Rubbly, sandstone outcrops on upper slopes and crests of gently undulating plains. Slopes <3%.

GEOLOGY: Fresh sediments of the Cretaceous *Rolling Downs Group - Coreena Member.*

SOILS: Very shallow to shallow, grey and brown clays with a thin surface crust. Textures are light to medium clays with sandstone rocks scattered on the soil surface. Soils are moderately alkaline throughout with lime and gypsum present in the profile Uf 6.31.
C and N are fair and K is high. A.P. is high but B.P. is low. The clay type is predominantly montmorrillonite with high A.W.C.

Bayrick - Representative soil analysis: 98.

VEGETATION: Eastern dead finish tall open shrubland to wooded open tussock grassland. *Albizia basaltica* (eastern dead finish) predominates with *Acacia excelsa* (ironwood) conspicuous in places. Low shrub layer conspicuous in places. Ground layer composed of grasses and forbs.

TALL SHRUB LAYER: Ht 5-8 m, PFC 1-5%; 150/ha. *Albizia basaltica, Acacia excelsa.*

Predominant spp: *Acacia excelsa, Albizia basaltica.*

Frequent spp: *Bauhinia carronii, Canthium oleifolium, Eremophila longifolia, Flindersia maculosa, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht <2 m, PFC <5%; 300 $\pm$ 100/ha.

Frequent spp: *Acacia farnesiana, A. victoriae, Cassia nemophila, Eremophila mitchellii, Geijera parviflora, Pimelea pauciflora.*

GROUND LAYER: Ht 0.5-0.75 m, PFC 25 $\pm$ 20%.

FORBS:

Frequent spp: *Amaranthus mitchellii, Atriplex muelleri, Bassia quinquecuspis, Boerhavia diffusa, Convolvulus erubescens, Malvastrum americanum, Salsola kali, Verbena officinalis.*
Infrequent spp: *Bassia birchii.*

GRAMINOIDS:

Predominant spp: *Enneapogon avenaceus.*

Frequent spp: *Aristida leptopoda, Astrebla lappacea, Cenchrus ciliaris, Chloris virgata, Dicanthium sericium.*
Infrequent spp: *Aristida latifolia, Enteropogon acicularis, Panicum decompositum, P. queenslandicum, Tragus australianus.*

LAND USE: Condition fair, trend stable to downwards, high A.W.C., generally good fertility but low bicarb P on an alkaline soil; susceptible to slight wind erosion and sheet erosion; topfeed is present; woody weeds can be a problem in places; annual grasses very sparse in some areas.

LAND UNIT 8

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Fresh sediments of the Cretaceous *Rolling Downs Group.*

SOILS: Moderately deep to deep, grey and brown cracking clays with self-mulching surfaces. A surface crust may be evident. The profile is mildly to strongly alkaline throughout with $CaCO_3$ and gypsum present in the profile. Ug 5.13, Ug 5.21, Ug 5.31.

LAND UNIT 8 (Cont'd)

C and N are low and K is high. A.P. is variable and B.P. is very low to fair. A.W.C. is medium in the surface and high at depth. Subsoils have high salt content and may be sodic to strongly sodic.

Mendip - Representative soil analysis: 87, 250.

VEGETATION: Brigalow low open woodland to woodland. *Acacia harpophylla* (brigalow) predominates. A low shrub layer is present. Ground layer is composed of grasses and forbs and is well developed.

TREE, TALL SHRUB LAYER: Ht 7-10 m, PFC <5%; 350/ha.
Acacia harpophylla.

Predominant spp: *Acacia harpophylla.*

Infrequent spp: *Acacia cambagei, A. pendula, Bauhinia carronii, Brachychiton rupestre, Flindersia maculosa, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 100/ha.

Frequent spp: *Eremophila mitchellii.*
Infrequent spp: *Apophyllum anomalum, Atalaya hemiglauca, Canthium oleifolium, Capparis lasiantha, Carissa ovata, Cassia artemesoides, Eremophila maculata, Geijera parviflora, Myoporum acuminatum, M. deserti, Santalum lanceolatum, Ventilago viminalis.*

GROUND LAYER: Ht 0.5-0.7 m, PFC 15 $\pm$ 10%.

FORBS:

Frequent spp: *Sida fibulifera.*
Infrequent spp: *Amaranthus mitchellii, Alternanthera denticulata, Bassia quinquecuspis, B. ventricosa, Boerhavia diffusa, Cyperus victoriensis, Indigofera parviflora, Malvastrum americanum, Opuntia inerme, O. tomentosa, Oxalis corniculata, Rhagodia nutans, R. spinescens, Salsola kali, Sida fibulifera, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Aristida latifolia.*
Infrequent spp: *Aristida leptopoda, Astrebla lappacea, A. pectinata, A.squarrosa, Bothriochloa ewartiana, Brachyachne convergens, Dicanthium sericium, Digitaria divaricatissima, Enneapogon polyphyllus, Enteropogon acicularis, Eragrostis elongata, Iseilema membranaceum, Panicum decompositum, P. queenslandicum, Sporobolus caroli, Thellungia advena, Tragus australianus.*

LAND USE: Condition good, trend stable; low to fair fertility with high salts and sodic conditions in subsoil; topfeed present, perennial grasses with few poisonous plants.

LAND UNIT 9

LANDFORM: Gently undulating plains with slopes <3%.

GEOLOGY: Fresh sediments of Cretaceous *Rolling Downs Group - Mackunda Formation* and a minor portion of *Winton Formation.*

SOILS: Shallow brown clays with hard setting surfaces. Ironstone is scattered on the soil surface and is present in the base of the profile. The soil profile is moderately to strongly alkaline throughout. Uf 6.31, minor Db 1.23, Ug 5.34.
C and N are low and K is high. A.P. is very fair and B.P. very low.

Bayrick - Representative soil analysis: 26.

VEGETATION: Eastern dead finish - Bauhinia tall shrubland. *Albizia basaltica* (eastern dead finish) and *Bauhinia carronii* (bauhinia) predominate. Other shrubs also occur in the tall shrub layer. A low shrub layer is not well developed, ground layer consists of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 4-10 m, PFC <1%; 350/ha shrubs.

Predominant spp: *Albizia basaltica, Bauhinia carronii.*

Frequent spp: *Atalaya hemiglauca, Eremophila mitchellii, Eucalyptus terminalis, Heterodendrum oleifolium.*
Infrequent spp: *Acacia cana, Flindersia maculosa.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 50/ha.

Frequent spp: *Acacia farnesiana, A. victoriae, Capparis lasiantha, Ventilago viminalis, Apophyllum anomalum.*

GROUND LAYER: Ht 0.5-1 m, PFC 25 $\pm$ 20%.

FORBS:

Frequent spp: *Salsola kali.*
Infrequent spp: *Atriplex muelleri, Bassia birchii, B. ventricosa, Boerhavia diffusa, Malvastrum americanum, Portulaca* sp. aff. *oleracea, Rhynchosia minima, Solanum esuriale, Trianthema triquetra.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Enneapogon avenaceus, Tragus australianus.*
Infrequent spp: *Aristida latifolia, A. leptopoda, Astrebla elymoides, Bothriochloa ewartiana, Dactyloctenium radulans, Enteropogon acicularis, Panicum queenslandicum, Sporobolus actinocladus, S. caroli, Trirapis mollis.*

LAND USE: Condition is fair, trend stable; low fertility; wind erosion has caused scalding with sheet and slight gully erosion also present; topfeed present, grasses are perennials.

LAND UNIT 10

LANDFORM: Gently undulating plains with slopes <1%.

GEOLOGY: Fresh sediments of the Cretaceous *Rolling Downs Group - Mackunda Formation.*

SOILS: Very shallow to shallow, brown clays with hard surface crusts. Ironstone pebbles occur on the soil surface and at the base of the profile. Soils are slightly acid to neutral throughout. Uf 6.31.
C and N are low, K is high, but P is low. A.W.C. is medium in the surface increasing to high at depth.

Bayrick - Representative soil analysis: 190.

VEGETATION: Silver-leaved ironbark open woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates with *Eucalyptus terminalis* (western bloodwood) a common species. A tall shrub layer is present. Ground layer is composed of grasses and some forbs.

TREE, TALL SHRUB LAYER: Ht 7-13 m, PFC <1%; 125/ha; 100/ha shrubs.

Predominant spp: *Eucalyptus melanophloia, Eucalyptus terminalis.*

Frequent spp: *Acacia excelsa, Eremophila mitchellii.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%.

Frequent spp: *Acacia farnesiana.*
Infrequent spp: *Acacia victoriae, Myoporum acuminatum.*

GROUND LAYER: Ht 0.5-1 m, PFC <5%.

FORBS:

Infrequent spp: *Glossogyne tenuifolia, Malvastrum americanum, Oxalis corniculata, Portulaca* sp. aff. *oleracea, Salsola kali, Sida fibulifera, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Aristida latifolia, Astrebla lappacea, Bothriochloa ewartiana, Dactyloctenium radulans, Dicanthium sericeum, Enneapogon avenaceus, Themeda australis, Sporobolus actinocladus.*

LAND UNIT 10 (Cont'd)

LAND USE: Condition fair, trend stable; medium A.W.C. in surface increasing to high at depth, low fertility; limited topfeed present, grasses are perennials; poisonous plants present.

LAND UNIT 11

LANDFORM: Gently undulating plains with slopes <1%.

GEOLOGY: Fresh sediments of Cretaceous *Rolling Downs Group - Mackunda Formation*.

SOILS: Deep, grey cracking clays with moderately developed gilgais. Mottling occurs at depth. Profile is alkaline throughout with $CaCO_3$ present in the profile. Ug 5.21, Ug 5.31.

Romulus - Representative soil analysis: 91.

VEGETATION: Gidgee low open woodland. *Acacia cambagei* (gidgee) predominates. A well defined shrub layer occurs consisting almost entirely of *Eremophila mitchellii* (sandalwood). Ground layer is variable consisting of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 5-7 m, PFC <5%; 375/ha *Acacia cambagei*; 50/ha *Eremophila mitchellii*.

Predominant spp: *Acacia cambagei*.

Frequent spp: *Eremophila mitchellii*.

GROUND LAYER: Ht 0.5-0.75 m, PFC 5-10%.

FORBS:

Frequent spp: *Abuliton oxycarpum, Bassia quinquicuspis, Malvastrum americanum*.
Infrequent spp: *Abutilon malvifolium, Amaranthus mitchellii, Boerhavia diffusa, Pimelia microcephala,Salsola kali*.

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Enneapogon avenaceus, Enteropogon acicularis*.
Infrequent spp: *Astrebla lappacea, Dactyloctenium radulans, Sporobolus caroli*.

LAND USE: Condition fair to good, trend stable; topfeed is absent; grasses are perennials; woody weeds a problem.

LAND UNIT 12

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Fresh sediments of Cretaceous *Rolling Downs Group - Mackunda Formation*.

SOILS: Deep, grey cracking clays with self-mulching surfaces. Linear gilgais are well developed. Soils are medium to heavy clays. Profile is slightly alkaline at the surface, becoming strongly alkaline at depth. $CaCO_3$ is present throughout. Ug 5.13.
C and N are low, K is fair to high but P is very low. A.W.C. is medium. Subsoils are sodic and high salt levels may occur.

Landsdowne - Representative soil analysis: 205, 173.

VEGETATION: Mitchell grass wooded open tussock grassland. *Astrebla lappacea* (Mitchell grass) predominates. Tree layer composed mainly *Acacia excelsa* (ironwood) and *Albizia basaltica* (eastern dead finish). Ground layer composed of forbs as well as grasses.

TREE , TALL SHRUB LAYER: Ht 5-6 m, PFC <1%; 25/ha.

Frequent spp: *Acacia excelsa, Albizia basaltica*.
Infrequent spp: *Eucalyptus melanophloia, Heterodendrum oleifolium*.

LOW SHRUB LAYER: Ht 1 m, PFC <1%.

Frequent spp: *Acacia farnesiana*.
Infrequent spp: *Acacia victoriae, Eremophila mitchellii*.

GROUND LAYER: Ht 0.7 m, PFC 3-5%.

LAND UNIT 12 (Cont'd)

FORBS:

Infrequent spp: *Bassia tetricuspis, Daucus glochidiatus, Euphorbia drummondii, Evolvulus alsinoides, Oxalis corniculata, Pimilea microcephala, Ptilotus obovatus, Rhynchosia minima, Sida fibulifera, Sida trichopoda, Vittadinia triloba.*

GRAMINOIDS:

Predominant spp: *Astrebla lappacea, A. squarrosa.*

Frequent spp: *Cenchrus ciliaris, Dicanthium sericeum, Enneapogon avenaceus, E. polyphyllus, Sporobolus caroli, Themeda australis.*

LAND USE: Condition good, trend stable; medium A.W.C.; fertility low to very low, subsoil salinity and sodicity; limited topfeed, perennial grasses.

LAND UNIT 13

LANDFORM: Upper slopes of gently undulating plains with slopes <1%.

GEOLOGY: Sediments of Cretaceous *Rolling Downs Group - Mackunda Formation.*

SOILS: Deep, weakly gilgaied, grey cracking clays with self-mulching surfaces. Limestone appears as puffs or mounds. Profile is strongly alkaline throughout and lime is present in the profile. Ug 5.21.

Landsdowne.

VEGETATION: Mitchell grass open tussock grassland. *Astrebla* spp. predominates. Scattered shrubs do occur. Ground layer is well developed, composed of grasses and forbs.

LOW SHRUB LAYER: Ht 1-1.5 m, PFC <1%.

Frequent spp: *Acacia farnesiana.*

GROUND LAYER: Ht 0.5-0.75 m, PFC 20-30%.

FORBS:

Frequent spp: *Boerhavia diffusa, Malvastrum americanum, Morgania floribunda, Opuntia inerme, Salvia reflexa, Sida fibulifera.*

GRAMINOIDS:

Predominant spp: *Astrebla elymoides, A. lappacea, Aristida leptopoda.*

Frequent spp: *Cenchrus ciliaris, Chrysopogon fallax, Enneapogon avenaceus, Eragrostis setifolia, Eriochloa pseudoacrotricha, Sporobolus caroli.*
Infrequent spp: *Heteropogon contortus.*

LAND USE: Condition good, trend stable; topfeed limited; perennial grasses present.

LAND UNIT 14

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Sediments of Cretaceous *Rolling Downs Group.*

SOILS: Moderately deep to deep, grey and brown cracking clays with soft, self-mulching surfaces. Profile is alkaline throughout, with $CaCO_3$ and gypsum present in the profile. Ironstone concretions may be present in the surface soil.
Ug 5.26, Ug 5.29, Ug 5.31.
C and N are low and K is high. A.P. is high but B.P. is low, on an alkaline soil.

Warrah - Representative soil analysis: 69.

VEGETATION: Boree low open woodland. *Acacia cana* (boree) predominates. *Acacia cambagei* (gidgee) is a common species also. Tall and low shrub layers are usually present. Ground cover is variable and fluctuates between a forb dominated and grass dominated community.

LAND UNIT 14 (Cont'd)

TREE, TALL SHRUB LAYER: Ht 4-7 m, PFC 1-5%; 200/ha *Acacia cana*.

Predominant spp: *Acacia cana*.

Frequent spp: *Acacia cambagei, Eremophila mitchellii, Flindersia maculosa, Heterodendrum oleifolium.*
Infrequent spp: *Bauhinia carronii, Ventilago viminalis.*

LOW SHRUB LAYER: Ht <1 m, PFC <1%, 250/ha.

Frequent spp: *Acacia farnesiana, Apophyllum anomalum.*
Infrequent spp: *Eremophila maculata, Santalum lanceolatum, Opuntia inerme.*

GROUND LAYER: Ht 0.5-1 m, PFC 18 $\pm$ 10%.

FORBS:

Frequent spp: *Bassia quinquicuspis, Boerhavia diffusa, Malvastrum americanum.*
Infrequent spp: *Abutilon otocarpum, Amaranthus mitchellii, Bassia biflora, B. aniscanthoides, Dactyloctenium radulans, Portulaca* sp. aff. *oleracea, Sida trichopoda, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Astrebla lappacea, Aristida leptopoda, Cenchrus ciliaris, Cyperus bifax.*
Infrequent spp: *Astrebla elymoides, Dichanthium sericeum, Enneapogon avenaceus, Enteropogon acicularis, Eragrostis lacunaria, Eriochloa pseudoacratricha.*

LAND USE: Condition good, trend stable; low to fair fertility; topfeed present, perennial grasses present.

LAND UNIT 15

LANDFORM: Gently undulating plains with slopes <3%.

GEOLOGY: Fresh sediments of Cretaceous *Rolling Downs Group* and may be overlain in some areas by a Qs cover.

SOILS: Deep, brown and grey cracking clays with soft self-mulching surfaces. Weak to moderate gilgai development. A weak surface crust may be present. Stone cover is light. Colours range from brown to dark brown, which are the commonest colours, to yellowish brown and dark greyish brown. Soil reaction trend generally is strongly alkaline in the top 60 cm and then becomes less alkaline or even slightly acid at depth. Textures range from medium to heavy clays. $CaCO_3$ is present in the upper part of the profile and gypsum occurs at depth. Ug 5.31, Ug 5.32, Ug 5.21, Ug 5.24.
C and N are low to fair and K is high. A.P. is fair to very high and B.P. is low to fair. A.W.C. is high to very high. Subsoils are generally sodic to strongly sodic and may also be saline. Very high salt levels occur below 20 cm with gypsum being the main contributor.

Romulus - Representative soil analysis: 33, 139, 159.

VEGETATION: Gidgee low woodland, low open woodland, open woodland occasionally tall shrubland. *Acacia cambagei* (gidgee) predominates. A tall shrub layer is well developed and consists mainly of *Eremophila mitchellii* (sandalwood) and *Geijera parviflora* (wilga). Low shrub layer is variable. Ground layer is sparse to absent composed mainly of forbs and annual grasses.

TREE, TALL SHRUB LAYER: Ht 8 $\pm$ 3 m, PFC 5-35%, 800 $\pm$ 400/ha; *Acacia cambagei*. 200/ha shrubs.

Predominant spp: *Acacia cambagei*.

Frequent spp: *Eremophila mitchellii, Geijera parviflora.*

LAND UNIT 15 (Cont'd)

Infrequent spp: *Acacia harpophylla, A. salicina, Atalaya hemiglauca, Bauhinia carronii, Brachychiton australe, B. rupestre, Flindersia maculosa, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht <2 m, PFC 5%, 125 ± 100/ha.

Frequent spp: *Apophyllum anomalum, Capparis lasiantha, C. loranthifolia, Jasminum lineare, Myoporum deserti.*

Infrequent spp: *Cassia nemophila, Carissa ovata, Enchylaena tomentosa, Santalum lanceolatum, Ehretia membranifolia.*

GROUND LAYER: Ht 0.5 m, PFC 1-10%.

FORBS:

Frequent spp: *Abutilon oxycarpum, A. malvifolium, Bassia calcarata, Cheilanthes distans, Hibiscus trionum, Malvastrum americanum, Portulaca* sp. aff. *oleracea, Rhagodia parabolica, Salsola kali, Sida fibulifera, S. trichopoda.*
Infrequent spp: *Abutilon leucopetalum, Atriplex muelleri, Bassia birchii, B. cornishiana, B. tricuspis, B. quinquicuspis, Boerhavia diffusa, Dactyloctenium radulans, Rhagodia linifolia, R. nutans, R. parabolica, R. spinescens, Trianthema portulacastrum.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Enneapogon avenaceus, E. pallidus, E. polyphyllus, Enteropogon acicularis, Paspalidium constrictum, Sporobolus caroli.*
Infrequent spp: *Aristida latifolia, A. leptopoda, A. ramosa, Digitaria divaricatissima, Tragus australianus.*

LAND USE: Condition good, trend stable; high to very high A.W.C.; good fertility but subsoils sodic and some saline; slight sheet erosion; topfeed absent; grasses sparse and only annuals, few poisonous plants; woody weeds a problem where *Eremophila mitchellii* present.

LAND UNIT 16

LANDFORM: Flat to very gently undulating plains with slopes <1%.

GEOLOGY: Derived from sediments of the *Rolling Downs Group* with Qs cover, mixed with recent alluvial material, Qa.

SOILS: Deep to very deep, brown cracking clays with much surface stone and sandstone outcrops. Gilgais are weakly developed. Ironstone gravel may occur throughout the profile. Closely associated are texture contrast soils and layering of soils occurs near local alluvia. Ug 5.31, Dr 2.43, Dy 2.43. C and N are low to fair. K is high and concentrated in the surface. A.P. is very high and B.P. is very fair. Total P may be very high in the surface under the dense gidgee stands. A.W.C. is medium in the surface increasing to high at 60 cm. Subsoils are sodic to highly sodic and high salt levels are common with large quantities of gypsum occurring beyond 60 cm.

Romulus - Representative soil analysis: 252.

VEGETATION: Gidgee low woodland. *Acacia cambagei* (gidgee) predominant. Tall shrub layer is present composed almost entirely of *Eremophila mitchellii* (sandalwood). A low shrub layer is conspicuous, its density varying depending on the amount of *Carissa ovata* (currant bush). Ground layer is sparse composed of grasses and forbs.

TREE LAYER: Ht 6-9 m, PFC 10-30; 750 ± 200/ha. *Acacia cambagei.*

Predominant spp: *Acacia cambagei.*

Infrequent spp: *Acacia harpophylla.*

TALL SHRUB LAYER: Ht 2-4 m, PFC <5%; 100/ha.

LAND UNIT 16 (Cont'd)

Predominant spp: *Eremophila mitchellii.*

Infrequent spp: *Canthium oleifolium, Geijera parviflora, Ventilago viminalis.*

LOW SHRUB LAYER: Ht <2 m, PFC 1-5%; 1 500 $\pm$ 1 000/ha.

Frequent spp: *Carissa ovata.*
Infrequent spp: *Atalaya hemiglauca, Cassia nemophila, Myoporum deserti.*

GROUND LAYER: Ht <1 m, PFC <3%.

