Land Units of the Fitzroy Region, Queensland

Comprising papers by R. H. Gunn and H. A. Nix

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PART I. LAND RESOURCE SURVEYS IN THE FITZROY REGION

By R. H. GUNN* and H. A. NIX*

I. INTRODUCTION

Following a request in 1961 by the Co-ordinator General of Public Works, Queensland, broad-scale land resource surveys were carried out in three areas in the Fitzroy region in east-central Queensland during the period 1962–64. The surveys covered a region of about 198 000 km^2 which included almost the whole of the Fitzroy basin as well as the Belyando–Suttor system which discharges into the Burdekin, and the internal drainage basins of Lakes Buchanan and Galilee. It also included the Central

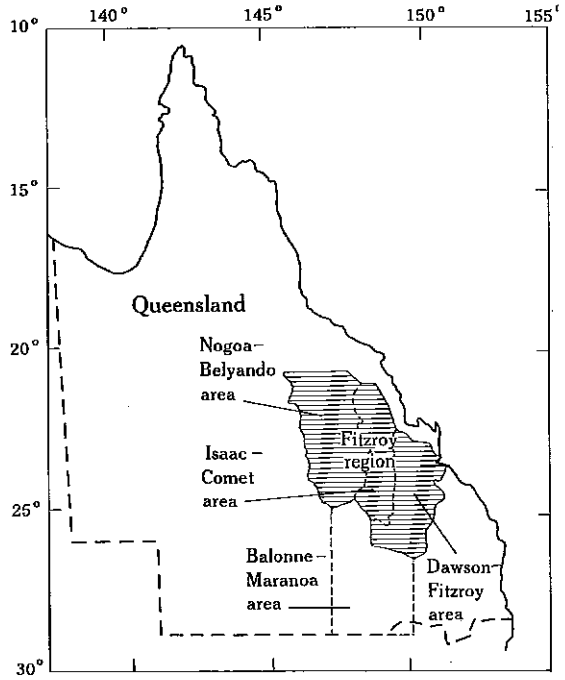

Fig. 1.—Location of survey areas in the Fitzroy region.

Highlands and most of the brigalow belt where potentialities for intensive or semi-intensive land use had long been recognized (Skerman 1950, 1953; Hart 1955). The surveys were carried out by three teams and the results were reported by Story *et al.* (1967) in the Isaac–Comet area, Gunn *et al.* (1967) in the Nogoa–Belyando area and Speck *et al.* (1968) in the Dawson–Fitzroy area (Fig. 1).

Variations in climate, topography, geology, soil and vegetation, and interactions between these attributes give rise to a wide range of environments in the region. Hence there is a need for some system of classifying land in terms of its inherent characteristics

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into mappable and readily identifiable categories, as a prerequisite to evaluation and planning for various land uses. Integrated surveys involving studies of these attributes and the relationships between them facilitate the ecological approach to land use and the evaluation of landscapes as complex wholes. Owing to the reconnaissance nature of the surveys and the lack of detailed information, a multi-attribute method of land classification was adopted. This method assumes covariance among measured properties as opposed to a parametric approach which does not. Future development and application of the parametric approach depend not only on the availability of detailed information (e.g. accurate contour maps, soil analysis data) but also on explicit models of land-using operations. These will specify key parameters and the degree of precision and accuracy required in their measurement. Every specific land use will require a specific model and classification procedure. Since this is not yet feasible the present study must rely on a general multi-purpose classification of land types.

TABLE 1

LAND SYSTEMS AND LAND UNITS IN THREE SURVEY AREAS IN THE FITZROY REGION

Survey area	No. of land systems	No. of land units
Nogoa–Belyando (91 000 km²)	43	202
Isaac–Comet (42 900 km²)	28(16)	126
Dawson–Fitzroy (65 000 km²)	63(61)	535
	134(120)	863

N.B. One land system is common to three areas; 11 land systems are common to Nogoa–Belyando and Isaac–Comet areas; 1 land system is common to Isaac–Comet and Dawson–Fitzroy areas.