FORBS:

Frequent spp: *Abutilon malvifolium, Bassia ventricosa, Boerhavia diffusa, Portulaca* sp. aff. *oleracea, Salsola kali, Sida trichopoda.*
Infrequent spp: *Bassia birchii, Enchylaena tomentosa.*

GRAMINOIDS:

Frequent spp: *Enneapogon avenaceus, E. pallidus, E. polyphyllus, Enteropogon acicularis, Eragrostis lacunaria.*
Infrequent spp: *Aristida armata, Cenchrus ciliaris.*

LAND USE: Condition good, trend stable; medium A.W.C. in surface increasing with depth; good surface fertility; subsoils are sodic to strongly sodic with high salt levels; slight water erosion; no topfeed present; grasses are annuals and may be very sparse; woody weeds a problem.

LAND UNIT 17

LANDFORM: Gently undulating plains with slopes <2%.

GEOLOGY: Sediments of Cretaceous *Rolling Downs Group-Winton Formation.*

SOILS: Weakly gilgaied, deep, brown cracking clays with soft-self-mulching surfaces. A surface crust may develop. Textures are medium clays. Soil reaction trend is slightly acid to neutral at the surface, becoming strongly alkaline in the lower profile and may become acid at depth. $CaCO_3$ is common in the upper profile and gypsum is abundant at depth.
Ug 5.36, Ug 5.31.
C and N are fair to low. K is very high in the surface but drops rapidly to low values at depth. A.P. and B.P. are fair to high in the surface but low to very low at the base of the profile. The gidgee vegetation has extracted nutrients from the soil profile and concentrated them in the surface. The subsoils have high salts, particularly gypsum and are sodic to strongly sodic.

Burenda - Representative soil analysis: 243, 347.

VEGETATION: Gidgee-brigalow low woodland to woodland. *Acacia cambagei* (gidgee) and *A. harpophylla* (brigalow) predominate. A tall shrub layer is present. A low shrub layer is usually not well defined but scattered shrubs occur. Ground layer is usually sparse composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 9-11 m, PFC 10-15%, 800/ha *Acacia cambagei, A. harpophylla;* Ht 3-4 m, PFC <5%, 175/ha shrubs.

Predominant spp: *Acacia cambagei, A. harpophylla.*

Frequent spp: *Brachychiton rupestre, Eremophila mitchellii, Geijera parviflora.*

LOW SHRUB LAYER: Ht <1 m, PFC <1%, 25/ha.

Infrequent spp: *Eremophila glabra.*

GROUND LAYER: Ht <0.5 m, PFC <5%.

LAND UNIT 17 (Cont'd)

FORBS:

Frequent spp: *Abutilon leucopetalum, A. malvifolium.*

GRAMINOIDS:

Frequent spp: *Enneapogon polyphyllus, Eragrostis lacunaria, Sporobolus actinoclatus, S. australasicus Sporobolus caroli.*

LAND USE: Condition good, trend stable; good surface fertility as nutrients have been cycled to surface, subsoils have high salts and are sodic to strongly sodic; topfeed absent, grasses are annuals and sparse; few poisonous plants; woody weed problem.

LAND UNIT 18

LANDFORM: Gently undulating plains with slopes <2%.

GEOLOGY: Mainly Jurassic *Birkhead Formation*, with extensive Quaternary sand cover.

SOILS: Moderately deep to deep, grey and brown cracking clays with weak surface crusts. Associated are texture contrast soils. Stone cover is light. Soils are weakly gilgaied. Textures are medium to heavy clays. Soil reaction trend is slightly acid to neutral at the surface, becoming strongly alkaline in the lower profile and then, acid at depth. $CaCO_3$ is common throughout and gypsum may occur in small amounts at depth. Ug 5.11, Ug 5.14, Ug 5.31, minor Dr 3.43. C and N are fair. K is very fair. A.P. and B.P. are very low. A.W.C. is medium at the surface increasing to very high values at depth.

Connemarra - Representative soil analysis: 272.

VEGETATION: Brigalow tall open shrubland (occasionally low woodland). *Acacia harpophylla* (brigalow) predominates, *Eremophila mitchellii* (sandalwood) is a common species. A low shrub layer is present but variable in density. Ground layer consists of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 3-6 m occasionally 12 m, PFC 5-20%; 200/ha *Acacia harpophylla.*

Predominant spp: *Acacia harpophylla.*

Frequent spp: *Eremophila mitchellii.*
Infrequent spp: *Albizia basaltica, Bauhinia carronii, Geijera parviflora, Eucalyptus populnea.*

LOW SHRUB LAYER: Ht <2m, PFC <1%, 200/ha (variable).

Infrequent spp: *Cassia nemophila.*

GROUND LAYER: Ht <1 m, PFC <5%.

LAND USE: Condition good, trend stable; some sheet and gully erosion; topfeed absent, grasses are annual, no poisonous plants. Nutrient levels very fair except for P.

LAND UNIT 19

LANDFORM: Gently undulating plains with slopes <2%.

GEOLOGY: Predominantly the Jurassic *Birkhead Formation* with Quaternary sand cover.

SOILS: Deep, grey and brown cracking clays with light scattering of surface stone. Gilgais weakly developed. Textures are medium to heavy clays. Soil reaction trend is slightly acid to neutral at the surface, grading to alkaline at approximately 20 cm and acid at depth. $CaCO_3$ is present in the upper profile with gypsum present at depth. Ug 5.12, Ug 5.11. C and N values are very fair. K is very fair. A.P. and B.P. are low.

LAND UNIT 19 (Cont'd)

Mendip - Representative soil analysis: 340.

VEGETATION: Brigalow-belah woodland or open woodland. *Acacia harpophylla* (brigalow) and *Casuarina cristata* (belah) predominate. A tall and low shrub layer are present but are variable in density. Ground layer is present composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC 5-15%; 300/ha *Acacia harpophylla*; 150/ha shrubs.

Predominant spp: *Acacia harpophylla, Casuarina cristata, Eucalyptus cambageana*.

Frequent spp: *Flindersia maculosa, Geijera parviflora*.

LOW SHRUB LAYER: Ht <2 m, PCF <1%; 500 $\pm$ 350/ha.

Frequent spp: *Carissa ovata, Eremophila mitchellii, Geijera parviflora, Myoporum deserti, Opuntia inerme, Ventilago viminalis, Parsonia eucalyptophylla*.

GROUND LAYER: Ht 0.5-0.75 m, PFC <5-30%.

FORBS:

Frequent spp: *Cheilanthes distans, Evolvulus alsinoides, Solanum parvifolium*.

GRAMINOIDS:

Frequent spp: *Aristida calycina, A. caput-medusae, Cyperus gracilis, Digitaria brownii, Eragrostis lacunaria, Enteropogon acicularis, Panicum caespitosium*.

LAND USE: Condition good, trend stable; nutrients are very fair except for P; no erosion; some topfeed present; grasses are mainly annuals; no poisonous plants.

LAND UNIT 20

LANDFORM: Upper slopes in gently undulating plains.

GEOLOGY: Quaternary sand cover overlying Cretaceous *Doncaster Beds*.

SOILS: Moderately deep, loamy red earths with hard setting surfaces. Ironstone shot on soil surface and ironstone gravel at base of profile. Soil reaction trend is slightly acid throughout. Gn 2.12.
Very low A.W.C. throughout. Very low C and N. Surface K and P are very fair but decrease quickly. Accumulation of total P in surface.

Khyber - Representative soil analysis: 107.

VEGETATION: Brigalow low open woodland. *Acacia harpophylla* (brigalow) predominates. A tall shrub layer is present composed mainly of *Eremophila mitchellii* (sandalwood). A low shrub layer is present. Ground layer is variable composed of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 8-10 m, PFC <1-5%; 50/ha, *Acacia harpophylla*; 125/ha shrubs.

Predominant spp: *Acacia harpophylla*.

Frequent spp: *Eremophila mitchellii*.
Infrequent spp: *Albizia basaltica, Alstonia constricta, Atalaya hemiglauca, Bauhinia carronii, Brachychiton populneum, Eucalyptus populnea*.

LOW SHRUB LAYER: Ht 1-1.5 m, PFC <5%; 200/ha.

Infrequent spp: *Cassia artemesoides, Cassia nemophila, Enchylaena tomentosa, Geijera parviflora*.

GROUND LAYER: Ht <0.5m, PFC <1%.

LAND UNIT 20 (Cont'd)

FORBS:

Infrequent spp: *Boerhavia diffusa, Cheilanthes sieberi, Portulaca* spp. aff. *oleracea, Salsola kali.*

GRAMINOIDS:

Infrequent spp: *Aristida jerichoensis, Brachyachne convergens, Enteropogon acicularis, Tripogon loliiformis.*

LAND USE: Condition good, trend stable; very low A.W.C. throughout profile; nutrient levels are fair to low, some surface accumulation of phosphorus and potassium; no erosion; limited topfeed; grasses are annuals, no poisonous plants.

LAND UNIT 21

LANDFORM: Narrow sandstone ridges outcropping in gently undulating plains. Slopes along ridge line <1%.

GEOLOGY: Jurassic *Birkhead Formation* blanketed by Quaternary sand cover.

SOILS: Shallow, brown clays with light covering of stone. Textures are medium clays. Soil reaction trend is slightly acid to neutral at the surface, becoming alkaline in lower profile. Uf 6.32, Uf 6.34- minor Dr 2.13.
Very low C and N. Very fair K. Very low A.P.

Bayrick - Representative soil analysis: 286.

VEGETATION: Silver-leaved ironbark low woodland or open woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates. Both tall and low shrub layers are present. The ground layer is well developed and consists of grass and some forbs.

TREE, TALL SHRUB LAYER: Ht 8-15 m, PFC <5-20%; 150/ha *Eucalyptus melanophloia;* 200/ha shrubs.

Predominant spp: *Eucalyptus melanophloia.*

Frequent spp: *Albizia basaltica, Eremophila mitchellii.*
Infrequent spp: *Bauhinia carronii, Brachychiton populneum, Eucalyptus whitei.*

LOW SHRUB LAYER: Ht 0.5-2 m, PFC <5%.

Frequent spp: *Canthium oleifolium.*
Infrequent spp: *Acacia farnesiana, Bursaria spinosa, Capparis spinosa, Ventilago viminalis.*

GROUND LAYER: Ht 0.5-1 m, PFC 15-30%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, Portulaca* sp. aff.*oleracea, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Bothriochloa ewartiana, Themeda australis.*
Infrequent spp: *Aristida calcyina, Chrysopogon falax, Enneapogon polyphyllus, Enteropogon acicularis, Eriochloa pseudoacratricha.*

LAND USE: Condition good; trend stable to downwards; nutrient levels very low; slight gully erosion; limited topfeed present; grasses are perennials and some annuals; termites are present in some areas; no poisonous plants present.

LAND UNIT 22

LANDFORM: Gently undulating plains with slopes <2%.

GEOLOGY: Fresh Cretaceous sediments - *Wallumbilla Formation.*

SOILS: Moderately deep to deep, brown and grey cracking clays with thin surface crusts. Textures are medium to heavy clays. Soil reaction trend is alkaline in upper profile becoming acid at depth. $CaCO_3$ is present in the upper profile and gypsum occurs at depth. Ug 5.32, Ug 5.13.
C and N values are low. K values very fair to high. A.P. values low to high. B.P. low to fair.

LAND UNIT 22 (Cont'd)

Connemarra - Representative soil analysis: 178, 183.

VEGETATION: Brigalow tall shrubland. *Acacia harpophylla* (brigalow) predominates. A well developed tall shrub layer is present. Scattered low shrubs also occur. Ground layer is variable and composed of grasses and some forbs.

TREE, TALL SHRUB LAYER: Ht 4-6 occ., 10 m, PFC 10-20%; 50/ha trees *Acacia harpophylla*; 750/ha shrubs.

Predominant spp: *Acacia harpophylla*.

Frequent spp: *Eremophila mitchellii, Flindersia maculosa, Heterodendrum oleifolium.*
Infrequent spp: *Acacia cambagei, Atalaya hemiglauca, Bauhinia carronii, Brachychiton rupestre, Eremophila oppositifolia* var. *rubra, Eucalyptus thozetiana, Geijera parviflora.*

LOW SHRUB LAYER: Ht <1 m, PFC <1%;75/ha.

Frequent spp: *Apophyllum anomalum, Canthium oleifolium, Eremophila glabra.*
Infrequent spp: *Capparis lasiantha, C. mitchellii, Myoporum deserti, Enchylaena tomentosa.*

GROUND LAYER: Ht <1 m, PFC 5-20%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, Hibiscus trionum, Malvastrum americanum, Portulaca* sp. aff. *oleracea, Sida fibulifera, S. trichopoda, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Enteropogon acicularis, Sporobolus caroli.*
Infrequent spp: *Aristida latifolia, Astrebla elymoides, A. lappacea, Cenchrus ciliaris, Digitaria brownii, D. divaricatissima, Enneapogon polyphyllus, Paspalidium caespitosum, Tripogon loliiformis.*

LAND USE: Condition fair, trend stable but downgraded by stone on surface; nutrient levels are low to fair; little topfeed available; annual grasses with some perennials; some poisonous plants present.

LAND UNIT 23

LANDFORM: Low ridges in gently undulating plains.

GEOLOGY: Fresh Cretaceous sediments, *Wallumbilla Formation.*

SOILS: Shallow, brown clays often with much surface stone. Soil reaction trend is slightly acid in the upper profile becoming alkaline at depth. $CaCO_3$ is present throughout, with gypsum present in the lower profile. Uf 6.31.

Bayrick.

VEGETATION: Mountain yapunyah low woodland. *Eucalyptus thozetiana* (mountain yapunyah) predominates. *Acacia harpophylla* (brigalow) forms a tall shrub layer. The low shrub layer is present but sparse. Ground layer is sparse and composed of annual grasses.

TREE: TALL SHRUB LAYER: Ht 4-7 m, PFC <5%; 300/ha *Eucalyptus thozetiana,* 1 000 ha/shrubs (mainly *Acacia harpophylla).*

Predominant spp: *Eucalyptus thozetiana, Acacia harpophylla.*

Frequent spp: *Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 25/ha.

Frequent spp: *Capparis lasiantha, Eremophila oppositifolia* var. *rubra, Geijera parviflora.*

GROUND LAYER: Ht <0.5, PFC <1%.

LAND USE: Condition fair; trend stable but made useless by stone mantle on surface; limited topfeed available; sparse annual grasses.

LAND UNIT 24

LANDFORM: Flat plains with gentle slopes <1%.

GEOLOGY: Fresh Cretaceous sediments, *Coreena Member*.

SOILS: Deep, brown clays with scattered surface stone. A surface crust is present. Texture is light clay, gravel occurring throughout. Soil reaction trend is slightly acid at the surface to alkaline at 30 cm and then acid at depth. Gypsum is abundant at depth. Uf 6.31.

Windeyer.

VEGETATION: Mountain yapunyah woodland. *Eucalyptus thozetiana* (mountain yapunyah) predominates. *Acacia harpophylla* (brigalow) is a frequent species. A tall shrub layer is present. Ground layer is sparse and composed of annuals.

TREE LAYER: Ht 12 m, PFC 15%; 75/ha *Eucalyptus thozetiana*.

Predominant spp: *Eucalyptus thozetiana*.

Frequent spp: *Acacia harpophylla*.

TALL SHRUB LAYER: Ht 2-4 m, PFC <5%; 250/ha.

Frequent spp: *Eremophila mitchellii, Geijera parviflora*.

GROUND LAYER: Ht <0.5 m, PFC <30%.

LAND USE: Condition fair, trend stable to downwards; scalding and slight gully erosion, limited topfeed present, sparse annual grasses.

LAND UNIT 25

LANDFORM: Flat to gently undulating plains with slopes <2%.

GEOLOGY: Triassic *Moolayember Formation* (siltstones and mudstones) which may be covered in part by Quaternary sands.

SOILS: Gilgaied, deep, grey and brown cracking clays with light stone cover. Textures are medium to heavy clays. Soil reaction trend is slightly acid at the surface to strongly alkaline at depth. $CaCO_3$ is present throughout the profile. Ug 5.11, Ug 5.12, Ug 5.31.
Low C and N values. High K. Fair A.P. and B.P. Medium A.W.C.

Mendip - Representative soil analysis: 285.

VEGETATION: Brigalow woodland. *Acacia harpophylla* (brigalow) predominates. A tall shrub layer is present. Ground layer is variable composed of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 9-12 m, PFC 10-15%; 400/ha *Acacia harpophylla*.

Predominant spp: *Acacia harpophylla*.

Frequent spp: *Eremophila mitchellii*.
Infrequent spp: *Atalaya hemiglauca, Bauhinia carronii, Brachychiton rupestre, Carissa ovata, Geijera parviflora, Heterodendrum oleifolium, Enchylaena tomentosa*.

GROUND LAYER: Ht 0.5-0.7 m, PFC 5-10%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, A. malvifolium, Ajuga australis, Bassia tetricuspis, B. ventricosa, Boerhavia diffusa, Desmodium varians, Evolvulus alsinoides, Hibiscus trionum, Justica procumbens, Malvastrum americanum, Marsilea drummondii, Portulaca* sp. aff. *oleracea, Salsola kali, Sida trichopoda, Trianthema triquetra*.

GRAMINOIDS:

Infrequent spp: *Cenchrus ciliaris, Cyperus bifax, Enneapogon polyphyllus, Enteropogon acicularis, Sporobolus actinocladus, S. caroli, Tripogon loliiformis*.

LAND USE: Condition good, trend stable; nutrient levels are fair; slight gully erosion; some topfeed present; forbs and some annual grasses occur; woody weeds are not a problem when developed.

LAND UNIT 26

LANDFORM: Low ridges and crests in gently undulating plains.

GEOLOGY: Triassic *Moolayember Formation* with Quaternary sand cover.

SOILS: Shallow to moderately deep texture contrast soils, often with an ironstone gravel layer on top of the B horizon. The surface texture ranges from loam to sandy clay loam and exhibits crusting. Soil reaction trend is slightly acid in the surface horizons becoming moderately alkaline in the subsoil. Dr 2.12, Dy 2.12, Db 2.13.
Low C and N values. High C/N ratio. K very fair. A.P. and B.P. fair. A.W.C. low at surface, medium in subsoil.

Thrungli - Representative soil analysis: 306.

VEGETATION: Dawson gum-brigalow open woodland. *Eucalyptus cambageana* (Dawson gum) - *Acacia harpophylla* (brigalow) predominate. The tall and low shrub layer are both well defined. The ground layer is sparse to absent.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC 5-10%; 100/ha *Eucalyptus cambageana, Acacia harpophylla;* 375/ha shrubs.

Predominant spp: *Acacia harpophylla, Eucalyptus cambageana.*

Frequent spp: *Brachychiton rupestre, Canthium oleifolium, Eremophila mitchellii, Erythroxylum australe, Flindersia maculosa, Geijera parviflora, Ventilago viminalis.*

LOW SHRUB LAYER: Ht 1-2 m, PFC 5%.

Frequent spp: *Apophyllum anomalum, Carissa ovata, Enchylaena tomentosa, Myoporum deserti.*

GROUND LAYER: Ht <1 m, PFC <1%.

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris.*

LAND USE: Condition good, trend stable; nutrient levels fair except for N; slight gully erosion; limited topfeed available; sparse grass layer; no poisonous plants.

LAND UNIT 27

LANDFORM: Flat to very gently undulating plains.

GEOLOGY: Triassic *Moolayember Formation* with Quaternary sand cover.

SOILS: Moderately deep texture contrast soils with surface crusting. Soil reaction trend is slightly acid at the surface to alkaline at depth. Dy 2.12.

Thrungli.

VEGETATION: Poplar box woodland. *Eucalyptus populnea* (poplar box) predominates. Tall shrub layer is present as is a low shrub layer. Ground layer is sparse to absent.

TREE, TALL SHRUB LAYER: Ht 12 m, PFC <10%; 125/ha *Eucalyptus populnea;* 150/ha shrubs.

Predominant spp: *Eucalyptus populnea.*

Frequent spp: *Acacia harpophylla, Bauhinia carronii.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 100/ha.

Frequent spp: *Carissa ovata, Capparis lasiantha, Eremophila mitchellii, Geijera parviflora, Heterodendrum oleifolium.*

GROUND LAYER: Ht <0.7 m, PFC <1%.

LAND USE: Condition good, trend stable; slight gully erosion; some topfeed present; ground layer is sparse; no poisonous plants.

LAND UNIT 28

LANDFORM: Gently undulating to undulating plains, including footslopes of dissected land surface.

GEOLOGY: Sediments of Jurassic *Westbourne Formation* (siltstones).

SOILS: Shallow to moderately deep clays and associated texture contrast soils. Surface stone and rocks present. Extensive sheet and gully erosion exposes bed rocks. Profiles are strongly alkaline with $CaCO_3$ present throughout. Uf 6.33, Dr 2.43.
Low to fair C and N. Very fair to high K. High A.P., fair B.P. Is sodic and contains Cl at depth. A.W.C. is medium at surface, increasing with depth.

Windeyer - Representative soil analysis: 108.

VEGETATION: Sparse herbland with scattered brigalow trees. Forbs and some grasses occur forming a sparse herbfield. Scattered trees of *Acacia harpophylla* (brigalow) and *Bauhinia carronii* occur. Scattered shrubs also occur.

TALL SHRUB LAYER: Ht 3-4 m, PFC <1%; 125/ha shrubs.

Frequent spp: *Acacia harpophylla, Bauhinia carronii, Eremophila mitchellii.*
Infrequent spp: *Flindersia maculosa, Geijera parviflora, Hakea leucoptera, Owenia acidula.*

LOW SHRUB LAYER: Ht <1 m, PFC <1%.

Infrequent spp: *Apophyllum anomalum, Atalaya hemiglauca, Capparis lasiantha.*

GROUND LAYER: Ht <0.5 m, PFC <1%.

Predominant spp: *Atriplex vesicaria, Portulaca* sp. aff. *oleracea.*

Frequent spp: *Bassia ventricosa.*
Infrequent spp: *Goodenia strongiophylla, Malvastrum americanum, Oxalis corniculata, Salsola kali, Solanum esuriale.*

GRAMINOIDS:

Infrequent spp: *Chloris pectinata, Dicanthium sericeum, Digitaria divaricatissima, Eriochloa pseudoacrotricha, Sporobolus actinocladus, Tripogon loliiformis, Tragus australianus.*

LAND USE: Condition bad; trend downwards; nutrient levels are fair; some wind erosion; severe gully erosion due to slopes and sodic subsoil; not recommended for timber clearing; sparse ground layer.

LAND UNIT 29

LANDFORM: Ridges, low hills in gently undulating to undulating plains with slopes to 10%.

GEOLOGY: Sediments of Jurassic *Westbourne Formation.*

SOILS: Rubble land with extensive gravel or stone pavements and abundant rock outcropping. Very shallow lithosols.
Um 1.
Lumeah.

VEGETATION: Mountain yapunyah open woodland. *Eucalyptus thozetiana* (mountain yapunyah) predominates. A tall shrub layer is present and scattered low shrubs also occur. The ground layer is sparse composed of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 15 m, PFC <5%, Ht 4 m, PFC <1%; 50/ha *Eucalyptus thozetiana.* 250/ha shrubs.

Predominant spp: *Eucalyptus thozetiana.*

Infrequent spp: *Acacia deani, A. shirleyi, Geijera parviflora.*

LAND UNIT 29 (Cont'd)

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 50/ha.

Infrequent spp: *Myoporum deserti, Enchylaena tomentosa.*

GROUND LAYER: Ht <1 m, PFC <1%.

FORBS:

Infrequent spp: *Hibiscus sturtii, Enchylaena tomentosa.*

GRAMINOIDS:

Infrequent spp: *Aristida caput-medusae, Sporobolus actinocladus.*

LAND USE: Condition bad; trend downwards; gully erosion occurs; no topfeed present; ground layer is sparse to bare.

LAND UNIT 30

LANDFORM: Upper slopes and crests of ridges in undulating plains with slopes to 4%.

GEOLOGY: Sediments of Jurassic *Westbourne Formation* with Quaternary cover and altered Cretaceous sediments.

SOILS: Shallow to moderately deep soils with gravel cover. Soil reaction trend is slightly acid throughout. Gravel often throughout profile. Subject to sheet and gully erosion. C is low and N very low. K is low and may be limiting. A.P. and B.P. low. Medium salts and high Cl at depth. Db 1.32.

Thrungli - Representative soil analysis: 109.

VEGETATION: Brigalow-sandalwood tall shrubland with emergent Dawson gum, *Acacia harpophylla* (brigalow) and *Eremophila mitchellii* (sandalwood) predominate with *Eucalyptus cambageana* (Dawson gum) as an emergent. A low shrub layer is present. Ground layer is sparse to absent.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <5%; 100/ha *Eucalyptus cambageana;* Ht 4 m, PFC 20%; 500/ha *Acacia harpophylla* and *Eremophila mitchellii.*

Predominant spp: *Acacia harpophylla, Eremophila mitchellii, Eucalyptus cambageana.*

Infrequent spp: *Eucalyptus populnea, Flindersia maculosa, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 0.5-1 m, PFC <1%; 125/ha shrubs.

Infrequent spp: *Enchylaena tomentosa, Myoporum deserti.*

GROUND LAYER: Ht <1 m, PFC <15%.

FORBS:

Infrequent spp: *Bassia birchii.*

GRAMINOIDS:

Infrequent spp: *Sporobolus actinocladus.*

LAND USE: Condition fair, trend downwards; some gully erosion; no topfeed present; grasses are sparse; poisonous plants occur; nutrient levels are low; susceptibility to gully erosion due to slopes and salt levels. Timber clearing not recommended.

LAND UNIT 31

LANDFORM: Gently undulating plains with slopes to 1%.

GEOLOGY: Fresh Cretaceous sediments, *Mackunda Formation.*

SOILS: Shallow to moderately deep, grey cracking clays with some ironstone pebble and sandstone rocks on surface, weakly gilgaied. A thin surface crust may be present. Soil reaction is alkaline throughout with $CaCO_3$ present in the profile. Ug 5.11.

LAND UNIT 31 (Cont'd)

Low C, very low N. High K. P status very low. A.W.C. is high increasing to very high at depth. Sodic beyond 30 cm.

Mendip - Representative soil analysis: 245.

VEGETATION: Brigalow tall open shrubland with emergent whitewood. *Acacia harpophylla* (brigalow) predominates with *Atalaya hemiglauca* (whitewood) as an emergent. A low shrub layer is also present. Ground layer is well developed and consists of grass and forbs.

TREE, TALL SHRUB LAYER: Ht 4-7 m, PFC 1-5%; 50/ha *Atalaya hemiglauca* and *Brachychiton rupestre;* 500 ± 250/ha *Acacia harpophylla*.

Predominant spp: *Acacia harpophylla, Atalaya hemiglauca, Brachychiton rupestre.*

Frequent spp: *Albizia basaltica, Eremophila mitchellii.*
Infrequent spp: *Geijera parviflora, Santalum lanceolatum, Ventilago viminalis.*

LOW SHRUB LAYER: Ht <2 m, PFC <1%; 175/ha.

Frequent spp: *Apophyllum anomalum.*
Infrequent spp: *Capparis lasiantha, Myoporum deserti.*

GROUND LAYER: Ht 0.3-1 m, PFC 18 ± 10%.

FORBS:

Frequent spp: *Hibiscus trionum, Malvastrum americanum, Salsola kali, Sida fibulifera.*
Infrequent spp: *Amaranthus mitchellii, Bassia cornishiana, B. quinquecuspis, Boerhavia diffusa, Maireana villosa, Oxalis corniculata, Phyllanthus maderaspatensis, Polymeria marginata, Rhynchosia minima, Sida trichopoda, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Aristida latifolia, Astrebla elymoides, A. lappacea, Dicanthium sericium, Digitaria divaricatissima, Enneapogon avenaceus, Enteropogon acicularis, Sporobolus caroli, Tragus australianus.*
Infrequent spp: *Cenchrus ciliaris, Chloris virgata, Cyperus bifax, C. gilesii, Dactylocteneum radulans, Eragrostis setifolia, Glossogyne tenuifolia, Iseilema membranaceum, Sporobolus actinocladus, Triraphis mollis.*

LAND USE: Condition good; trend stable; nutrient levels are very low except for K. Sodic beyond 30 cm; slight water erosion; topfeed available; good annual perennial grasses; poisonous plants present.

LAND UNIT 32

LANDFORM: Flat to gently undulating plains with slopes <1%. Indistinct drainage pattern.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments masking underlying rocks.

SOILS: Moderately deep to deep, red earths with associated texture contrast soils and yellow earths. Surface textures are hard setting sandy loams to sandy clay loams which exhibit a surface crust. Ironstone shot occurs on soil surface and in the profile. Soil reaction trend is slightly acid throughout. Gn 2.12 with Dr 2.12, Gn 2.22.
Very low C, low N. Very fair K. Very low A.P. Very low A.W.C.

Erne - Representative soil analysis: 72.

VEGETATION: Silver-leaved ironbark open woodland occasionally woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates. A tall shrub layer is usually well defined and low shrubs are scattered. Ground layer is well defined and composed mainly of grasses.

LAND UNIT 32 (Cont'd)

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <5-10%; 250/ha *Eucalyptus melanophloia*; 100/ha shrubs.

Predominant spp: *Eucalyptus melanophloia*.

Frequent spp: *Acacia coriacea, A. excelsa, Albizia basaltica, Bauhinia carronii, Bursaria spinosa, Eremophila mitchellii, Eucalyptus papuana, E. polycarpa.*
Infrequent spp: *Atalaya hemiglauca, Brachychiton australe, B. populneum, Eucalyptus tessellaris, Geijera parviflora, Heterodendrum oleifolium, Petalostigma pubescens.*

LOW SHRUB LAYER: Ht <2 m, PFC <5%; 100/ha.

Frequent spp: *Carissa ovata, Cassia artemisioides, C. nemophila, C. sturtii, Cassinia laevis.*

GROUND LAYER: Ht 1-1.5 m, PFC 30%.

FORBS:

Frequent spp: *Solanum ferocissimum.*
Infrequent spp: *Bassia convexula, Centaurium spicatum, Euphorbia drummondii, Sida fibulifera, Solanum esuriale, Tricoryne elatior.*

GRAMINOIDS:

Frequent spp: *Aristida caput-medusae, A. ingrata, A. jerichoensis, Cenchrus ciliaris.*
Infrequent spp: *Bothriochloa ewartiana, Cymbopogon refractus, Eragrostis speciosa, Heteropogon contortus, Panicum effusum, Themeda australis, Triodia mitchellii.*

LAND USE: Condition good, trend stable; very low nutrient levels; some sheet erosion; some topfeed present; grasses are perennials; poisonous plants present; woody weed problems resulting from seedlings can be a problem.

LAND UNIT 33

LANDFORM: Lower slopes and indistinct drainage lines in flat to gently undulating plains.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately deep to deep, red and yellow, texture contrast soils. Surface textures range from sandy loams to sandy clay loams overlying structured clays. Surfaces are mainly hard setting and ironstone shot is present on the surface crust. Soil reaction trend is slightly acid in the upper profile to alkaline at depth. Dr 2.43, Dr 4.43, Dy 3.32.
Low C, very low N. High C/N ratio. Low to fair K. Very low A.P. High surface bulk density. Very low A.W.C.

Lancevale - Stratford - Representative soil analysis: 11, 299.

VEGETATION: Poplar box open woodland *Eucalyptus populnea* (poplar box)predominates. A well defined tall shrubby layer dominated by *Eremophila mitchellii* (sandalwood) is usually present. Scattered low shrubs may also occur. Ground layer is variable composed of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 9-12 m, PFC 5-<10%; 150/ha *Eucalyptus populnea*; Ht 3-7 m, PFC <5%; 100/ha shrubs.

Predominant spp: *Eucalyptus populnea*.

Frequent spp: *Eremophila mitchellii.*
Infrequent spp: *Acacia coriacea, A. excelsa, Albizia basaltica, Atalaya hemiglauca, Canthium oleifolium, Eucalyptus melanophloia, E. polycarpa, E. terminalis, Ventilago viminalis, Geijera parviflora.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 75/ha.

LAND UNIT 33 (Cont'd)

Infrequent spp: *Calytrix longiflora, Capparis lasiantha, Carissa ovata, Cassia artemisioides, C. nemophila, C. oligophylla, Ehretia membranifolia, Persoonia falcata.*

GROUND LAYER: Ht 1-1.5 m, PFC 15 $\pm$ 10%.

FORBS:

Frequent spp: *Evolvolus alsinoides.*
Infrequent spp: *Crotalaria linifolia, Jasminum lineare, Sida fibulifera, S. spinosa, Solanum cleistogamum, S. ferocissimum.*

GRAMINOIDS:

Frequent spp: *Aristida browniana, Cenchrus ciliaris, Enneapogon polyphyllus, Heteropogon contortus.*
Infrequent spp: *Aristida calycina, A. caput-medusae, A.jerichoensis, Bothriochloa ewartiana, Cenchrus ciliaris, Chrysopogon falax, Cymbopogon obtectus, Digitaria brownii, D. divaricatissima, Enteropogon acicularis, Eriachne mucronata, Fimbristylis dichotoma, Sporobolus elongatus, Tragus australianus, Tripogon loliiformis.*

LAND USE: Condition good, trend stable; very low fertility levels, some sheet erosion; some topfeed present; grasses are perennials; poisonous plants present; woody weeds are not a major problem although some regrowth can take place after clearing.

LAND UNIT 34

LANDFORM: Flat to very gently undulating plains with slopes <1%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately deep to deep, loamy red earths and texture contrast soils. The soil surface is usually loose but exhibits a weak crust. Ironstone shot occurs on the soil surface and in the profile. Soil reaction trend is slightly acid throughout. Dy 5.12, Gn 2.12 with Dy 4.43.
Very low C and N. Low K. Very low A.P.

Lancevale, Rosemount - Representative soil analysis: 300.

VEGETATION: Desert gum, bloodwood open woodland. *Eucalyptus papuana* (desert gum) and *E. polycarpa* (long-fruited bloodwood) predominate with *E. dichromophloia* (gum topped bloodwood) conspicuous in places. A well defined tall shrub layer may be present. Ground layer is variable, composed of forbs and grasses.

TREE LAYER: Ht 10-15 m, PFC <10%; 150/ha *Eucalyptus* spp.

Predominant spp: *Eucalyptus dichromophloia, E. papuana, E. polycarpa.*

Frequent spp: *Eucalyptus melanophloia, E. populnea.*
Infrequent spp: *Eucalyptus drepanophylla, E. moluccana, E. similis, E. whitei.*

TALL SHRUB LAYER: Ht 4-8 m, PFC <5%,175/ha shrubs.

Frequent spp: *Acacia coriacea, Bursaria spinosa, Grevillea juncifolia.*
Infrequent spp: *Cassinia laevis, Clerodendrum floribundum, Eremophila mitchellii, Hakea chordophylla, Kerandrenia collina, Persoonia falcata, Santalum lanceolatum.*

GROUND LAYER: Ht 0.5-1 m, PFC 30 $\pm$ 10%.

FORBS:

Frequent spp: *Evolvolus alsinoides, Sida spinosa.*
Infrequent spp: *Atylosia marmorata, Glycine tabascina, G. tomentella, Heliotropium tenuifolium, Indigofera linifolia, Lomandra leucocephala, Pteracaulan sphacelatum, Rhynchosia minima, Solanum ferrocissimum.*

LAND UNIT 34 (Cont'd)

GRAMINOIDS:

Frequent spp: *Aristida browniana, A. ingrata, A. jerichoensis, Chrysopogon fallax,Eriachne aristidea, Heteropogon contortus.*
Infrequent spp: *Aristida calycina, Bulbostylis barbata, Cymbopogon refractus, Digitaria ammophila, D. brownii, D. divaricatissima, Eragrostis lacunaria, E. speciosa, Eriachne obtusa, Fimbristylis nelsonii, Perotis rara, Schizachyrium fragile, Themeda australis, Tragus australianus, Triodia mitchellii, Triraphis mollis.*

LAND USE: Condition good, trend stable; very low fertility, occasional sheet erosion; some topfeed present; grasses are perennials; some poisonous plants are present; woody weeds are not a problem but a dense shrub layer may limit production in places.

LAND UNIT 35

LANDFORM: Flat to very gently undulating plains.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Shallow earthy sands. Soil surface is loose and weakly crusted. Ironstone gravel occurs at base of profile. Soil reaction trend is slightly acid throughout. Uc 5.11.

Rosedale

VEGETATION: Desert oak - *Hakea chordophylla* low open woodland. *Acacia coriacea* (desert oak) and *Hakea chordophylla* predominate. *Eucalyptus populnea* (poplar box) and *E. polycarpa* (long-fruited bloodwood) occur frequently. Ground layer is variable and composed mainly of spinifex grasses.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <1%; 100/ha trees; Ht 6 m, PFC <5%; 250/ha *Acacia coriacea.*

Predominant spp: *Acacia coriacea, Hakea chordophylla.*

Frequent spp: *Eucalyptus populnea, Eucalyptus polycarpa.*
Infrequent spp: *Brachychiton rupestre, Exocarpus aphyllus.*

GROUND LAYER: Ht 0.5-1 m, PFC 10-15-20%.

GRAMINOIDS:

Frequent spp: *Triodia mitchellii.*
Infrequent spp: *Aristida helicophylla, A. ingrata, A. browniana, Bulbostylus barbata, Chrysopogon fallax, Eriachne aristida, E. obtusa, Themeda australis.*

FORBS:

Infrequent spp: *Bonamia media, Goodenia glabra, Solanum ferocissimum.*

LAND USE: Condition good, trend stable; no erosion present; grasses variable depending on the amount of *Triodia* sp. present; no poisonous plants present.

LAND UNIT 36

LANDFORM: Knolls and interfluves in flat to gently undulating plains.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Shallow, loamy, earthy sands with red and yellow earths. Pisolitic ironstone frequently occurs on soil surface and throughout profile. Soil reaction trend is strongly acid to acid throughout. Uc 1.43, Gn 2.21.
Very low C, N, K and A.P.

Rosedale - Representative soil analysis: 323.

LAND UNIT 36 (Cont'd)

VEGETATION: *Melaleuca tamarascina* tall open shrubland. *Melaleuca tamarascina* predominates with scattered trees of *Eucalyptus papuana* (desert gum). A low shrub layer is also present. Ground layer is composed mainly of spinifex.

TALL SHRUB LAYER: Ht 3 m, PFC <5%; 125/ha *Melaleuca tamarascina*, odd trees of *Eucalyptus papuana* to 8 m.

Predominant spp: *Melaleuca tamarascina*.

Frequent spp: *Eucalyptus papuana*.
Infrequent spp: *Eucalyptus exserta, E. terminalis*.

LOW SHRUB LAYER: Ht 1-2 m, PFC <10%; 400/ha.

Frequent spp: *Acacia curvinervia*.
Infrequent spp: *Acacia decora, Grevillea striata, Hakea chordophylla, Melaleuca nodosa, Micromyrtus hexamera*.

GROUND LAYER: Ht <1 m, PFC <5%.

FORBS:

Infrequent spp: *Stylidium eglandulosum*.

GRAMINOIDS:

Frequent spp: *Triodia mitchellii*.
Infrequent spp: *Tripogon loliiformis, Schizachyrium fragile*.

LAND USE: Condition bad; trend stable to downwards; very low fertility; slight gully erosion; topfeed absent; grasses are variable depending on the amount of spinifex present; poisonous plants can be present.

LAND UNIT 37

LANDFORM: Upper slopes in gently undulating plains with slopes commonly <3%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately deep to deep, red and yellow earths with associated texture contrast soils. The soil surface is crusted and hard setting. Soil reaction trend is usually slightly acid throughout. Gn 2.12, Gn 2.22 with Dr 3.12.
Very low C, N, K and A.P. A.W.C. very low.

Sydenham, Lancevale, Erne - Representative soil analysis: 284, 322, 325.

VEGETATION: Silver-leaved ironbark open woodland occasionally woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates with *Eucalyptus whitei* (White's ironbark) occurring in places. Well defined tall shrub layer composed mainly of *Acacia* spp. Low shrub layer is scattered to absent. Ground layer is variable composed mainly of hummock grasses.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC 5-10%; 200/ha *Eucalyptus melanophloia*; Ht 3-6 m, PFC <5%; 300 ± 200/ha shrubs mainly *Acacia* spp.

Predominant spp: *Eucalyptus melanophloia*.

Frequent spp: *Acacia coriacea, A. excelsa, Eucalyptus whitei*.
Infrequent spp: *Brachychiton populneum, Eucalyptus drepanophylla, Eucalyptus papuana, E. polycarpa, E. populnea, Hakea chordophylla, Ventilago viminalis*.

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 100/ga,

Frequent spp: *Bauhinia carronii, Bursaria spinosa, Canthium oleifolium, Carissa lanceolata, Eremophila mitchellii*.
Infrequent spp: *Acacia mellodora, Albizia basaltica, Carissa ovata, Cassinia laevis, Capparis lasiantha, Eremophila longifolia, Geijera parviflora, Melaleuca nodosa, Petalostigma pubescens*.

LAND UNIT 37 (Cont'd)

GROUND LAYER: Ht 1-1.5 m, PFC 30%.

FORBS:

Infrequent spp: *Desmodium varians, Euphorbia drummondii, Pteracaulon sphacelatum.*

GRAMINOIDS:

Frequent spp: *Eragrostis speciosa, Heteropogon contortus, Themeda australis, Triodia mitchellii, T. pungens.*
Infrequent spp: *Aristida browniana,A.calycina, A. inaequiglumis, A. ingrata, Chrysopogon fallax,Cymbopogon obtectus, Cyperus fulvus, C. subpinnatus, Eragrostis elongata, E. japonica, E. xerophila.*

LAND USE: Condition good to fair; trend stable; fertility levels very low; sheet and slight gully erosion; topfeed absent; perennial grasses present; seedling and shrubs in places can lower productivity.

LAND UNIT 38

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Very shallow to shallow, red earths and earthy sands with hard-setting surfaces. Ironstone nodules may occur throughout. Parent rocks exposed where sheet and gully erosion is active. Gn 2.42, Uc 1.23.

Milray, Rosedale.

VEGETATION: Desert gum open woodland. *Eucalyptus papuana* (desert gum) predominant. A well defined tall shrub layer may be present. Ground layer is variable composed mainly of grasses.

TREE LAYER: Ht 10 m, PFC <5%; 100/ha.

Predominant spp: *Eucalyptus papuana.*

Infrequent spp: *Acacia shirleyi, A. aneura, Brachychiton populneum, Eucalyptus drepanophylla, E. polycarpa.*

TALL SHRUB LAYER: Ht 3-4 m, PFC <1%; 100/ha.

Frequent spp: *Acacia coriacea.*
Infrequent spp: *Acacia dictyophleba, Canthium oleifolium, Petalostigma pubescens.*

LOW SHRUB LAYER: Ht <2m, PFC <1%; 75 $\pm$ 50/ha.

Infrequent spp: *Acacia excelsa, Cassia nemophila* var. *nemophila, Melaleuca tamarascina.*

GROUND LAYER: Ht <1 m, PFC 20%.

FORBS:

Infrequent spp: *Sida virgata* vel aff.

GRAMINOIDS:

Frequent spp: *Aristida psammophila, Heteropogon contortus, Panicum queenslandicum, Themeda australis, Tripogon loliiformis.*

LAND USE: Fair to poor condition; trend downwards, scalding, sheet and gully erosion present; topfeed absent; perennial grasses; some poisonous plants present.

LAND UNIT 39

LANDFORM: Lower slopes and drainage lines in flat to gently undulating plains.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately deep to deep, texture contrast soils which often exhibit a loose, loamy sand surface. Soil reaction trend is usually slightly acid throughout, occasionally $CaCO_3$ occurs at depth. Dy 5.42, Dy 5.43, Dr 2.33.

Rosemount, Lancevale.

VEGETATION: Poplar box open woodland *Eucalyptus populnea* (poplar box) predominates. Tall and low shrubby layers are present but not well defined. Ground layer is composed mainly of hummock grasses.

TREE, TALL SHRUB LAYER: Ht 10-11 m, PFC <5%; 75/ha. *Eucalyptus populnea* trees, Ht 3-4 m; PFC <1%; 125/ha shrubs.

Predominant spp: *Eucalyptus populnea.*

Infrequent spp: *Acacia coriacea, Canthium oleifolium, Eremophila mitchellii, Eucalyptus melanophloia, Grevillea striata, Heterodendrum oleifolium, Petalostigma pubescens.*

LOW SHRUB LAYER: Ht <2 m, PFC <1%; 100/ha.

Infrequent spp: *Acacia excelsa, Capparis lasiantha, Carissa lanceolata, Cassia nemophila, Myoporum deserti.*

GROUND LAYER: Ht 1 m, PFC <50%.

GRAMINOIDS:

Frequent spp: *Triodia mitchellii.*

LAND USE: Condition good, trend stable; some sheet erosion; topfeed absent; perennial grasses mainly *Triodia* spp., some poisonous plants present.

LAND UNIT 40

LANDFORM: Gently undulating plains with slopes 0.5-2%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Deep, sandy yellow earths and earthy sands. Surface textures are loose loamy sands which increase in texture to sandy clay loams. Soil reaction trend is strongly to moderately acid throughout. Gn 2.21, Uc 1.43, Dy 5.51.

Very low C, N, K and A.P. High C/N ratio. Very low A.W.C.

Sydenham - Representative soil analysis: 290.

VEGETATION: Silver-leaved ironbark woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates with a well defined tall shrub layer always present. The low shrub layer is variable but *Cassinia laevis* is always present. The ground layer is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10-13 m, PFC 10-15%; 100/ha. *Eucalyptus melanophloia;* Ht 3-4 m, PFC 20-40%; 800/ha shrubs.

Predominant spp: *Eucalyptus melanophloia.*

Frequent spp: *Acacia bancroftii, A. decora, Albizia basaltica, Bursaria spinosa, Callitris columellaris, Eremophila longifolia, Eucalyptus papuana.*

LOW SHRUB LAYER: Ht 1-2 m, PFC 10 $\pm$ 5%; 250 $\pm$ 200/ha.

Frequent spp: *Cassinia laevis.*
Infrequent spp: *Acacia farnesiana, Dodonaea* sp. aff. *attenuata.*

GROUND LAYER: Ht 0.5-1 m, PFC 10-30%.

FORBS:

Frequent spp: *Lomandra leucocephala.*

GRAMINOIDS:

Frequent spp: *Aristida ingrata, Heteropogon contortus, Triodia mitchellii.*

LAND UNIT 40 (Cont'd)

LAND USE: Condition good, trend stable; very low fertility; slight sheet erosion; topfeed absent; grasses are perennials; some poisonous plants are present.

LAND UNIT 41

LANDFORM: Low stony hills and jump-ups in undulating plains with slopes <15%.

GEOLOGY: Tertiary basalt as a hill capping of rubbly basalt overlying silicified *Adori Sandstone*.

SOILS: Rubble land with extensive gravel pavements. Very shallow sandy loams with slightly acid soil reaction trend. Uc 1.

Neverfail.

VEGETATION: Shrubby *Eucalyptus* spp. open woodland. *Eucalyptus drepanophylla* (grey ironbark) and *E. melanophloia* (silver-leaved ironbark) predominate with *Lysicarpus angustifolius* forming a tall shrub layer. A low shrub layer consisting mainly of *Acacia* species is conspicuous. Ground layer is variable and consists of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 20 m, PFC <5%; 125/ha *Eucalyptus* spp.; *Lysicarpus angustifolius*; Ht 10 m, PFC <1%; 75/ha.

Predominant spp: *Angophora costata, Callitris columellaris, Eucalyptus drepanophylla, E. melanophloia, Lysicarpus angustifolius.*

LOW SHRUB LAYER: Ht 2 m, PFC 10-15%; 2 200/ha.

Frequent spp: *Acacia deani, A. decora, A. doratoxylon* var. *angustifolius, A. macradenia, A. melleodora, Acacia oswaldii, Dodonaea attenuata*.
Infrequent spp: *Acacia biocalyx, A. clivicola, Alstonia constricta, Cassinia laevis, Carissa ovata, Dodonaea peduncularis, Eremophila mitchellii, Hakea chordophylla, Ricinocarpus bowmanii*.

GROUND LAYER: Ht 0.5-0.75 m, PFC <5-15%.

FORBS:

Infrequent spp: *Exocarpus cupressiformis, Glycine tabascina.*

GRAMINOIDS:

Frequent spp: *Heteropogon contortus, Scleria sphacelata.*
Infrequent spp: *Aristida caput-medusae, A. gracilipes, A. vagans, Cymbopogon obtectus, Cyperus fulvus, Eragrostis sororia, Eulalia fulva, Lomandra longifolia, Paspalidium constrictum, Themeda australis*.

LAND USE: Condition fair; trend stable; no erosion; dense shrub layer inhibits the ground layer.

LAND UNIT 42

LANDFORM: Gently undulating to undulating plains.

GEOLOGY: Quaternary sand deposits derived from Jurassic *Hutton Sandstones*.

SOILS: Moderately deep to deep, earthy sands with loose surfaces of loamy sand which may exhibit a weak surface crust. Associated are sandy surfaced, texture contrast soils. Soil reaction trend is slightly acid throughout. Uc 5.21, Uc 5.11, Dr 2.42.

Low C, very low N, fair K, very low A.P. and very low A.W.C.

Tarabah, Thrungli - Representative soil analysis: 116.

VEGETATION: *Eucalyptus* spp. - Cypress pine woodland. *Callitris columellaris* (cypress pine) predominates. Scattered *Eucalyptus melanophloia* (silver-leaved ironbark) and *E. populnea* (poplar box) occur usually as emergents. A low shrub layer is not well defined but scattered shrubs may occur. Ground layer is sparse, composed of scattered grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 8-12 m, PFC 10%; 550 ± 400/ha (depends on density of *Callitris columellaris*).

Predominant spp: *Callitris columellaris, Eucalyptus melanophloia, E. populnea.*

Frequent spp: *Canthium oleifolium, Lysicarpus angustifolius.*
Infrequent spp: *Persoonia falcata.*

LOW SHRUB LAYER: Ht 0.5-2 m, PFC <1%; 50/ha.

Frequent spp: *Acacia bancroftii, Dodonaea boronifolia, D. viscosa, Eremophila mitchellii, Grevillea stenobotrya.*

GROUND LAYER: Ht <0.75 m, PFC <10%.

FORBS:

Frequent spp: *Boerhavia diffusa, Evolvulus alsinoides, Helichrysum semiamplixicaule.*

GRAMINOIDS:

Frequent spp: *Chrysopogon falax, Cymbopogon refractus, Enneapogon polyphyllus, Themeda australis, Tragus australianus, Tripogon loliiformis, Perotis rara.*

LAND USE: Condition fair; trend stable; very low fertility; topfeed absent; grasses are perennials; some poisonous plants are present.

LAND UNIT 43

LANDFORM: Gently undulating to undulating plains with slopes <5%.

GEOLOGY: Jurassic *Hutton Sandstones* which may be masked in some areas by Quaternary sand cover.

SOILS: Deep to very deep, earthy sands and associated sandy surfaced texture contrast soils and siliceous sands. Surface colours are brown to dark brown which become lighter with depth. The soil surface is characteristically loose but a very weak crust may form. Soil reaction trend is slightly acid to neutral.
Uc 5.11, Dy 5.51.

Very low to low C and N. Low K. Very low to low AP. Very low A.W.C. Higher values may be obtained under tree canopies.

Tarabah, Rosemount - Representative soil analysis: 307, 337.

VEGETATION: Cypress pine woodland. *Callitris columellaris* (cypress pine) predominates with scattered *Eucalyptus melanophloia* (silver-leaved ironbark) occurring. Well defined low shrub layer only where cypress pine seedlings present. Ground cover variable composed of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 11-20 m, PFC 10-20%; 500 ± 150/ha, *Callitris columellaris;* 75/ha *Eucalyptus* spp.

Predominant spp: *Callitris columellaris, Eucalyptus melanophloia.*

Frequent spp: *Eucalyptus tessellaris.*
Infrequent spp: *Angophora costata, Brachychiton populneum, Eucalyptus dealbata, Eucalyptus polycarpa.*

LOW SHRUB LAYER: Ht 0.5-2 m, PFC <1% (5% in places) 125/ha in places up to 1 000/ha where *Callitris columellaris* seedlings.

Frequent spp: *Albizia basaltica, Callitris columellaris, Dodonaea boronifolia, D. viscosa.*
Infrequent spp: *Acacia blakei, A. conferta, A. decora, A. excelsa, A. longispicata, Bursaria spinosa, Carissa ovata, Cassinia laevis, Dodonaea attenuata, Erythroxylum australe, Eremophila mitchellii, Grevillea juncifolia, Heterodendrum oleifolium, Maytenus cunninghamii, Persoonia sericea, Petalostigma pubescens, Sparthothamnella juncea.*

GROUND LAYER: Ht 0.3-1 m, PFC 5-15%.

FORBS:

Frequent spp: *Abutilon otocarpum, Bassia birchii, Dianella revoluta, Euphorbia drummondii, Glycine tabacina, Helichrysum semiamplixicaule, Justicia procumbens, Lomandra longifolia, Marsdenia leptophylla, Sida ammophila, Veronia cinerea, Veronia sericea.*

GRAMINOIDS:

Frequent spp: *Aristida calycina, Chrysopogon falax, Cymbopogon refractus, Eragrostis lacunaria.*
Infrequent spp: *Aristida browniana, Bothriochloa ewartiana, Digitaria brownii, Eragrostis elongata, E. sororia, Eulalia fulva, Fimbristylis dichotoma, F. nelsonii, Perotis rara, Triraphis mollis.*

LAND USE: Condition fair to medium; trend stable; no erosion; very low nutrient levels; grasses mainly annuals; some poisonous plants present; dense seedling populations of cypress pine can act like woody weeds.

LAND UNIT 44

LANDFORM: Lower slopes and drainage lines in gently undulating plains. Slopes <1%.

GEOLOGY: Local alluvia in Jurassic *Hutton Sandstones.*

SOILS: Shallow texture contrast soils with scattered stone on the soil surface. The hardsetting soil surface has a texture of sandy loam which grades to medium clay. Quartz is present throughout the profile and a gravel layer commonly occurs on top of B horizon. $CaCO_3$ is present at depth. Db 2.43, Dr 2.43.

Very low C, N, A.P., B.P. and low K.

Jericho - Representative soil analysis: 355.

VEGETATION: Poplar box/sandalwood woodland, *Eucalyptus populnea* (poplar box) predominates. Scattered trees of *Acacia harpophylla* (brigalow) may occur. There is a well defined tall shrubby layer of *Eremophila mitchellii* (sandalwood). A lower shrubby layer is conspicuous in places. The ground layer is variable composed of forbs and grasses.

TREE LAYER: Ht 15-20 m, PFC <5%, *Eucalyptus populnea.*

Predominant spp: *Eucalyptus populnea.*

Infrequent spp: *Acacia harpophylla.*

TALL SHRUB LAYER: Ht 3-6 m, PFC <5%; 1 000/ha.

Frequent spp: *Eremophila mitchellii.*

LAND UNIT 44 (Cont'd)

LOW SHRUB LAYER: Ht <1 m, PFC <15%; 500/ha.

Frequent spp: *Capparis lasiantha, Eremocitrus glauca.*

GROUND LAYER: Ht 1 m, PFC 5%.

FORBS:

Frequent spp: *Bassia birchii, Boerhavia diffusa, Salsola kali.*
Infrequent spp: *Tribulus terrestris.*

GRAMINOIDS:

Frequent spp: *Aristida armata, A. ramosa, Enneapogon polyphyllus, Enteropogon acicularis, Eriachne mucronata, Paspalidium constrictum, Sporobolus caroli.*

LAND USE: Condition fair to medium; trend stable; very low fertility; topfeed absent; grasses mainly annuals; some poisonous plants present; dense layer of sandalwood can limit productivity.

LAND UNIT 45

LANDFORM: Gently undulating to undulating plains with slopes <5%.

GEOLOGY: Jurassic *Hooray Sandstones,* which consists of cross-bedded clayey quartzose to sublabile sandstone and conglomerate.

SOILS: Moderately deep texture contrast soils and brown clays. The soil surface is hardsetting and an algal crust may be present. Some surface stone is present. $CaCO_3$ is present at depth. Soil reaction trend is slightly acid in the surface horizons becoming alkaline at depth. Db 1.33, Uf 6.31.

Low C and N. Very fair K. High surface A.P., B.P., decreasing sharply down the profile. Where dense vegetation occurs, nutrients are concentrated in the surface and low levels occur down the profile.

Jericho - Representative soil analysis: 354.

VEGETATION: Poplar box-sandalwood open woodland. *Eucalyptus populnea* (poplar box) predominates with dense tall shrub layer of *Eremophila mitchellii* (sandalwood). A low shrub layer is present. Ground cover is sparse to absent composed mainly of annual grasses.

TREE, TALL SHRUB LAYER: Ht 6-15 m, PFC <5%; 50/ha *Eucalyptus populnea;* 600/ha shrubs.

Predominant spp: *Eucalyptus populnea, Eremophila mitchellii.*

Frequent spp: *Acacia excelsa, Bauhinia carronii, Geijera parviflora, Heterodendrum oleifolium.*
Infrequent spp: *Acacia harpophylla, Albizia basaltica.*

LOW SHRUB LAYER: Ht 1 m, PFC <5%, 250/ha.

Frequent spp: *Apophyllum anomalum, Carissa ovata, Cassia nemophila, Denhamia obscura.*

GROUND LAYER: Ht <1 m, PFC <2%.

FORBS:

Frequent spp: *Bassia birchii.*

LAND UNIT 45 (Cont'd)

GRAMINOIDS:

Frequent spp: *Aristida calycina*.

LAND USE: Condition fair to bad; trend downwards; nutrient levels are generally low except in the surface soil under the tree canopies; scalding, gully and sheet erosion were present; some topfeed is present; grasses mainly annuals; the dense layer of sandalwood limiting productivity.

LAND UNIT 46

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Deep earthy sands and associated sandy red earths. Soil surface is loose and may exhibit a weak crust. Ironstone shot occurs on the soil surface and ironstone gravel may occur at depth. Soil reaction trend is moderately to slightly acid throughout. Uc 5.11, Uc 1.21, Gn 2.11.

Very low C, N, K, A.P. and B.P. Very low A.W.C.

Rosefield - Representative soil analysis: 269.

VEGETATION: Shrubby bloodwood open woodland. *Eucalyptus dichromophloia* (gum topped bloodwood) and *E. similis* (desert yellow jacket) predominate. A tall shrub layer composed mainly of *Acacia* spp. is present. A low shrub layer is also present. Ground layer is composed of grasses and some forbs.

TREE, TALL SHRUB LAYER: Ht 12 m, PFC <5%; 100/ha *Eucalyptus dichromophloia, Eucalyptus similis;* Ht 3-6 m, PFC <20%; 900/ha shrubs.

Predominant spp: *Eucalyptus dichromophloia, E. similis*.

Frequent spp: *Canthium oleifolium, Eucalyptus drepanophylla*. Infrequent spp: *Acacia complanata, A. excelsa, A. leptostachya, A. platycarpa, A. tenuissima, Alphitonia excelsa, Alstonia constricta, Bursaria spinosa, Grevillea glauca, G. stenobotrya, Lysicarpus angustifolius, Maytenus cunninghamii*.

LOW SHRUB LAYER: Ht <2 m, PFC <5%; 125/ha.

Infrequent spp: *Coclospermum reticulatum, Davesia filipes, Hovea longifolia, Eremophila longifolia*.

GROUND LAYER: Ht 0.5-1 m, PFC 30%.

FORBS:

Infrequent spp: *Cheilanthes sieberi, Jasminum lineare, Lomandra leucocephala, Phyllanthus maderaspatensis, Solanum ferocissimum, Verbena officinalis*.

GRAMINOIDS:

Frequent spp: *Triodia mitchellii, Aristida ingrata*.

LAND USE: Condition fair; trend stable; very low fertility; topfeed absent; grasses are mainly *Triodia* spp., poisonous plants are present; shrub layer can lower productivity.

LAND UNIT 47

LANDFORM: Elevated plains whose upper slopes merge into tablelands with slopes to 8%;

GEOLOGY: Quaternary sand deposits overlying Jurassic *Ronlow Beds*.

SOILS: Deep, sandy red earths with hardsetting surfaces of sandy loams. Ironstone shot occurs on the soil surface and in the profile. Soil reaction trend is moderately acid throughout. Gn 2.11, Gn 2.12, Um 1.41.

Low to fair C and very low to low N. High C/N ratio. Very low to low K, very low P. Very low A.W.C.

Alice - Representative soil analysis: 262, 268.

VEGETATION: Western bloodwood open woodland. *Eucalyptus terminalis* (western bloodwood) predominates. Scattered tall shrubs do occur but a well defined shrubby layer is not present. Ground cover is variable and composed of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <5%; 100/ha *Eucalyptus terminalis*; Ht 3-5 m, PFC 1%; 75/ha shrubs.

Predominant spp: *Eucalyptus terminalis*.

Frequent spp: *Acacia curvinervi, A. coriacea, Alphitonia excelsa, Cassinia laevis, Grevillea juncifolia, Petalostigma pubescens*.

GROUND LAYER: Ht 0.5-0.7 m, PFC <5%.

FORBS:

Frequent spp: *Convolvulus erubescens, Euphorbia mitchellii, Evolvulus alsinoides, Goodenia hederacea, Gossypium australe, Oleria subspicata, Rutidosis leucantha, Solanum feroccissimum*.

GRAMINOIDS:

Frequent spp: *Aristida browniana, A. ingrata, Triodia mitchellii*.

LAND USE: Condition fair; trend stable; very low nutrient levels; topfeed absent; perennial grasses mainly *Triodia* sp., poisonous plants present.

LAND UNIT 48

LANDFORM: Shallow depressions in the flat tops of tablelands and mesas.

GEOLOGY: Local alluvia.

SOILS: Deep, sandy red earths with hardsetting surfaces of sandy loam. Ironstone shot occurs on the soil surface and in profile. Soil reaction trend is slightly acid throughout. Gn 2.12.

Alice -

VEGETATION: River red gum, *Eucalyptus* spp. open woodland. *Eucalyptus camaldulensis* (river red gum) predominates with *E. melanophloia* (silver-leaved ironbark) and *E. whitei* (White's ironbark) occurring frequently and in places being co-dominant. There is a well defined tall shrub layer and some isolated low shrubs do occur. The ground layer is composed mainly of grasses.

LAND UNIT 48 (Cont'd)

TREE, TALL SHRUB LAYER: Ht 10 m, PFC 5-10%; 200/ha *Eucalyptus* spp.; Ht 3-5 m, PFC <1%; 100/ha shrubs.

Predominant spp: *Eucalyptus camaldulensis, E. melanophloia, E. whitei.*

Frequent spp: *Acacia excelsa, A. coriacea, Alphitonia excelsa, Eucalyptus populnea, Ventilago viminalis.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 25/ha.

Infrequent spp: *Bursaria spinosa, Eremophila mitchellii.*

GROUND LAYER: Ht <1 m, PFC 10-20%.

GRAMINOIDS:

Frequent spp: *Themeda australis, Triodia pungens.*

LAND USE: Condition good; trend stable; topfeed absent; grasses are mainly *Triodia* sp. some poisonous plants occur.

LAND UNIT 49

LANDFORM: Very slight rises (<0.5 m) on the flat to very gently undulating tops of tablelands and mesas. Slopes <1%.

GEOLOGY: Quaternary sand deposits overlying Jurassic *Ronlow Beds.*

SOILS: Shallow, sandy red earths with ironstone shot and pisolitic ironstone occurring both on the soil surface and in the profile. The soil surface is crusted and the profile is slightly acid throughout. Gn 2.12.

Low C, very low N, very fair K and very low P. Low surface A.W.C. decreasing with depth.

Milray - Representative soil analysis: 274.

VEGETATION: *Melaleuca tamarascina* tall open shrubland. *Melaleuca tamarascina* predominates with scattered emergent *Eucalyptus* spp. A low shrub layer is present and composed mainly of *Melaleuca tamarascina* seedlings. Ground layer is composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 3 m, PFC <5%; 125/ha *Melaleuca tamarascina;* Ht 5-10 m, PFC <1%; 75/ha *Eucalyptus* spp.

Predominant spp: *Melaleuca tamarascina.*

Frequent spp: *Eucalyptus drepanophylla, E. peltata, E. setosa, E. whitei.*
Infrequent spp: *Acacia leptostachya, Brachychiton populneum, Calytrix longiflora.*

LOW SHRUB LAYER: Ht 1 m, PFC <1%; 175/ha mainly *Melaleuca tamarascina.*

Frequent spp: *Melaleuca tamarascina.*
Infrequent spp: *Commesperma sylvestre, Dodonaea* sp. aff. *attenuata.*

GROUND LAYER: Ht 1 m, PFC 10%.

GRAMINOIDS:

Frequent spp: *Aristida ingrata, Triodia pungens.*

LAND USE: Condition fair; trend stable; very low fertility; topfeed absent; grasses are sparse and mainly *Triodia* sp., some poisonous plants are present.

LAND UNIT 50

LANDFORM: Eroded ridges and crests of isolated, low hills and jump-ups in gently undulating plains. Slopes to 5%.

GEOLOGY: Jurassic *Ronlow Beds* which may have some Quaternary sand cover.

SOILS: Very shallow to shallow, loamy red earths which are subject to severe sheet and gully erosion, exposing parent rocks. Some silcrete and ironstone is present on the soil surface. Profile is slightly acid throughout. Um 5.31.

Milray.

VEGETATION: Desert gum low open woodland. *Eucalyptus papuana* (desert gum) predominates. A low shrub layer is well defined. Ground flora is composed mainly of grasses with some forbs.

TREE, TALL SHRUB LAYER: Ht 6-12 m, PFC <5%; 250/ha trees.

Predominant spp: *Eucalyptus papuana.*

Infrequent spp: *Acacia aneura, A. coriacea, Albizia basaltica, Bursaria spinosa, Canthium oleifolium, Erythrina verspertilio, Eucalyptus terminalis.*

LOW SHRUB LAYER: Ht <2 m, PFC <1%; 125/ha.

Infrequent spp: *Acacia tenuissima, Cassia artemesoides, C.sturtii, Carissa ovata, Eremophila mitchellii, Ventilago viminalis.*

GROUND LAYER: Ht 0.5-1 m, PFC <5%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, Bassia cornishiana, Portulaca filifolia.*

GRAMINOIDS:

Infrequent spp: *Aristida calycina, A. contorta, Enneapogon pallidus, E. polyphyllus, Enteropogon acicularis, Eriachne mucronata, Themeda australis, Tragus australianus, Triodia mitchellii, Tripogon loliiformis.*

LAND USE: Condition bad; trend downward; sheet and severe gully erosion; topfeed absent; grasses are sparse; some poisonous plants are present.

LAND UNIT 51

LANDFORM: Flat to gently undulating tops of tablelands and mesas.

GEOLOGY: Quaternary sand deposits overlying Jurassic *Ronlow Beds.*

SOILS: Moderately deep texture contrast soils with a surface crust. Ironstone concretions are abundant in the mottled B horizon. Dy 3.42.

Stratford.

VEGETATION: Poplar box open woodland. *Eucalyptus populnea* (poplar box) predominates with scattered *Eucalyptus papuana* (desert gum). No shrub layer exists. Ground cover is variable composed mainly of grasses.

TREE LAYER: Ht 11-13 m, PFC <1%; 75/ha. *Eucalyptus populnea, Eucalyptus papuana.*

Predominant spp: *Eucalyptus papuana, Eucalyptus populnea.*

GROUND LAYER: Ht 0.5-1 m, PFC 10-15%.

GRAMINOIDS:

Frequent spp: *Cyperus fulvus, Eragrostis elongata, E. speciosa.*

LAND USE: Condition fair, trend stable; slight sheet erosion; topfeed absent; grasses are sparse and mainly annuals; poisonous plants are present; termites are a problem.

LAND UNIT 52

LANDFORM: Flat to very gently undulating plains with slopes to 1½%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments. These sand sheets may overlie Tertiary sandstones in some areas.

SOILS: Moderately deep to deep, massive red earths with surface crusts. Surface textures range from sandy loams to sandy clay loams. Ironstone shot occurs on the soil surface. Ironstone nodules may occur at depth. Soil reaction trend is slightly acid throughout. Gn 2.12, Um 1.43.

Fair to low C, low N. Fair to high K. Very low to low AP, BP. Ca may be marginal in some areas. Low to very low AWC.

Yo Yo, Khyber - Representative soil analysis: 155, 191, 203, 214, 217, 223.

VEGETATION: Mulga low open woodland with emergent poplar box. *Acacia aneura* (mulga) predominates with emergent *Eucalyptus populnea* (poplar box). A low shrub layer is present and in places is extremely dense. Ground layer consists of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 5-10 m, PFC 15 $\pm$ 10%; 500 $\pm$ 250/ha, *Acacia aneura;* Ht 10-15 m, PFC <1%; 50/ha; *Eucalyptus populnea.*

Predominant spp: *Acacia aneura, Eucalyptus populnea.*

Frequent spp: *Eucalyptus melanophloia.*
Infrequent spp: *Acacia cana, A. excelsa, Brachychiton australae, B. populneum.*

LOW SHRUB LAYER: Ht 2-4 m, PFC <5%; 900 $\pm$ 850/ha depending on density of *Eremophila gilesii.*

Frequent spp: *Eremophila bowmanii, E. gilesii.*
Infrequent spp: *Cassia nemophila, C. nemophila* var. *nemophila, Denhamia obscura, Eremophila latrobei, E. longifolia, E. glabra, E. mitchellii, Geijera parviflora.*

GROUND LAYER:

FORBS:

Frequent spp: *Cheilanthes sieberi.*
Infrequent spp: *Abutilon otocarpum, Evolvolus alsinoides, Sida filiformis, S. macropoda, S. trichopoda.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Digitaria brownii, Eragrostis lacunaria.*

Infrequent spp: *Aristida aramata, A. benthamii, A. calycina, A. contorta, A. glumaris, A. jerichoensis, Enneapogon polyphyllus, Eriachne mucronata, Panicum decompositum, P. effusum, Themeda australis, Thyridolepis mitchelliana, Tripogon loliiformis.*

LAND USE: Condition good, trend stable; nutrient levels are low; abundant topfeed present; grasses are annuals and some perennials and may vary from sparse to medium cover; some poisonous plants present; in areas *Eremophila bowmanii* and *E. gilesii* become woody weed problems.

LAND UNIT 53

LANDFORM: Flat to gently undulating surface of Enniskillen Range.

GEOLOGY: Tertiary sandstones overlain by Quaternary sand deposits.

SOILS: Moderately deep texture contrast soils with surface crusts and ironstone shot on the surface soil. These soils tend to erode, exposing parent rocks near scarp edges or where stock have been concentrated. Soil reaction is slightly acid throughout. Dr 2.12.

Thrungli.

VEGETATION: Mulga - Moreton Bay ash low open woodland. *Acacia aneura* (mulga) and *Eucalyptus tessellaris* (Moreton Bay ash) predominate. Low shrub layer present composed mainly of *Cerbera* sp. Ground layer is sparse to absent.

TREE LAYER: Ht 9-10 m, PFC <5%; 150/ha.

Predominant spp: *Acacia aneura, Eucalyptus tessellaris.*

LOW SHRUB LAYER: Ht 2 m, PFC <5%; 500/ha.

Frequent spp: *Cassia sturtii, Cerbera* sp., *Eremophila latrobei.*

GROUND LAYER: Ht <0.5 m, PFC <1%.

FORBS:

Infrequent spp: *Cheilanthes sieberi.*

GRAMINOIDS:

Infrequent spp: *Enneapogon* spp.

LAND USE: Condition medium, trend downward; slight sheet erosion; abundant topfeed present; grasses mainly annuals and sparse cover; *Cassia* spp. can cause woody weed problems; some poisonous plants present.

LAND UNIT 54

LANDFORM: Depressions in the flat to very gently undulating plains and occasional low ridges.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately gilgaied, deep, grey cracking clays in the depressions to shallow texture contrast soils on ridges or upper slopes. Soil reaction trend is strongly alkaline throughout with $CaCO_3$ throughout the profile and gypsum at depth. Ug 5.21, Ug 5.13, Db 1.32.

Mendip, Thrungli.

VEGETATION: Brigalow-Dawson gum woodland. *Acacia harpophylla* (brigalow) predominates with emergent trees of *Eucalyptus cambageana* (Dawson gum). A shrub layer is well developed with *Eremophila mitchellii* (sandalwood) and *Myoporum deserti* (Ellangowan poison bush) predominant. Ground cover is variable composed of forbs and grasses.

TREE LAYER: Ht 10 m, PFC 10-15%; 400/ha *Acacia harpophylla*; Ht 12-20 m, PFC <5%; 75/ha *Eucalyptus cambageana*.

Predominant spp: *Acacia harpophylla, Eucalyptus cambageana*.

Infrequent spp: *Acacia aneura, Brachychiton rupestre, Eucalyptus thozetiana*.

TALL SHRUB LAYER: Ht 3 m, PFC 5%; 300/ha *Eremophila mitchellii, Geijera parviflora*.

Predominant spp: *Eremophila mitchellii, Geijera parviflora*.

LOW SHRUB LAYER: Ht 1-2 m, PFC <5%; 300/ha.

Frequent spp: *Myoporum deserti*.
Infrequent spp: *Acacia burrowii, Carissa ovata, Cassia nemophila, Dodonaea boronifolia, D. tenuifolia, Eremophila glabra*.

GROUND LAYER: Ht 0.5-0.75 m, PFC <5%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, Portulaca* sp. aff. *oleracea, Salsola kali, Sida fibulifera, S. filiformis*.

GRAMINOIDS:

Infrequent spp: *Chloris ventricosa, Enneapogon avenaceus, E. polyphyllus, Enteropogon acicularis, Eragrostis leptocarpa, Sporobolus caroli*.

LAND USE: Condition fair; trend stable; some topfeed present; grasses are sparse and mainly annuals; some poisonous plants are present; in places sandalwood and Ellangowan poison bush are a woody weed problem.

LAND UNIT 55

LANDFORM: Upper slopes in gently undulating plains with slopes to 1½%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Shallow, brown texture contrast soils with a conspicuous A2 horizon. Strongly acid surface horizons, becoming slightly alkaline at depth. Db 1.42.

Thrungli.

VEGETATION: Mulga low open woodland with emergent green-leaved box. *Acacia aneura* (mulga) predominates with emergent *Eucalyptus microcarpa* (green-leaved box). A few low shrubs occur but there are no well defined shrub layers. Ground layer is sparse to absent consisting of forbs and grasses.

LAND UNIT 55 (Cont'd)

TREE LAYER: Ht 5-10 m, PFC 15 ± 10%; 550 ± 250/ha *Acacia aneura;* Ht 10-15 m, PFC <1%; 50/ha *Eucalyptus microcarpa.*

Predominant spp: *Acacia aneura, Eucalyptus microcarpa.*

LOW SHRUB LAYER: Ht 2-4 m, PFC <1%.

Infrequent spp: *Cassia nemophila, C. nemophila* var. *nemophila, Eremophila longifolia, E. mitchellii.*

GROUND LAYER:

FORBS:

Frequent spp: *Cheilanthes sieberi.*
Infrequent spp: *Abutilon otocarpum, Evolvolus alsinoides, Sida filiformis, S. macropoda, S. trichopoda.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Digitaria brownii, Eragrostis lacunaria.*
Infrequent spp: *Aristida armata, A. calycina, A. contorta, A. glumaris, A. jerichoensis, Enneapogon polyphyllus, Eriachne mucronata, Panicum decompositum, P. effusum, Themeda australis, Thyridolepis mitchelliana, Tripogon loliiformis.*

LAND USE: Condition good, trend stable; topfeed present; grasses are annuals and some perennials and may vary from sparse to medium cover.

LAND UNIT 56

LANDFORM: Lower slopes in gently undulating plains with slopes <1%.

GEOLOGY: Quaternary sand sheets.

SOILS: Deep, loamy red earths and associated texture contrast soils. A surface crust is present. Soil reaction trend is variable. $CaCO_3$ may be present at depth. Dr 2.13, Db 2.43, Gn 2.12. Low C, very low N. High K. Very fair AP, BP.

Cunnalama, Champion - Representative soil analysis: 225.

VEGETATION: Poplar box open woodland. *Eucalyptus populnea* (poplar box) predominates. *Eremophila mitchellii* (sandalwood) dominates the tall shrub layer. Scattered low shrubs also occur. Ground layer is variable and composed of grasses and some forbs.

TREE, TALL SHRUB LAYER: Ht 15 m, PFC <5%; 100/ha. *Eucalyptus populnea;* Ht 3-4 m, PFC 5%.

Predominant spp: *Eucalyptus populnea.*

Frequent spp: *Eremophila mitchellii.*
Infrequent spp: *Acacia aneura, A. cambagei, A. excelsa, Albizia basaltica.*

LOW SHRUB LAYER: Ht 2 m, PFC 1%; 25/ha.

Frequent spp: *Hakea leucoptera, Myoporum deserti.*

GROUND LAYER: Ht 1-1.5 m, PFC <5-15%.

LAND UNIT 56 (Cont'd)

FORBS:

Frequent spp: *Abutilon otocarpum, Bassia birchii, Boerhavia diffusa, Salsola kali.*

GRAMINOIDS:

Frequent spp: *Enteropogon acicularis.*
Infrequent spp: *Aristida contorta, A. glumaris, A. jerichoensis, Cenchrus ciliaris, Chloris virgata, Chrysopogon falax, Enneapogon polyphyllus, Eragrostis lacunaria, E. leptocarpa, Sporobolus caroli, Triraphis mollis.*

LAND USE: Condition medium, trend stable; minor water erosion; grasses are mainly annuals; some topfeed is present; while surface soil nutrients may be fair, fertility is generally low.

LAND UNIT 57

LANDFORM: Flat to gently undulating plains with slopes <1%.

GEOLOGY: Fresh, Cretaceous sediments with some Quaternary sand cover.

SOILS: Moderately deep, brown clays with stone present in upper profile. Light cover of stone on soil surface. Profile is strongly alkaline throughout with carbonate present. Ug 5.32.

Warrah.

VEGETATION: Wooded open tussock grassland. *Astrebla elymoides* (hoop Mitchell grass) and *A. lappacea* (curly Mitchell grass) predominate. Tree, tall shrub layer is present consisting mainly of *Eremophila mitchellii* (sandalwood) and *Heterodendrum oleifolium* (boonaree).

TREE, TALL SHRUB LAYER: Ht 4-9 m, PFC <5%; 200/ha.

Frequent spp: *Acacia cambagei, A. harpophylla, Canthium oleifolium, Eremophila mitchellii, Heterodendrum oleifolium.*

GROUND LAYER: Ht 0.5-1 m, PFC <5-25%.

FORBS:

Frequent spp: *Bassia calcarata, Boerhavia diffusa, Malvastrum americanum, Portulaca* sp. aff. *oleracea, Ptilotus exaltatus, Salvia reflexa, Sida fibulifera, Trianthema triquetra, Solanum esuriale.*

GRAMINOIDS:

Predominant spp: *Astrebla elymoides, A. lappacea.*

Frequent spp: *Aristida latifolia, A. leptopoda, Tragus australianus.*
Infrequent spp: *Brachyachne convergens, Digitaria brownii, Enneapogon avenaceus, E. polyphyllus, Enteropogon acicularis, Eriochloa pseudoacratricha, Paspalidium caespitosum, Sporobolus caroli.*

LAND USE: Condition good, trend stable; topfeed present; perennial grasses present.

LAND UNIT 58

LANDFORM: Flat to gently undulating crests of dissected plains. Slopes along ridges <3%.

GEOLOGY: Tertiary sandstone which may have a covering of Quaternary sands.

SOILS: Very shallow to shallow, red earths and lithosols which are subject to sheet and gully erosion. Scalding occurs in some areas. Silcrete and gravel are abundant on the soil surface of ridges and hills. Profiles are slightly acid throughout. Gn 2.12, Um 1.23. Fair C, low N, high K, low AP, BP. Medium A.W.C. Nutrients accumulate in the surface.

Milray, Lumeah - Representative soil analysis: 206.

VEGETATION: Open scrubs - low open woodlands of mulga with emergent Dawson gum. *Acacia aneura* (mulga) predominates with *Eucalyptus cambageana* (Dawson gum) as an emergent. A low shrub layer composed entirely of *Eremophila latrobei*. Ground layer is sparse and usually absent.

TREE, TALL SHRUB LAYER: Ht 5-15 m, PFC <10-30%; 500 $\pm$ 375/ha *Acacia aneura;* Ht 20 m, PFC <1%; 50/ha *Eucalyptus cambageana*.

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 200/ha *Eremophila latrobei*.

GROUND LAYER: Ht <1 m, PFC <1%.

FORBS:

Infrequent spp: *Abutilon oxycarpum, Alternanthera denticulata, Indigofera australis, I. parviflora, Justiciaprocumbens, Thyridolepis mitchelliana, Solanum esuriale*.

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Digitaria brownii, Enteropogon acicularis, Eriochloa pseudoacratricha, Tripogon loliiformis*. Infrequent spp: *Aristida glumaris, A. leichhardtiana, Bracharia miliiformis, Chloris pectinata, Dactyloctenium radulans, Digitaria diminuta, D. divaricatissima, D. orbata, Enneapogon polyphyllus, Eragrostis elongata, Panicum decompositum, Paspilidium caespitosum, P. rarum, Sporobolus scabridus*.

LAND USE: Condition fair, trend downward; sheet erosion; topfeed present; ground layer is mainly bare and a few annuals; some poisonous plants present; nutrient levels are low.

LAND UNIT 59

LANDFORM: Flat to gently undulating plains and crests of dissected tablelands.

GEOLOGY: Tertiary sandstones.

SOILS: Very shallow, red,loamy, lithosols. Soil surface is scalded and base rocks are exposed. Profile is strongly acid. Very low C, N, K, P. Very low to low A.W.C. depending on organic matter. Um 1.43.

Lumeah - Representative soil analysis: 207.

VEGETATION: Bastard mulga tall open shrubland. *Acacia clivicola* (bastard mulga) and *Eucalyptus exserta* (Bendo) predominate. Ground layer is sparse to absent. These areas are usually scalded.

LAND UNIT 59 (Cont'd)

TALL SHRUB LAYER: Ht 3 m, PFC <1%; 150/ha.

Predominant spp: *Acacia clivicola, Eucalyptus exserta.*

GROUND LAYER: Ht <1 m, PFC <1%.

FORBS:

Infrequent spp: *Monochatea paradoxa.*

GRAMINOIDS:

Infrequent spp: *Aristida benthamii, A. glumaris, Digitaria brownii, Eragrostis lacunaria, Tripogon loliiformis.*

LAND USE: Condition bad, trend downward; very low nutrient levels; severe scalding; severe sheet and gully erosion; topfeed absent; ground mainly bare with some annuals; some poisonous plants present.

LAND UNIT 60

LANDFORM: Gently undulating plains with slopes <1%.

GEOLOGY: Tertiary sandstones.

SOILS: Shallow, red earths with ironstone shot on the surface. Ironstone concretions may occur throughout the profile. The surface soil is crusted and hard setting. Profile is moderately acid throughout. Low C, N. Fair K. Very low AP, BP. Gn 2.12, Um 1.43.

Milray - Representative soil analysis: 208.

VEGETATION: Mulga open woodland. *Acacia aneura* (mulga) predominates with *Brachychiton populneum* (kurrajong) and *Eucalyptus populnea* (poplar box) frequently present. Low shrub layer present and very dense in places due to presence of *Eremophila* spp.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC <5%; 150/ha *Acacia aneura, Eucalyptus populnea;* 300/ha shrubs.

Predominant spp: *Acacia aneura.*

Frequent spp: *Brachychiton populneum, Eucalyptus populnea, E. polycarpa.*
Infrequent spp: *Eucalyptus melanophloia.*

LOW SHRUB LAYER: Ht 0.5-2 m, PFC 5%; 700/ha.

Frequent spp: *Acacia aneura* (seedlings), *Cassia nemophila, Eremophila bowmanii, E. gilesii, E. longifolia.*
Infrequent spp: *Prostanthera suborbicularis.*

GROUND LAYER: Ht 0.5-1 m, PFC <5-20%.

FORBS:

Frequent spp: *Cheilanthes sieberi, Hibiscus sturtii, Monochater paradoxa, Sida cunninghamii, S. filiformis, Thyridolepis mitcheliana.*

GRAMINOIDS:

Frequent spp: *Digitaria brownii, Eragrostis lacunaria, Fimbristylis dichotoma, Panicum decompositum, Themeda australis.*

LAND USE: Condition fair to medium; trend stable; nutrients low to very low; topfeed abundant; grasses annuals with some perennials; in some areas *Eremophila* spp. can become a problem.

LAND UNIT 61

LANDFORM: Scarp retreats, upper slopes in dissected tablelands. Slopes range from 5% to 60% on the scarps, with lower slopes 3-8%.

GEOLOGY: Chemically altered, Cretaceous sediments with Cainozoic cover.

SOILS: Very shallow, red, loamy lithosols with surface stone cover of silcrete and ferricrete. Base rocks often exposed. Um 1.43.

Lumeah.

VEGETATION: Shrubby bendee low woodland. *Acacia catenulata* (bendee) predominates and *Eucalyptus exserta* (bendo) is a common species. Low shrub layer is conspicuous consisting of *Eremophila latrobei*. Ground layer is sparse to absent.

TREE LAYER: Ht 5-6 m, PFC 20%; 200/ha *Acacia catenulata* and *Eucalyptus exserta*.

Predominant spp: *Acacia catenulata, Eucalyptus exserta*.

LOW SHRUB LAYER: Ht 2 m, PFC 60%; 6 000/ha *Eremophila latrobei*.

Frequent spp: *Alstonia constricta, Eremophila latrobei, Geijera parviflora*.

GROUND LAYER: Ht <0.5 m, PFC <1%.

FORBS:

Infrequent spp: *Pandorea doratoxylon*.

GRAMINOIDS:

Infrequent spp: *Paspalidium caespitosum*.

LAND USE: Condition fair to bad; trend downwards; this unit is naturally unstable; scalding, some gully and sheet erosion; grasses are sparse annuals to completely absent; a dense shrub layer is present.

LAND UNIT 62

LANDFORM: Scarp retreats, upper slopes and flat tops of dissected tablelands with slopes to 30%.

GEOLOGY: Chemically altered Cretaceous sediments and Jurassic sandstones.

SOILS: Very shallow to shallow, yellowish brown to red, acid, lithosols with surface stone and boulders. Base rocks commonly exposed. Textures range from loamy sands to sandy loams. Uc 1.21, Uc 1.23, Uc 5.11. The levels of nutrients and A.W.C. are affected by the depth of soil, density of trees and amount of organic matter build up. Very fair C, fair N, low K, low P.

Neverfail - Representative soil analysis: 288.

VEGETATION: Bendee low woodland to woodland. *Acacia catenulata* (bendee) predominates with *Acacia shirleyi* (lancewood) occurring frequently. Scattered emergent trees may be present. Low shrubby layer is conspicuous. Ground layer is sparse composed of forbs and grasses.

LAND UNIT 62 (Cont'd)

TREE LAYER: Ht 6-10 m, PFC 10-30%; 200/ha *Acacia catenulata*.

Predominant spp: *Acacia catenulata.*

Frequent spp: *Acacia shirleyi.*
Infrequent spp: *Eucalyptus cambageana, E. decorticans, E. exserta, E. similis, E. trachyphloia, Grevillea striata.*

LOW SHRUB LAYER: Ht <2 m, PFC <15%; 700/ha.

Frequent spp: *Alphitonia excelsa, Boronia bipinnata, Canthium buxifolium, Carissa ovata, Eremophila latrobei.*
Infrequent spp: *Acacia blakei, Erythroxylum australe, Phelbalium glandilosum, Spartothamnella juncea.*

GROUND LAYER: Ht <1 m, PFC <1%.

FORBS:

Frequent spp: *Abutilon otocarpum, Cheilanthes distans, C. sieberi.*
Infrequent spp: *Convolvulus erubescens, Euphorbia drummondii, Goodenia* sp., *Prostanthera collina, Sarcostemma australe, Sida filiformis, Solanum ferocissimum , S. tetrathecum.*

GRAMINOIDS:

Frequent spp: *Aristida caput-medusae, A. disimilis.*
Infrequent spp: *Enneapogon lindleyanus, Paspalidium constrictum.*

LAND USE: Condition fair to bad; trend downward; nutrient levels are low to fair depending on the organic matter build up; gully and sheet erosion; grasses sparse to absent.

LAND UNIT 63

LANDFORM: Lower slopes of scarp retreats associated with dissected tablelands. Slopes to 3%.

GEOLOGY: Jurassic sandstones.

SOILS: Moderately deep, sandy yellow earths and associated earthy sands and sandy surfaced texture contrast soils. Acid soil reaction trend. Gn 2.21, Uc 5.21, Dy 2.41. Low C, very low N, high C/N ratio, very low K, very low P.

Sydenham, Rosedale - Representative soil analysis: 310.

VEGETATION: Narrow-leaved ironbark and silver-leaved ironbark low woodland. *Eucalyptus drepanophylla* (narrow-leaved ironbark) and *E. melanophloia* (silver-leaved ironbark) predominate with *E. terminalis* (western bloodwood) a common species. A tall shrub layer is present and a low shrub layer is present in some areas. Ground layer is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Low woodland, Ht 10-12 m, PFC <5-15%; 125/ha.

Predominant spp: *Eucalyptus drepanophylla, E. melanophloia, E. terminalis.*

Frequent spp: *Acacia longispicata.*
Infrequent spp: *Acacia decora, A. excelsa, Bursaria spinosa, Eremophila mitchellii, Eucalyptus populnea, E. dealbata, Petalostigma pubescens, Lysicarpus angustifolius, Melaleuca tamarascina.*

LAND UNIT 63 (Cont'd)

LOW SHRUB LAYER: Ht <2 m, PFC 5%; 120/ha.

Infrequent spp: *Acacia macradenia, Alphitonia excelsa, Baekei diosonifolia, Carissa orvata, Capparis lasiantha, Callitris columellaris* (seedlings), *Hovea longifolia, Santanlum lanceolata, Maytenus cunninghamii.*

GROUND LAYER: Ht <1 m, PFC 5-10%.

FORBS:

Infrequent spp: *Bassia birchii.*

GRAMINOIDS:

Frequent spp: *Triodia mitchellii, Eragrostis lacunaria, E. speciosa, E.elongata.*
Infrequent spp: *Aristida jerichoensis sub spinulifera.*

LAND USE: Condition fair, trend stable to downwards; some sheet erosion; topfeed absent; grasses annuals and some perennials; poisonous plants present mainly heartleaf poison bush; *Acacia* spp. cause woody weed problems in some areas.

LAND UNIT 64

LANDFORM: Flat to very gently undulating tops of tablelands, mesas and buttes. Slopes to 1%.

GEOLOGY: Cainozoic cover overlying Jurassic sandstones.

SOILS: Moderately deep to deep, red and yellow earths and associated earthy sands. Soil surface is crusted and profile is acid throughout. Gn 2.22, Uc 5.22.

Carbean.

VEGETATION: *Eucalyptus* spp. low open woodland. *Eucalyptus polycarpa* (long-fruited bloodwood) and *E. drepanophylla* (narrow-leaved ironbark) predominate. A well developed low shrub layer is present. Ground cover is variable composed mainly of spinifex.

STRUCTURAL FORM: Low open woodland Ht 4-6 m, PFC <5%.

TREE, TALL SHRUB LAYER: Ht 4-6 m, PFC <5%; 70/ha.

Predominant spp: *Eucalyptus drepanophylla, E. polycarpa.*

Frequent spp: *Casuarina inophloia, Lysicarpus angustifolius, Persoonia falcata, Petalostigma pubescens.*

LOW SHRUB LAYER: Ht 1-3 m, PFC 50-60%; 750/ha.

Frequent spp: *Acacia bancroftii, A. complanata, A. leptostachya, A. triptera, Dodonaea* sp. aff. *attenuata, Gastrolobium grandiflorum.*
Infrequent spp: *Alphitonia excelsa, Calytrix longiflora, Chloanthes parviflora, Leucopogon mitchellii, Maytenus cunninghamii, Micromyrtus hexamera, Ricinocarpus pinnifolius.*

GROUND LAYER: Ht 1 m, PFC 5-10-40%.

FORBS:

Infrequent spp: *Damperia discolor, Exocarpus cupressiformis.*

LAND UNIT 64 (Cont'd)

GRAMINOIDS:

Frequent spp: *Triodia mitchellii*.

LAND USE: Condition fair; trend stable to downwards; some sheet erosion; topfeed absent; grasses annuals and some perennials; poisonous plants present mainly heartleaf poison bush; *Acacia* spp. cause woody weed problems in some areas. Nutrient levels very low.

LAND UNIT 65

LANDFORM: Lower slopes, sandy aprons and fans in deeply dissected mountains and hills.

GEOLOGY: Jurassic sandstones.

SOILS: Deep, coarse textured soils. Uc 1.23.

VEGETATION: Wedding bush shrubland. *Ricinocarpus bowmanii* (wedding bush) predominates usually with scattered trees of *Eucalyptus polycarpa* (long-fruited bloodwood). Other shrubs occur. Ground cover is sparse and composed mainly of forbs and some grasses.

TREE, TALL SHRUB LAYER: Ht 3-6 m occasional *Eucalyptus* spp. to 12 m, PFC 25%; 4 000/ha shrubs; Ht 10-12 m, PFC <5% trees.

Predominant spp: *Acacia melleodora, Alphitonia excelsa, Petalostigma pubescens, Ricinocarpus bowmanii*.

Frequent spp: *Acacia bancroftii, A. longispicata, A. macradenia, Alstonia constricta, Bertya oleifolia, Eriostemon difformis, Eucalyptus polycarpa, Leptospermum attenuatum, Lysicarpus angustifolius, Pandorea pandorona, Persoonia falcata*.

GROUND LAYER: Ht 0.5-1 m, PFC <1%.

FORBS:

Frequent spp: *Cheilanthes sieberi*.
Infrequent spp: *Glycine tomentella, Helichrysum ramosissimum, Sida spinosa*.

GRAMINOIDS:

Infrequent spp: *Aristida caput-medusae, A. contorta, Cyperus brevibrasteatus, Digitaria ramularis, Eragrostis sororia*.

LAND USE: Condition fair; trend stable to downwards; some gully and sheet erosion; topfeed absent; grasses are mainly annuals and sparse; poisonous plants are present; shrubs form a dense layer and make any form of land use except recreational activities impossible.

LAND UNIT 66

LANDFORM: Flat to very gently undulating tops of tablelands, mesas and buttes.

GEOLOGY: Cainozoic cover.

SOILS: Shallow texture contrast soils subject to sheet and minor gully erosion on steeper slopes near scarps. Profile is strongly acid throughout. Dy 3.41. Low C, very low N, low K, very low P. Low A.W.C.

Caldervale - Representative soil analysis: 338.

LAND UNIT 66 (Cont'd)

VEGETATION: Silver-leaved ironbark, cypress pine open woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) and *Callitris columellaris* (cypress pine) predominate. A tall shrub layer is also present. The low shrub layer is dense in places due to the presence of *Callitris columellaris* seedlings and *Acacia* spp. Ground layer is variable but usually sparse composed of grasses.

TREE, TALL SHRUB LAYER: Ht 25 m, PFC <10%; 250/ha *Eucalyptus melanophloia, Callitris columellaris;* Ht 4 m, PFC <1%; 200/ha shrubs.

Predominant spp: *Callitris columellaris, Eucalyptus melanophloia.*

Frequent spp: *Dodonaea viscosa, Petalostigma pubescens.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <10%; 1 000/ha.

Frequent spp: *Callitris columellaris, Dodonaea viscosa.*
Infrequent spp: *Acacia blakei, A. decora, Maytenus cunninghamii, Melicrus urceolatus.*

GROUND LAYER: Ht <1 m, PFC <15%.

FORBS:

Frequent spp: *Cheilanthes distans.*
Infrequent spp: *Glossogyne tenuifolia, Helichrysum semiamplexicaule, Lomandra longifolia.*

GRAMINOIDS:

Frequent spp: *Aristida browniana, Chrysopogon fallax, Eragrostis lacunaria, E. mucronata, E. sororia, Eriachne obtusa, Eulalia fulva, Fimbristylis dichotoma, Heteropogon contortus, Themeda australis, Tragus australianus.*

LAND USE: Condition fair; trend stable to downwards; nutrient levels are very low; some gully erosion; topfeed absent; grasses mainly annuals with some perennials; poisonous plants present; shrub layer; can be very dense where *Callitris columellaris* seedlings occur.

LAND UNIT 67

LANDFORM: Flat to very gently undulating tops of tablelands, mesas and buttes.

GEOLOGY: Cainozoic cover.

SOILS: Shallow, loamy red earths subject to scalding and some sheet erosion. Profile is slightly acid throughout. Gn 2.12.

Milray.

VEGETATION: Bendo - *Acacia triptera* tall open shrubland. *Eucalyptus exserta* (bendo) and *Acacia triptera* predominate. Ground layer is sparse to absent.

TALL SHRUB LAYER: Ht 2-5 m, PFC <5%; 1 000/ha.

Predominant spp: *Eucalyptus exserta, Acacia triptera.*

GROUND LAYER: Ht <0.2 m, PFC <1%.

LAND USE: Condition bad, trend downwards; severe water erosion; *Acacia triptera* thickets make country unusable.

LAND UNIT 68

LANDFORM: Major channels on alluvial plains.

GEOLOGY: Recent clay alluvia.

SOILS: Very deep, grey clays. Alluvial soils. A surface crust is common. Sand seams are common in the profile. Bed load of silt and sand. Ug 5.0 .

VEGETATION:Coolibah-river red gum open woodland. *Eucalyptus microtheca* (coolibah) and *Eucalyptus camaldulensis* (river red gum) predominate. A tall shrub layer is present composed mainly of *Acacia stenophylla* (belalie). Ground layer is variable composed mainly of grasses and some forbs.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC 5-10%; 100/ha; Ht 4-8 m, PFC <5%; 125/ha shrubs mainly *Acacia stenophylla*.

Predominant spp: *Eucalyptus camaldulensis, E. microtheca*.

Frequent spp: *Acacia farnesiana, A. stenophylla, Bauhinia carronii, Eremophila bignoniiflora, Melaleuca linarifolia*.

GROUND LAYER: Ht 1 m, PFC 5-10%.

FORBS:

Frequent spp: *Alternanthera nodiflora, Euphorbia drummondii*.

GRAMINOIDS:

Frequent spp: *Cymbopogon refractus, Dicanthium sericeum, Enteropogon acicularis, Leptochloa digitata, Sporobolus caroli*.

LAND USE: Condition medium to good; trend stable if not overgrazed; flooding can cause some erosion; topfeed present; annuals and perennials.

LAND UNIT 69

LANDFORM: Levees and inter-channel areas of major drainage channels on alluvial plains.

GEOLOGY: Recent clay alluvia.

SOILS: Deep to very deep, grey cracking clays. Surface silt and sand forms a thin surface crust. Sand and silt bands may occur in the profile. Profiles range from slightly acid to neutral at the surface to mildly alkaline at depth. Scalding is common on inter-channel areas. Ug 5.15, Ug 5.17.

Duneira, LaPlata.

VEGETATION: Open herbfield. *Bassia* spp. and *Sida* spp. predominate. Other forbs and scattered grasses are present. Trees and shrubs absent. Vegetation very dependent on seasonal conditions.

GROUND LAYER: Ht 0.5 - 0.75 m, PFC <5-10%.

FORBS:

Predominant spp: *Bassia calcarata, Portulaca* sp. aff. *oleracea, Salsola kali*.

Frequent spp: *Atriplex muelleri, Bassia bicornis, B. quinquecuspis, Malvastrum americanum, Sida fibulifera, S. goniacarpa, Trianthema triquitra*.

LAND UNIT 69 (Cont'd)

GRAMINOIDS:

Frequent spp: *Enneapogon avenaceus.*
Infrequent spp: *Aristida latifolia, Astrebla lappacea, A. squarrosa, Brachyachne convergens, Cenchrus ciliaris, Chloris pectinata, Cyperus gilesii, Dactyloctenium radulans, Sporobolus actinocladus, S. caroli.*

LAND USE: Condition fair to bad; trend down; seasonal scalding, some erosion caused by flooding; topfeed absent; grasses are sparse and mainly annuals; poisonous plants present.

LAND UNIT 70

LANDFORM: Back swamps, depressions and shallow drainage lines in the inter-channel areas of major drainage channels.

GEOLOGY: Recent clay alluvia.

SOILS: Deep to very deep, grey cracking clays. Sand seams occur in the profile. Soil reaction tends to become alkaline with depth. Low C and N, very high AP, BP. Total P, K, S and AP and BP are much higher in the surface than the rest of the profile. BP/AP ratio is very high compared to values on adjacent downs. High A.W.C. decreasing with depth. Ug 5.17.

Duniera - Representative soil analysis: 150.

VEGETATION: Coolibah open woodland. *Eucalyptus microtheca* (coolibah) predominates. *Eremophila bignoniiflora* and *Acacia farnesiana* form a well defined shrub layer. Ground layer is composed of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 10-14 m, PFC <5%; 150/ha *Eucalyptus microtheca;* Ht 7 m, PFC <1%; 100/ha *Eremophila bignoniiflora.*

Predominant spp: *Eucalyptus microtheca.*

Frequent spp: *Eremophila bignoniiflora.*
Infrequent spp: *Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 0.5 m, PFC <1%; 100/ha.

Frequent spp: *Acacia farnesiana.*

GROUND LAYER: Ht 0.5 - 1 m, PFC 10-20%.

FORBS:

Infrequent spp: *Bassia quinquecuspis, Malvastrum americanum, Sida fibulifera.*

GRAMINOIDS:

Frequent spp: *Astrebla squarrosa, Enteropogon acicularis.*
Infrequent spp: *Bothriochloa ewartiana, Cenchrus ciliaris, Cyperus bifax, C. victoriensis, Eragrostis setifolia, E. leptocarpa, Eriochloa pseudoacratricha, Eulalia fulva, Panicum decompositum, P. queenslandicum, Paspalidium caespitosum, Sporobolus caroli.*

LAND USE: Condition good; trend stable; surface fertility fair to good; some erosion due to flooding; topfeed present; annual and perennial grasses present.

LAND UNIT 71

LANDFORM: Major channel on alluvial plains.

GEOLOGY: Recent clay alluvia.

SOILS: Alluvial grey clays with silt and sand forming a surface crust. Bed load of sand and silt.

Champion.

VEGETATION: River red gum woodland. *Eucalyptus camaldulensis* (river red gum) predominates. Scattered tall shrubs do occur but a well defined shrubby layer is not present. Ground cover is variable and composed mainly of grasses.

STRUCTURAL FORM: Woodland, Ht 12-20 m, PFC <15%.

TREE, TALL SHRUB LAYER: Ht 12-20 m, PFC <15%; 150/ha *Eucalyptus camaldulensis*;Ht 4 m, PFC <5%; 100/ha.

Predominant spp: *Eucalyptus camaldulensis*.

Frequent spp: *Acacia salicina, Bauhinia carronii*.
Infrequent spp: *Eremophila bignoniiflora*.

GROUND LAYER: Ht 0.5 - 1.5 m, PFC <15%.

Frequent spp: *Cenchrus ciliaris*.

LAND USE: Condition good; trend stable; some erosion due to flooding; topfeed present; annual and perennial grasses.

LAND UNIT 72

LANDFORM: Lower slopes on alluvial plains subject to seasonal flooding.

GEOLOGY: Recent alluvia which may have a covering of Quaternary sands.

SOILS: Deep to very deep, earthy sands and sandy surfaced, texture contrast soils. Water transported sand may cover clay plains in some areas. Soil reaction trend is variable, generally the profile is slightly acid throughout. $CaCO_3$ occurs occasionally in lower profiles. C and N ranges from very low on coarse textured soils to fair on finer textured soils. Similarly, K is very low to high. AP is very low to low. BP is very low. A.W.C. is low. Uc 5.12, Uc 1.12, Dy 5.42, Dd 3.12.

Jericho, Garfield, Birkhead - Representative soil analysis: 118, 172, 327.

VEGETATION: Poplar box woodland to open woodland. *Eucalyptus populnea* (poplar box)predominates. Shrubby layers are not well developed, but scattered shrubs occur frequently. Ground cover is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10-25 m, PFC 5-30%; 250/ha *Eucalyptus populnea;* Ht 6-8 m, PFC <5% 200±180/ha.

Predominant spp: *Eucalyptus populnea*.

Frequent spp: *Albizia basaltica, Callitris columellaris, Eremophila mitchellii, Eucalyptus melanophloia*.
Infrequent spp: *Acacia excelsa, A. salicina, Eucalyptus cambageana, E. dealbata, E. tessellaris, Grevillea striata, Ventilago viminalis*.

LOW SHRUB LAYER: Ht 0.5-2 m, PFC <1%; 100 $\pm$ 90/ha.

Infrequent spp: *Acacia farnesiana, Atalaya hemiglauca, Canthium oleifolium.*

GROUND LAYER: Ht <1 m, PFC <10%.

FORBS:

Infrequent spp: *Boerhavia diffusa, Crotalaria mitchellii, Eragrostis cumingii, Euphorbia drummondii, Glossogyne tenuifolia, Indigofera hirsuta, Oxalis corniculata, Portulaca* sp. aff. *oleracea, Veronia cinerea, Wahlenbergia* sp.

GRAMINOIDS:

Frequent spp: *Aristida calycina, A. ingrata, A. muricata, A. ramosa, Bothriochloa ewartiana, Heteropogon contortus, Themeda australis.*
Infrequent spp: *Chrysopogon falax, Cymbopogon refractus, Cyperus gracilis, Digitaria divaricatissima, Enneapogon polyphyllus, Enteropogon acicularis, Eragrostis lacunaria, E. molybdea, Fimbristylis dichotoma, Perotis rara, Triraphis mollis.*

LAND USE: Condition good;trend stable; fertility levels are variable but generally low; some erosion due to flooding; some topfeed present; annual and perennial grasses; no poisonous plants.

LAND UNIT 73

LANDFORM: Upper slopes on alluvial plains not subject to seasonal flooding.

GEOLOGY: Recent alluvia, which may be overlain by Quaternary sands.

SOILS: Moderately deep to deep, texture contrast soils. A surface crust is present. Profiles are slightly acid at the surface, becoming alkaline at depth. $CaCO_3$ is present at depth. Mottling of sub-soils is common. Very low C, N. Fair K. Very low to low P. Very low A.W.C. in surface soil increasing at depth. Dy 3.43, Dr 2.43, Db 2.42.

Jericho, Thrungli - Representative soil analysis: 169, 283.

VEGETATION: Poplar box open woodland to woodland. *Eucalyptus populnea* (poplar box) predominates with a well defined tall shrub layer dominated by *Eremophila mitchellii* (sandalwood). A low shrub layer is not well developed but scattered shrubs occur frequently. Ground layer is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC 5-20%; 175/ha *Eucalyptus populnea;* Ht 2-4 m, PFC <5%; 200/ha *Eremophila mitchellii.*

Predominant spp: *Eucalyptus populnea.*

Frequent spp: *Eremophila mitchellii.*
Infrequent spp: *Acacia excelsa, Apophyllum anomalum, Eucalyptus melanophloia, Geijera parviflora, Heterodendrum oleifolium, Owenia acidula.*

LAND UNIT 73 (Cont'd)

LOW SHRUB LAYER: Ht <2 m, PFC <1%; 75/ha.

Frequent spp: *Albizia basaltica.*
Infrequent spp: *Alstonia constricta, Atalaya hemiglauca, Canthium oleifolium, Cassia nemophila, Maytenus cunninghamii, Myoporum deserti.*

GROUND LAYER: Ht <1 m, PFC 10-40%.

FORBS:

Frequent spp: *Bassia birchii, Opuntia inerme.*
Infrequent spp: *Boerhavia diffusa, Euphorbia australis, Gomphrena celosioides, Portulaca* sp. aff. *oleracea, Pterocaulon sphacelatum, Salvia reflexa, Sida spinosa.*

GRAMINOIDS:

Frequent spp: *Bothriochloa ewartiana, Heteropogon contortus, Themeda australis.*
Infrequent spp: *Aristida armata, A. ingrata, Chrysopogon fallax, Cymbopogon refractus, Digitaria brownii, Enneapogon pallidus, Enteropogon acicularis, Eragrostis setifolia, Triodia mitchellii, Tripogon loliiformis.*

LAND USE: Condition good; trend stable; low to very low fertility; scalded areas in patches; topfeed present; annual and perennial grasses; well defined shrub layer which may become a woody weed problem in some areas.

LAND UNIT 74

LANDFORM: Outer margins of alluvial plains not subject to flooding.

GEOLOGY: Recent alluvia, which may be covered by Quaternary sands.

SOILS: Deep earthy sands and sandy surfaced, texture contrast soils. Profiles are slightly acid throughout. The soil surface is characteristically loose. Uc 5.11, Dr 4.22.

Duck Creek. Rosemount.

VEGETATION: Silver-leaved ironbark woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) predominates. A low shrub layer is present. Ground layer is composed mainly of grasses and some forbs.

TREE LAYER: Ht 17 m, PFC 15%; 200/ha *Eucalyptus melanophloia.*

Predominant spp: *Eucalyptus melanophloia.*

Infrequent spp: *Eucalyptus papuana, Callitris columellaris.*

LOW SHRUB LAYER: Ht 1-3 m, PFC <1%; 300/ha.

Infrequent spp: *Acacia coriacea, Bursaria spinosa, Dodonaea viscosa, Petalostigma pubescens.*

GROUND LAYER: Ht <1 m, PFC 20%.

FORBS:

Infrequent spp: *Justicia procumbens, Sida cunninghamii, S. filiformis, S. spinosa, Veronia cinerea.*

GRAMINOIDS:

Frequent spp: *Heteropogon contortus.*

Infrequent spp: *Chrysopogon falax, Cymbopogon refractus, Digitaria brownii, D. divaricatissima, Eulalia fulva, Themeda australis, Tragus australianus.*

LAND USE: Condition good; trend stable; topfeed absent; annual and perennial grasses; well defined shrub layer.

LAND UNIT 75

LANDFORM: Higher sandy levees, sand sheets and dunes mainly associated with old channels. Not flooded.

GEOLOGY: Quaternary sands, overlying recent alluvia.

SOILS: Deep to very deep uniform sandy soils with loose surfaces of coarse loamy sands. Colours vary from dark reddish brown to brown. Profiles are slightly acid to neutral throughout. Uc 1.43, Uc 5.11. These are of very low nutrient status.

Duck Creek, Birkhead.- Representative soil analysis: 314.

VEGETATION: Moreton Bay ash open woodland. *Eucalyptus tessellaris* (Moreton Bay ash) predominates with *Eucalyptus melanophloia* (silver-leaved ironbark) important in places. There is no well defined shrub layer but scattered shrubs do occur. Ground cover is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 20-30 m, PFC <1%; 450/ha *Eucalyptus tessellaris;* Ht 2-10, PFC <1%; 400/ha shrubs.

Predominant spp: *Eucalyptus tessellaris.*

Frequent spp: *Eucalyptus melanophloia.*
Infrequent spp: *Acacia coriacea, A. salicina, Angophora melanoxylon, Bauhinia carronii, Brachychiton populneum, Canthium oleifolium, Clerodendrum floribundum, Eremophila mitchellii, Eucalyptus populnea, E. watsoniana, Erythroxylum australe, Geijera parviflora, Petalostigma pubescens.*

GROUND LAYER: Ht 0.5-1 m, PFC 20-40%.

FORBS:

Infrequent spp: *Boerhavia diffusa, Convolvulus erubescens, Glossogyne tenuifolia, Glycine tabacina, Helichrysum semiamplexixaule, Justicia procumbens, Lomandra leucocephala, Oxalis corniculata, Phyllanthus* sp., *Sida filiformis, Tribulus terrestris.*

GRAMINOIDS:

Frequent spp: *Aristida armata, Cenchrus ciliaris, Enneapogon polyphyllus, Heteropogon contortus.*
Infrequent spp: *Aristida biglandulosa, A. browniana, A. calycina, A. contorta, Bothriochloa ewartiana, Chrypopogon fallax, Cynodon dactylon, Digitaria brownii, Enteropogon avenaceus, Eragrostis molybdea, E. sororia, Tripogon loliiformis.*

LAND USE: Condition good; trend stable; very low fertility; topfeed absent; annual and perennial grasses.

LAND UNIT 76

LANDFORM: Higher sandy levees and dunes associated with old channels. Not flooded.

GEOLOGY: Quaternary sands overlying recent alluvia.

SOILS: Deep to very deep, sandy red earths with loose surfaces. Surface colour is dark reddish brown. Profile is slightly acid throughout. Clay content increases with depth. Gn 2.12.

Rosefield.

VEGETATION: Silver-leaved ironbark, Bauhinia open woodland. *Eucalyptus melanophloia* (silver-leaved ironbark) and *Bauhinia carronii* (bauhinia) predominant. A low shrub layer is present. Ground layer is variable composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <10%; 175/ha trees; Ht 3-6 m, PFC <30%; 300/ha mainly *Bauhinia carronii*.

Predominant spp: *Eucalyptus melanophloia*.

Frequent spp: *Bauhinia carronii, Grevillea striata.*
Infrequent spp: *Acacia excelsa, Brachychiton populneum, Eremophila longifolia, E. mitchellii, Eucalyptus tessellaris, E. polycarpa, Flindersia maculosa.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 125/ha.

Infrequent spp: *Canthium oleifolium, Carissa ovata, Geijera parviflora, Maytenus cunninghamii.*

GROUND LAYER: Ht <1 m, PFC 10-20%.

GRAMINOIDS:

Frequent spp: *Aristida ingrata, Heteropogon contortus, Themeda australis.*

LAND USE: Condition good; trend stable; some topfeed present; well defined shrub layer; annual and perennial grasses.

LAND UNIT 77

LANDFORM: Flat alluvial plains with weak to moderate gilgai micro-relief. Subject to seasonal flooding.

GEOLOGY: Deep to very deep, gilgaied, grey and brown cracking clays.

SOILS: Soils are strongly alkaline throughout. $CaCO_3$ is present throughout with gypsum occurring at depth. Textures are medium to heavy clays. Ug 5.21. Low C, N. High K. Low to very low P. Subsoils are saline.

Tumbar - Representative soil analysis: 329.

VEGETATION: Brigalow open woodland. *Acacia harpophylla* (brigalow) predominates with scattered trees of *Bauhinia carronii* (bauhinia). The tall shrub layer is well developed with scattered low shrubs. Ground cover is variable composed of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 10 m, PFC <10%; 200/ha *Acacia harpophylla;* Ht 3-4 m, PFC 1%; 175/ha shrubs.

Predominant spp: *Acacia harpophylla.*

LAND UNIT 77 (Cont'd)

Frequent spp: *Bauhinia carronii, Eremophila mitchellii, Heterodendrum oleifolium.*
Infrequent spp: *Flindersia maculosa.*

LOW SHRUB LAYER: Ht 1 m, PFC <1%; 25/ha.

Infrequent spp: *Geijera parviflora.*

GROUND LAYER: Ht <1 m, PFC 5%.

GRAMINOIDS:

Frequent spp: *Sporobolus actinocladus.*

LAND USE: Condition fair; trend stable; low fertility; some topfeed present; grasses mainly annuals.

LAND UNIT 78

LANDFORM: Drainage lines, prior streams and backswamps in flat alluvial plains.

GEOLOGY: Recent alluvia.

SOILS: Alluvial soils with surface textures of fine sandy clay loams. The soil profile is slightly acid throughout. Crusting is common.

Fanning.

VEGETATION: Coolibah woodland. *Eucalyptus microtheca* (coolibah) predominates. A well defined tall shrub layer occurs. Ground layer is composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 17 m, PFC 10%; 100/ha *Eucalyptus microtheca;* Ht 3 m, PFC <1%; 200/ha shrubs.

Predominant spp: *Eucalyptus microtheca.*

Frequent spp: *Acacia salicina, Eremophila bignoniiflora, Pimelea pauciflora.*

LOW SHRUB LAYER: Ht 1 m, PFC <1%; 25/ha.

Infrequent spp: *Acacia farnesiana, Myoporum acuminatum.*

GROUND LAYER: Ht 1 m, PFC 10-20%.

GRAMINOIDS:

Frequent spp: *Aristida* sp., *Cenchrus ciliaris.*

LAND USE: Condition fair, trend stable; some topfeed present; grasses mainly annuals; poisonous plants present.

LAND UNIT 79

LANDFORM: Clay floodplains along major watercourses.

GEOLOGY: Recent alluvia.

SOILS: Very deep, grey cracking clays. Textures are heavy clays. Soil reaction trend is slightly acid throughout. Ug 5.17.

Duneira.

LAND UNIT 79 (Cont'd)

VEGETATION: Coolibah, woodland to open forest. *Eucalyptus microtheca* (coolibah) predominates. There is no well defined tall or low shrubby layers. Isolated shrubs do occur. Ground cover is well developed and composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 10 m, PFC 30-40%; 75/ha *Eucalyptus microtheca;* Ht 3 m, PFC <1%; 100/ha shrubs.

Predominant spp: *Eucalyptus microtheca.*

Frequent spp: *Albizia basaltica, Eremophila glabra, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 125/ha.

Frequent spp: *Acacia oswaldi, Apophyllum anomalum, Eremophila maculata, E. glabra.*

GROUND LAYER: Ht <1 m, PFC 40-50%.

FORBS:

Infrequent spp: *Atriplex muelleri, Bassia quinquecuspis.*

GRAMINOIDS:

Frequent spp: *Paspalidium jubiflorum, Sporobolus caroli.*

LAND USE: Condition good, trend stable; some erosion due to flooding; some topfeed present; grasses are annuals and perennials; poisonous plants present.

LAND UNIT 80

LANDFORM: Flat alluvial plains with braided channels, occasionally with low ridge and swale relief between channels.

GEOLOGY: Recent alluvia.

SOILS: Deep to very deep, grey cracking clays. The inter-channel areas are self-mulching. Soil reaction trend is moderately alkaline throughout with $CaCO_3$ present in the profile. Ug 5.24.

Douglas Ponds.

VEGETATION: Wooded open tussock grassland. *Astrebla lappacea* (curly Mitchell grass) predominates with scattered trees of *Eucalyptus microtheca* (coolibah). A low shrub layer is always present. Forbs and *Astrebla lappacea* compose the ground layer.

TREE LAYER: Ht 10 m, PFC <1%; 25/ha *Eucalyptus microtheca.*

Frequent spp: *Eucalyptus microtheca.*

LOW SHRUB LAYER: Ht 1 m, PFC <5%; 150/ha.

Frequent spp: *Acacia farnesiana, Apophyllum anomalum, Eremophila maculata.*

GROUND LAYER: Ht <1 m, PFC 20-35%.

FORBS:

Frequent spp: *Bassia biflora, Boerhavia diffusa, Centaurium spicatum, Desmodium brachypodum, Malvastrum americanum, Neptunia dimorphantha, Phyllanthus maderaspatensis, Polymeria marginata, Sida fibulifera, Solanum esuriale.*

LAND UNIT 80 (Cont'd)

GRAMINOIDS:

Predominant spp: *Astrebla lappacea*, PFC 20%.

Frequent spp: *Brachyachne convergens*.

LAND USE: Condition good; trend stable; some erosion due to seasonal flooding; topfeed present; perennial grasses present; some poisonous plants.

LAND UNIT 81

LANDFORM: Broad drainage depressions in flat alluvial plains subject to seasonal flooding.

GEOLOGY: Recent alluvia.

SOILS: Deep, grey cracking clays with weakly self-mulching surfaces. Soil reaction is strongly alkaline. $CaCO_3$ is present in the lower profile. Ug 5.24.

Low C, N. High K. Low to fair P. A.W.C. medium at the surface increasing with depth.

Fanning - Representative soil analysis: 13.

VEGETATION: Coolibah open woodland. *Eucalyptus microtheca* (coolibah) predominates. A tall shrub layer is not well developed. The low shrub layer is well developed in places. Ground layer is composed mainly of forbs.

TREE, TALL SHRUB LAYER: Ht 10-12 m, PFC <5%; 125/ha *Eucalyptus microtheca*; Ht 4 m, PFC <1%; 25/ha shrubs.

Predominant spp: *Eucalyptus microtheca*.

Infrequent spp: *Acacia farnesiana, Heterodendrum oleifolium*.

LOW SHRUB LAYER: Ht <1 m, PFC <1%; 175/ha.

Infrequent spp: *Capparis lasiantha, C. mitchellii, Eremophila maculata*.

GROUND LAYER: Ht <1 m, PFC 35%.

FORBS:

Infrequent spp: *Bassia quinquecuspis, Boerhavia diffusa, Enchylaena tomentosa, Malvastrum americanum, Marsilea drummondii, Polymeria marginata, Portulaca* sp. aff. *oleracea, Sida trichopoda, Solanum elipticum, Teucrinum rasmosum, Triantherma trignetra*.

GRAMINOIDS:

Frequent spp: *Panicum decompositum*.

LAND USE: Condition good; trend stable; generally low fertility; some flooding; topfeed present; ground layer is mainly forbs; some poisonous plants present.

LAND UNIT 82

LANDFORM: Flat alluvial plains with weak to moderate gilgai microrelief.

GEOLOGY: Recent alluvia.

SOILS: Deep, gilgaied, grey cracking clays. Textures are medium to heavy clays. Soil reaction trend is slightly acid at the surface becoming strongly alkaline at depth. $CaCO_3$ is present throughout with gypsum in the lower profile. Mottling occurs at depth. Ug 5.21, Ug 5.22.

Low C, N. Fair AP, low BP. High K. Medium A.W.C.

Tumbar, Armagh - Representative soil analysis: 282.

VEGETATION: Gidgee low woodland. *Acacia cambagei* (gidgee) predominates. The tall shrub layer is present but not conspicuous. The low shrub layer is dense consisting mainly of *Carissa ovata* (currant bush) and *Eremophila mitchellii* (sandalwood). Ground layer is sparse consisting of forbs and grasses.

TREE, TALL SHRUB LAYER: Ht 9 m, PFC 15%; 175/ha, *Acacia cambagei;* Ht 4-6 m, PFC <5%; 75/ha shrubs.

Predominant spp: *Acacia cambagei.*

Infrequent spp: *Atalaya hemiglauca, Bauhinia carronii, Canthium oleifolium, Heterodendrum oleifolium, Geijera parviflora.*

LOW SHRUB LAYER: Ht <2 m, PFC <10%; 1 000 $\pm$ 600/ha

Frequent spp: *Carissa ovata, Eremophila mitchellii.*
Infrequent spp: *Apophyllum anomalum, Cassia barkleyana, Santalum lanceolatum.*

GROUND LAYER: Ht <0.75 m, PFC 5-15%.

FORBS:

Frequent spp: *Enchylaena tomentosa, Opuntia inerme, O. tomentosa.*
Infrequent spp:*Alternanthera pungens, Gomphrena celosioides, Justicia procumbens, Malvastrum americanum, Oxalis corniculata, Pterocaulon spathelatum, Vittadinia pterochaeta.*

GRAMINOIDS:

Frequent spp: *Aristida latifolia, Enteropogon acicularis.*
Infrequent spp: *Cenchrus ciliaris, Enneapogon palladus, Sporobolus caroli.*

LAND USE: Condition fair; trend stable; fair to low fertility; subjected to seasonal flooding.

LAND UNIT 83

LANDFORM: Single channel in flat alluvial plains.

GEOLOGY: Recent alluvia.

SOILS: Alluvial soils with sand and silt bed load.

Champion.

LAND UNIT 83 (Cont'd)

VEGETATION: Coolibah, brigalow woodland. *Eucalyptus microtheca* (coolibah) predominates with *Acacia harpophylla* (brigalow) occurring in places. A tall and low shrub layer is present but in restricted areas is completely absent and *Eucalyptus microtheca* only occurs.

TREE, TALL SHRUB LAYER: Ht 10 m, PFC 15%; 250/ha *Eucalyptus microtheca, Acacia harpophylla;* Ht 3-5 m, PFC 5%; 250/ha shrubs.

Predominant spp: *Eucalyptus microtheca.*

Frequent spp: *Acacia harpophylla, Bauhinia carronii, Canthium oleifolium, Eremophila mitchellii, Geijera parviflora, Heterodendrum oleifolium.*

LOW SHRUB LAYER: Ht 1-2 m, PFC 10%; 600/ha.

Frequent spp: *Atalaya hemiglauca, Cassia nemophila, Carissa ovata.*
Infrequent spp: *Muehlenbeckia cunninghamii.*

GROUND LAYER: Ht 1 m, PFC 5%.

LAND USE: Condition fair; trend stable to downwards; some gully erosion; topfeed present; some poisonous plants present.

LAND UNIT 84

LANDFORM: Outer margins of flat alluvial plains subjec to occasional overflow.

GEOLOGY: Recent alluvia.

SOILS: Deep, brown and grey cracking clays. The soil surface is self-mulching and weakly crusted. Associated are extensive scalded areas. Soil reaction trend is moderately alkaline throughout. $CaCO_3$ is present throughout. Ug 5.31, Ug 5.36, Ug 5.21.

C and N are low. High K. Low to fair AP, very low BP.

Douglas Ponds - Representative soil analysis: 80, 204.

VEGETATION: Mitchell grass open tussock to tussock grassland. *Astrebla* spp. predominate, *Aristida leptopoda* (white spear grass) and *Dicanthium sericeum* (Queensland blue grass) are common species. Other forbs and grasses make up the ground layer. A low shrub layer may be present and is composed mainly of *Acacia farnesiana.*

LOW SHRUB LAYER: Ht 1-4 m, PFC <1%; 50/ha mainly *Acacia farnesiana.*

Frequent spp: *Acacia farnesiana.*
Infrequent spp: *Acacia stenophylla, Eremophila bignoniiflora.*

GROUND LAYER: Ht 0.5-1 m, PFC 10-40%.

FORBS:

Frequent spp: *Abutilon malvifolium, Bassia quinquecuspis, Boerhavia diffusa, Malvastrum americanum, Sida fibulifera.*

Infrequent spp: *Alternanthera denticulata, Aeschomene indica, Atriplex muelleri, Bassia calcarata, B. tricuspis, Calostemma luteum, Crotalaria dissitiflora, Desmodium brachypodum, D. compylocaulon, Glycine tabacina, Goodenia strongiophylla, Maireana coronata, Neptunia dimorphantha, Polymeria marginata, Portulaca* sp. aff. *oleracea, Rhynchosia minima, Salsola kali, Sida goniacarpa, Solanum esuriale, Triantherma triquetra.*

GRAMINOIDS:

Predominant spp: *Aristida leptopoda, Astrebla elymoides, A. lappacea, Dicanthium sericeum.*

Frequent spp: *Digitaria ammophila, Enneapogon avenaceus, Panicum decompositum, Sporobolus actinocladus.*
Infrequent spp: *Aristida obscura, Astrebla squarrosa, Bothriochloa ewartiana, Cenchrus ciliaris, Chrysopogon falax, Cyperus bifax, Dactyloctenium radulans, Eriochloa pseudoacratricha, Eulalia fulva, Heteropogon contortus, Iseilema membranaceum, Sporobolus caroli.*

LAND USE: Condition fair to medium, trend stable; low fertility; seasonal scalding; grasses are perennials.

LAND UNIT 85

LANDFORM: Outer margins of flat alluvial plains, adjacent to major watercourses.

GEOLOGY: Quaternary sand deposits overlying recent alluvia.

SOILS: Deep to very deep, uniform sandy soils and associated sandy texture contrast soils. Surface textures are loamy sands with loose surfaces. Soil reaction trend is slightly acid in surface horizons becoming moderatley alkaline at depth. $CaCO_3$ may occur at depth. Uc 1.23, Dr 4.13.

Very low C, N. Very low to very fair K. Very fair to high AP, BP. Very low to low A.W.C.

Garfield - Representative soil analysis: 25, 67.

VEGETATION: Eastern dead finish, whitewood low woodland. *Albizia basaltica* (eastern dead finish) and *Atalaya hemiglauca* (whitewood) predominate. Other shrubs also occur in the tall shrub layer. Low shrub layer is well developed. Ground layer is variable composed of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 3-6 m, PFC 5-15%; 450/ha.

Predominant spp: *Albizia basaltica, Atalaya hemiglauca.*

Frequent spp: *Eremophila mitchellii, Geijera parviflora, Heterodendrum oleifolium, Ventilago viminalis.*
Infrequent spp: *Bauhinia carronii, Eucalyptus populnea, Flindersia maculosa.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <5%; 400/ha.

Infrequent spp: *Acacia excelsa, Apophyllum anomalum, Canthium oleifolium, Capparis lasiantha, Carissa ovata, Cassia nemophila, Denhamia obscura.*

GROUND LAYER: Ht 1 m, PFC <5%.

FORBS:
Frequent spp: *Enchylaena tomentosa, Salsola kali.*

Infrequent spp: *Abutilon otocarpum, Boerhavia diffusa, Evolvolus alsinoides, Helichrysum semiamplexicaule, Jasminum lineare, Maireana villosa, Ptilotus polystachyus, Rhagodia parabolica, Sida spinosa.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris.*
Infrequent spp: *Aristida browniana, Aristida jerichoensis, A.* sp. aff. *inaequiglumis, Digitaria ciliaris, Enteropogon acicularis.*

LAND USE: Condition fair to bad; trend stable to downwards depending on use; P levels adequate, N and K may be limiting; some sheet and gully erosion; topfeed present; grasses are perennials but sparse; a well defined shrub layer exists which may become a woody weed problem.

LAND UNIT 86

LANDFORM: Flat alluvial plains.

GEOLOGY: Recent alluvia, overlain in part by Quaternary sands.

SOILS: Moderately deep to deep, texture contrast soils and earthy sands. A surface crust is present. Soil reaction trend is slightly acid in the upper profile, becoming moderately alkaline at depth. $CaCO_3$ may occur at depth. Db 1.13, Dr 2.13, Uc 5.21.

Low C, N. High K. High P. Low A.W.C. on coarse textured soils but varies with clay percentage.

Thrungli, Birkhead - Representative soil analysis: 295.

VEGETATION: Gidgee open woodland. *Acacia cambagei* (gidgee) predominates with a well developed tall shrub layer dominated by *Eremophila mitchellii* (sandalwood) and *Geijera parviflora* (wilga). Ground layer is variable consisting of forbs and grasses.

TREE LAYER: Ht 6-10 m, PFC 5-10%; 300/ha *Acacia cambagei.*

Predominant spp: *Acacia cambagei.*

Frequent spp: *Eremophila mitchellii.*

TALL SHRUB LAYER: Ht 3-4 m, PFC 5%; 175/ha.

Frequent spp: *Eremophila mitchellii, Geijera parviflora, Santalum lanceolatum.*
Infrequent spp: *Atalaya hemiglauca, Apophyllum anomalum, Cassia nemophila, Ventilago viminalis.*

GROUND LAYER: Ht 0.5-0.75 m, PFC <5-10%.

FORBS:

Frequent spp: *Abutilon oxycarpum, Enchylaena tomentosa, Salsola kali.*
Infrequent spp: *Abutilon otocarpum, Jasminium lineare, Maireana villosa, Rhagodia parabolica.*

GRAMINOIDS:

Frequent spp: *Cenchrus ciliaris, Enneapogon pallidus, E.polyphyllus, Enteropogon acicularis.*
Infrequent spp: *Enneapogon avenaceus, Sporobolus actinocladus, S. caroli, Tripogon loliiformis.*

LAND UNIT 86 (Cont'd)

LAND USE: Condition medium, trend stable; generally good fertility but N may be limiting; topfeed present; grasses are mainly annuals; a well defined shrub layer exists which can be a woody weed problem in some areas.

LAND UNIT 87

LANDFORM: Shallow depressions, seasonal swamps in flat alluvial plains.

GEOLOGY: Recent alluvia.

SOILS: Deep, grey cracking clays. Textures are medium to heavy clays. Soil reaction trend is moderately alkaline throughout, with $CaCO_3$ present. Ug 5.26.

Fanning.

VEGETATION: Coolibah, brigalow open woodland. *Eucalyptus microtheca* (coolibah) and *Acacia harpophylla* (brigalow) predominant. A low shrub layer is present and conspicuous. Ground layer is well developed and consists of grasses and forbs.

TREE, TALL SHRUB LAYER: Ht 10-15 m, PFC <10%; 150/ha *Eucalyptus microtheca, Acacia harpophylla;* Ht 3-4 m, PFC <1%; 75/ha shrubs.

Predominant spp: *Acacia harpophylla, Eucalyptus microtheca.*

Frequent spp: *Atalaya hemiglauca, Heterodendrum oleifolium, Ventilago viminalis.*

LOW SHRUB LAYER: Ht 1-2 m, PFC 5%; 400/ha.

Frequent spp: *Apophyllum anomalum, Bauhinia carronii, Eremophila maculata, E. mitchellii, Geijera parviflora.*

GROUND LAYER: Ht 0.5-0.75 m, PFC 20-30%.

FORBS:

Infrequent spp: *Bassia lanicuspis, B. quinquecuspis, B. ventricosa, Enchylaena tomentosa, Hibiscus trionum, Malvastrum americanum, Polymeria marginata, Phyllanthus maderaspatensis, Rhagodia parabolica, Rhynchosia minima, Salsola kali, Solanum esuriale.*

GRAMINOIDS:

Frequent spp: *Astrebla lappacea, A. squarrosa.*
Infrequent spp: *Aristida latifolia, A. leptopoda, Cenchrus ciliaris, Dichanthium sericeum, Enteropogon acicularis, Sporobolus caroli.*

LAND USE: Condition medium; trend stable; topfeed available; grasses are perennials; well defined shrub layer; poisonous plants present.

LAND UNIT 88

LANDFORM: Higher slopes in flat alluvial plains not subject to flooding.

GEOLOGY: Recent alluvia.

SOILS: Deep, plastic clays and associated texture contrast soils. Profiles are slightly acid to neutral throughout. Uf 6.33, Db 1.12.

Armagh, Cunnalama.

LAND UNIT 88 (Cont'd)

VEGETATION: Poplar box open woodland. *Eucalyptus populnea* (poplar box) predominates with a well defined tall shrub layer with some low shrubs. Ground flora is well developed consisting mainly of grasses with some forbs.

TREE, TALL SHRUB LAYER: Ht 10-20 m, PFC 5-10%; 100/ha *Eucalyptus populnea;* Ht 3-5 m, PFC 5%; 300/ha shrubs.

Predominant spp: *Eucalyptus populnea.*

Frequent spp: *Albizia basaltica, Bauhinia carronii, Geijera parviflora, Grevillia striata, Ventilago viminalis.*
Infrequent spp: *Acacia salicina, Canthium oleifolium, Heterodendrum oleifolium, Eremophila mitchellii, Eucalyptus microtheca.*

LOW SHRUB LAYER: Ht 2 m, PFC <5%; 200/ha

Frequent spp: *Acacia excelsa.*
Infrequent spp: *Atalaya hemiglauca, Capparis mitchellii.*

GROUND LAYER: Ht <0.75 m, PFC 10-15%.

FORBS:

Frequent spp: *Salsola kali, Solanum esuriale.*
Infrequent spp: *Abutilon otocarpum, Bassia calcarata, Opuntia inerme, Sida filiformis.*

GRAMINOIDS:

Frequent spp: *Aristida anthoxanthoides, A. armata, Bothriochloa ewartiana, Cenchrus ciliaris, Chloris pectinata, C. scariosa, Chrysopogon acicularis, Eragrostis japonica, Enteropogon acicularis, Sporobolus actinocladus.*

LAND USE: Condition good; trend stable; topfeed present; well defined shrub layer; grasses are perennials; poisonous plants are present; woody weeds are a problem in some areas.

LAND UNIT 89

LANDFORM: Low sandy rises or ridges in flat alluvial plains.

GEOLOGY: Quaternary sand deposits overlying recent alluvia.

SOILS: Deep to very deep, uniform sandy soils with loose surface texture of loamy coarse sand. Profile is slightly acid throughout. Uc 1.23.

Duck Creek.

VEGETATION: Eastern dead finish open woodland. *Albizia basaltica* (Eastern dead finish) predominates with *Acacia excelsa* (ironwood) and *Ventilago viminalis* (vine tree) conspicuous in places. There is a well defined low shrubby layer. Ground cover is variable composed of forbs and grasses.

TREE LAYER: Ht 10-15 m, PFC <10%; 300/ha trees.

Predominant spp: *Albizia basaltica.*

Frequent spp: *Acacia excelsa, Ventilago viminalis.*
Infrequent spp: *Bauhinia carronii.*

LAND UNIT 89 (Cont'd)

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 100/ha.

Frequent spp: *Alstonia constricta.*
Infrequent spp: *Alphitonia excelsa, Capparis mitchellii, Santalum lanceolatum.*

GROUND LAYER: Ht 1 m, PFC 10-20%.

FORBS:

Frequent spp: *Convolvulus erubescens, Evolvulus alsinoides, Helichrysum semiamplexicaule, Indigofera hirsuta, Nicotiana velutina, Phyllanthus* sp., *Salsola kali, Sida spinosa, Wahlenbergia* spp.

GRAMINOIDS:

Frequent spp: *Aristida brownii, A. jerichoensis* var. *subspinulifera, Digitaria brownii, Eragrostis lacunaria, Perotis rara, Tragus australianus.*

LAND USE: Condition good; trend stable; topfeed present; shrub layer present; grasses are perennials.

LAND UNIT 90

LANDFORM: Flat claypans linked to local drainage lines, in the 'desert'.

GEOLOGY: Quaternary alluvium.

SOILS: Deep to very deep, poorly drained, grey clays with massive sandy surfaced soil. Textures are predominantly sandy, becoming heavy clays at depth. The surface exhibits a thin crust. Soil reaction ranges from neutral at the surface to alkaline at depth. $CaCO_3$ present in alkaline profiles. Dy 5.23.

Very low C, N, K and P. Very strongly alkaline. High salt content, highly sodic.

Garfield - Representative soil analysis: 260.

VEGETATION: Porcupine spinifex hummock grassland. *Triodia longiceps* (porcupine spinifex) predominates; rarely with scattered low trees and shrubs. Ground cover is variable and areas between hummocks of *T. longiceps* devoid of vegetation or supporting short grasses.

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 50/ha.

Frequent spp: *Myoporum acuminatum.*

GROUND LAYER: Ht 1 m, PFC 30-50% (scalded areas <1%).

Predominant spp: *Triodia longiceps.*

Frequent spp: *Chloris virgata.*

LAND USE: Condition fair; trend stable; soil fertility very low, soils highly alkaline, sodic and saline; scalding; subjected to seasonal flooding; topfeed absent; poisonous plants present; grasses are perennial but unpalatable.

LAND UNIT 91

LANDFORM: Flat claypans lined to local drainage lines.

GEOLOGY: Quaternary sand overlying recent alluvia.

SOILS: Deep uniform sandy soils. The surface soil is a loose, coarse sand which increased only slightly in texture at depth. Profile is strongly acid in upper 60 cm, becoming strongly alkaline at depth. Uc 5.11.

Extremely low fertility. High salts and sodicity may occur at depth as per cent clay increases.

Thornhill - Representative soil analysis: 261.

VEGETATION: Bloodwood woodland. *Eucalyptus polycarpa* (long-fruited bloodwood) predominates with occasional trees of *Eucalyptus papuana* (desert gum). A shrub layer is rarely present. Ground cover is variable and composed mainly of grasses.

TREE LAYER: Ht 10 m, PFC 10-15%; 350/ha *Eucalyptus polycarpa*.

Predominant spp: *Eucalyptus polycarpa*.

Infrequent spp: *Eucalyptus papuana*.

LOW SHRUB LAYER: Ht 2 m, PFC <1%; 100/ha.

Frequent spp: *Myoporum acuminatum*.

GROUND LAYER: Ht 1 m, PFC 10-15%.

FORBS:

Frequent spp: *Bulbostylis barbata*.

GRAMINOIDS:

Frequent spp: *Aristida pruniosa, Cyperus gilesii, Eragrostis speciosa, Lomandra leucocephela, Perotis rara*.

LAND USE: Condition fair; trend stable; very low A.W.C.; extremely low fertility; topfeed absent; grasses are annuals; poisonous plants present.

LAND UNIT 92

LANDFORM: Flat poorly drained claypans.

GEOLOGY: Recent alluvia.

SOILS: Very deep, alkaline grey clays with a surface crust. Associated are texture contrast soils on sandy rises. Ug 5.2, Dy 2.33.

VEGETATION: Sparse herbland on claypan surrounded by beach with mulga-poplar box open woodland. *Marseila* spp. (Nardoo) predominate in herbland and *Acacia aneura* (mulga) and *Eucalyptus populnea* (poplar box) on the beach. Scattered low shrubs do occur. Ground layer is sparse to absent.

TREE, TALL SHRUB LAYER: Ht 10 m, PFC <10%.

Predominant spp: *Acacia aneura, Eucalyptus populnea*.

LAND UNIT 92 (Cont'd)

LOW SHRUB LAYER: Ht 1-3 m, PFC <5%.

Frequent spp: *Acacia stenophylla, Muelenbeckia cunninghamii* (on claypan). *Acacia excelsa, Eremophila gilesii, E. mitchellii* (on beach).

GROUND LAYER: Ht 0.1 m on claypan; 0.5-1 m on beach PFC <2-15%.

FORBS:

Frequent spp: *Marselia* spp.

GRAMINOIDS:

Frequent spp: *Aristida* spp., *Eragrostis laniflora, E. leptocarpa.*

LAND USE: Condition fair, trend stable; topfeed absent; limited grazing after inundation; limited in area and of little significance.

LAND UNIT 93

LANDFORM: Flat to very gently undulating plains. Slopes <1%.

GEOLOGY: Quaternary sand deposits derived from Mesozoic and Tertiary sediments.

SOILS: Moderately deep, heavily mottled, yellow podzolics with hard setting surfaces. Ironstone shot on surface and in profile. Profile slightly acid throughout. Dy 3.22.

Erne.

VEGETATION: Narrow-leaved ironbark low open woodland. *Eucalyptus drepanophylla* (narrow-leaved ironbark) predominates with *Eucalyptus papuana* (desert gum) a common species. A few tall shrubs occur but there is no well defined shrub layer. Ground layer is variable and composed of *Triodia* spp.

TREE, TALL SHRUB LAYER: Ht 6-8 m, PFC <5%; 100/ha.

Predominant spp: *Eucalyptus drepanophylla, E. papuana.*

Frequent spp: *Acacia coriacea, Brachychiton australe, Bursaria spinosa.*

GROUND LAYER: Ht <1 m, PFC 30-35%.

Predominant spp: *Triodia mitchellii.*

LAND USE: Condition good, trend stable; some sheet erosion, some topfeed present; grasses are perennials.

LAND UNIT 94

LANDFORM: Flat to very gently undulating tops of tablelands, mesas and buttes.

GEOLOGY: Jurassic *Ronlow Beds* overlain by Quaternary sands.

Deep, sandy red earths with firm surface crusts. Ironstone shot occurs on the soil surface. Pisolitic ironstone occurs at depth in soil profile. Profile is slightly acid throughout. Gn 2.12. Low C, very low N, fair K. Very low P. Very low A.W.C.

Alice - Representative soil analysis: 268, 275.

LAND UNIT 94 (Cont'd)

VEGETATION: Mixed bloodwood woodland. *Eucalyptus similis* (yellow jacket) and *E. dichromophloia* (gum-topped bloodwood) predominate. A few isolated low shrubs occur but a well developed shrub layer is not present. Ground layer is variable composed mainly of grasses and some forbs.

TREE LAYER: Ht 5-12 m, PFC <10%; 100/ha.

Predominant spp: *Eucalyptus similis, E. dichromophloia.*

Frequent spp: *Eucalyptus trachyophloia, Lysicarpus angustifolius, Acacia tenuissima, A. platycarpa.*

Infrequent spp: *Acacia coriacea, Acacia gnidium, Alphitonia excelsa, Hakea chordophylla, Bursaria spinosa, Hovea longifolia.*

GROUND LAYER: Ht <1 m, PFC 5-10%.

GRAMINOIDS:

Frequent spp: *Heteropogon contortus, Themeda australis, Triodia mitchellii.*

LAND USE: Condition good, trend stable; very low fertility; some sheet erosion.

LAND UNIT 95

LANDFORM: Scarp retreats, upper slopes and flat tops of dissected tablelands. Slopes to 30%.

GEOLOGY: Chemically altered Cretaceous sediments and Jurassic sandstones.

SOILS: Shallow lithosols with surface stone and boulders. Base rocks commonly exposed. Textures are loamy coarse sands. Profile is strongly acid throughout. Uc 5.11.

Rosedale.

VEGETATION: Lancewood low woodland. *Acacia shirleyi* (lancewood) predominates. *Eucalyptus melanophloia* (silver-leaved ironbark) and *E. polycarpa* (long-fruited bloodwood) are common species. Scattered tall shrubs occur. Ground cover is sparse composed mainly of grasses.

TREE, TALL SHRUB LAYER: Ht 4-5 m emergent Eucalypts to 15 m, PFC <5%; 400/ha.

Predominant spp: *Acacia shirleyi.*

Frequent spp: *Eucalyptus melanophloia, E. polycarpa.*
Infrequent spp: *Acacia blakei, A. longispicata, Dodonaea boronifolia.*

GROUND LAYER: Ht <1 m, PFC 5-10%.

FORBS:

Infrequent spp: *Abutilon otocarpum.*

GRAMINOIDS:

Frequent spp: *Aristida caput-medusae.*

LAND USE: Condition fair; trend stable to downwards; sheet and gully erosion throughout.

LAND UNIT 96

LANDFORM: Scarp retreats, upper slopes in dissected tablelands. Slopes range from 5-60%, with lower slopes 3-8%.

GEOLOGY: Chemically altered Cretaceous sediments with Cainozoic cover.

SOILS: Very shallow, red, loamy lithosols with surface stone cover of silcrete and ferricrete. Base rocks often exposed. Um 1.0.

Lumeah.

VEGETATION: Mountain yapunyah-bowyakka low open woodland. *Eucalyptus thozetiana* (mountain yapunyah) and *Acacia microsperma* (bowyakka) predominate. Tall shrub layers are conspicuous in places. Ground layer is sparse to absent.

TREE, TALL SHRUB LAYER: Ht 4-8 m, PFC <5%; 400/ha *Acacia microsperma* and *Eucalyptus thozetiana*; Ht 3 m, PFC <1%; 300/ha *Eremophila mitchellii*.

Predominant spp: *Acacia microsperma, Eucalyptus thozetiana.*

Frequent spp: *Eremophila mitchellii, Myoporum desertii, Notalea ovata.*

LOW SHRUB LAYER: Ht 1-2 m, PFC <1%; 300/ha.

Infrequent spp: *Alstonia constricta, Apophyllum anomalum, Capparis lasiantha, Eremophila glabra, Ventilago viminalis, Enchylaena tomentosa, Petalostylis labichoides.*

GROUND LAYER: Ht <1 m, PFC <10%.

FORBS:

Infrequent spp: *Sida filiformis, Solanum ellipticum.*

GRAMINOIDS:

Frequent spp: *Paspalidium caespitosum, Sporobolus caroli.*

LAND USE: Condition bad; trend down; gully erosion; grasses are sparse and mainly annuals; some topfeed available; poisonous plants present.

CLIMATE

INTRODUCTION

The appendix contains a brief description of the significant climatic characteristics in Part IV of the region. A comprehensive analysis of climate and its significance in terms of productivity is to be published as a separate bulletin covering the entire Western Arid Region.

The data included in the Appendix (unless otherwise acknowledged) have been extracted from analyses undertaken by P.R. Thomas, formerly of the C.S.I.R.O. Division of Land Resources Management. Rainfall data for the analyses were obtained from the Bureau of Meteorology. The rainfall network was selected on the basis of criteria such as the length and equivalence of record at different locations and the quality and completeness of the record.

CLIMATE CHARACTERISTICS

The summer-dominant rainfall pattern in conjunction with the temperature regime, result in an arid to semi-arid climate classification. Average rainfall in the area of about 500 mm and high potential evaporation in excess of 2000 mm limit rural industry to grazing enterprises. The transition in mean annual rainfall across the area is from 550 mm in the more elevated eastern part to 450 mm in the south-west.

Table VI-1. Average monthly rainfall (mm)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aramac	91	77	56	30	27	27	25	12	13	29	39	59
Augathella	72	72	61	32	24	25	36	17	16	46	44	46
Barcaldine	83	85	74	35	32	31	28	14	10	34	38	50
Blackall	89	86	69	42	29	27	31	14	14	36	38	64
Evora Stn	78	73	51	34	29	30	28	14	14	29	34	49
Lochnagar	71	66	52	29	20	23	22	11	12	39	35	46
Mt. Morris	63	66	61	28	24	24	31	17	16	36	30	47
Surbiton	92	99	52	28	25	27	27	12	13	31	48	66
Tambo	74	77	50	41	30	27	34	15	16	38	46	71
Yandarlo Stn	82	70	51	34	28	29	39	16	17	46	55	52

The seasonal rainfall pattern is shown in Table VI-1 where mean monthly rainfall is presented for ten stations in and adjacent to the area. January and February are the wettest months, each averaging about 75 mm. A slight winter peak in June and July is followed by the driest months of August and September.

As shown in Table VI-2, the summer component of annual rainfall increases from less than 70 per cent in the south to 75 per cent in the north.

Although rainfall variability from year to year can be regarded as high, the variability is generally less than areas of comparable annual rainfall to the north-west. As shown in Table VI-2, annual rainfall totals as low as about 100 mm have been recorded in the area. The percentile information indicates that an annual rainfall of less than 300 mm can be expected in much of the area about one year in ten. By contrast, extreme annual rainfalls in excess of 1000 mm have been recorded in the area.

Table VI-2. Seasonal and percentile distribution, and range of annual rainfall

Location	Mean Annual	Summer Oct-Mar	Winter Apr-Sep	% Summer	Percentile Least	10	50	90	Greatest
Aramac	485	351	134	72	109	259	430	784	1158
Augathella	491	341	159	69	199	297	461	857	1130
Barcaldine	514	364	150	71	141	272	446	821	1083
Blackall	539	382	157	71	173	322	455	866	1053
Evora Stn	463	314	149	68	178	241	414	794	1152
Lochnagar	426	309	117	73	170	217	422	801	938
Mt. Morris	443	303	140	68	105	254	384	770	1264
Surbiton	520	388	132	75	174	288	465	799	1354
Tambo	520	357	163	68	185	324	486	762	1186
Yandarlo Stn	519	356	163	69	211	298	481	748	1045

Temperature data for three stations in or near the area are presented in Table VI-3. In addition to monthly means of the daily maxima and minima, the appropriate percentile is also presented. The 86 percentile shows the temperature likely to be exceeded about one day a week. Thus, for Barcaldine in January, a daily maximum temperature in excess of 39.2°C can be expected with an average frequency of once a week. Correspondingly for low temperatures, the minimum temperature can be expected to fall below the 14 percentile, one day per week.

Table VI-3. Monthly and annual means and percentiles of temperature extremes (°C)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barcaldine													
Daily Max.													
Mean	35.8	35.2	33.0	30.3	25.9	23.4	22.8	25.3	28.8	32.3	35.1	35.5	30.3
86 Percentile	39.2	38.0	36.0	33.4	28.9	26.2	26.0	28.9	32.2	36.9	38.9	39.0	
Daily Min.													
Mean	22.8	22.9	20.9	16.8	12.2	9.0	7.4	9.9	13.4	17.7	20.2	21.8	16.3
14 Percentile	20.5	20.7	18.3	13.3	7.8	5.3	2.8	5.9	8.3	13.9	16.7	18.7	
Blackall													
Daily Max.													
Mean	36.9	35.3	33.3	30.5	25.6	23.0	22.3	24.7	28.5	32.6	35.2	35.8	30.2
86 Percentile	39.9	38.8	36.7	33.8	28.8	26.1	25.6	28.3	32.2	36.7	38.8	39.0	
Daily Min.													
Mean	22.1	21.9	19.7	16.0	11.0	8.2	6.6	8.3	11.9	16.5	19.5	21.1	15.2
14 Percentile	19.6	19.4	17.2	12.8	6.6	4.4	2.2	3.8	6.9	12.4	16.2	17.9	
Tambo													
Daily Max.													
Mean	34.5	34.1	32.0	29.1	24.3	21.7	20.9	23.3	27.0	31.0	33.5	34.2	28.8
86 Percentile	38.3	37.6	35.2	32.2	27.8	25.0	24.4	27.2	30.6	35.0	37.2	37.8	
Daily Min.													
Mean	19.6	19.7	17.3	12.8	7.7	4.7	2.8	5.2	8.5	13.6	16.5	18.6	12.3
14 Percentile	16.6	16.6	13.9	8.5	2.6	0.6	-1.7	0.0	2.8	7.8	11.7	14.4	

Source: Climatic Averages, Queensland (Metric Edition, Bureau of Meteorology, 1975).

Evaporation in the area averages about 2100 mm and ranges from 275 mm in December to 75 mm in July.

OTHER BULLETINS PUBLISHED IN THIS SERIES

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No. 6* An Erosion Survey of the Upper Nogoa Catchment (1972) - A.F. Skinner, C.C. Gillies and L.E. Milton.

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* These Bulletins are now out of print.