The lands of the three survey areas were mapped and described in terms of 120 land systems and 863 land units (Table 1), land classification categories which were defined by Christian and Stewart (1953) and Christian (1958). In the reports covering the three areas, block diagrams were used to illustrate the landforms and geology of the land systems and the distribution of the component land units which were described in tabular form below. This method of presentation placed restrictions on the number of land units that could be shown and the level of detail at which they could be described. The large number and the complexity and repetition of descriptions made the land units difficult to comprehend. The main purpose of this study, which is essentially a reorganization of material published in the three reports, is to facilitate the recognition of land units and understanding of their distribution in the region.

II. METHODS

Land system mapping is based on the concept that similar kinds of land reflect similar patterns in aerial photographs (see Appendix II). The procedure generally

followed in the Fitzroy region surveys was to map initially every pattern that could be identified in the 1 : 50 000 to 1 : 85 000 scale photography and which was large enough to be included, individually if necessary, in published maps at scales of 1 : 500 000. In the Nogoa–Belyando area, for example, about 350 patterns or mapping units were recognized. For descriptive convenience and because of limitations imposed by the scale of published maps, these mapping units were grouped into 43 land systems according to their affinities. These then are the areas or groups of areas with similar recurring patterns of topography, soils and vegetation as defined by Christian and Stewart (1953). They are convenient mapping entities for broad reconnaissance surveys, particularly in areas where close correlations between landforms, lithology, soils and vegetation are apparent.

The component elements of land systems are termed *land units*. Unit is used in the sense: 'each of the individuals or groups into which a complex whole may be analysed' (Oxford Dictionary). The land unit is defined by Christian and Stewart (1968) as 'a group of related sites associated with a particular land form within a land system, and wherever the land unit recurs, it has the same association of sites. The simplicity or complexity of the land unit is determined in part by the *complexity of the land form accepted as the unit of study** and in part by changes in genetic factors that are reflected in changes in soil and/or vegetation but not in the land form itself.' The land unit is similar to the land facet of Brink *et al.* (1966) but these authors use the term in a different sense from Savigear (1965), who refers to facets as planes which are horizontal, inclined or vertical surface areas. It is also similar to the land component of Gibbons and Downes (1964), the land type of Veatch (1937) and Davis (1969), the terrain unit of Grant (1968), and in certain landscapes it is synonymous with the catenary zone of Milne (1935).

Land units can be identified in small-scale aerial photographs as elements of patterns but their extent is generally too limited to be mapped at scales smaller than about 1 : 25 000. Land units are of variable size, ranging from hundreds of square kilometres to narrow belts a few metres in width. They may occur singly in large uniform areas reflecting simple photographic patterns or in small areas of varying shapes and sizes forming component elements of complex patterns. It is also generally assumed that each land unit described in a land system is not necessarily present in every occurrence (mapping unit) of that system. For descriptive convenience it was usually necessary to group *simple land units* into a smaller number of *complex land units* in accordance with the above definition. These complex land units are generally the forms used to describe the land systems of the three survey areas in the Fitzroy region. In the Dawson–Fitzroy area (Speck *et al.* 1968) numbered land facets (Brink *et al.* 1966) were used to facilitate descriptions of most of the land systems in that area.

In this study the complex land units have been subdivided into their component simple forms and instead of complicating the issue this procedure has resulted in considerable simplification. The method of subdivision is illustrated in Fig. 2 and an example is given in Table 2 in respect of Monteagle land system in the Nogoa–Belyando area. The 6 mainly complex land units with various landforms, soils and plant communities have been separated into 19 simple land units which are described in Part V of this report.

* Present authors' italics.

The criteria used in the classification and description of land units are discussed in Parts II, III and IV.

III. Results

The main conclusion reached in this study is that the lands of the region can in fact be described in terms of about 142 simple land units, many of which recur in

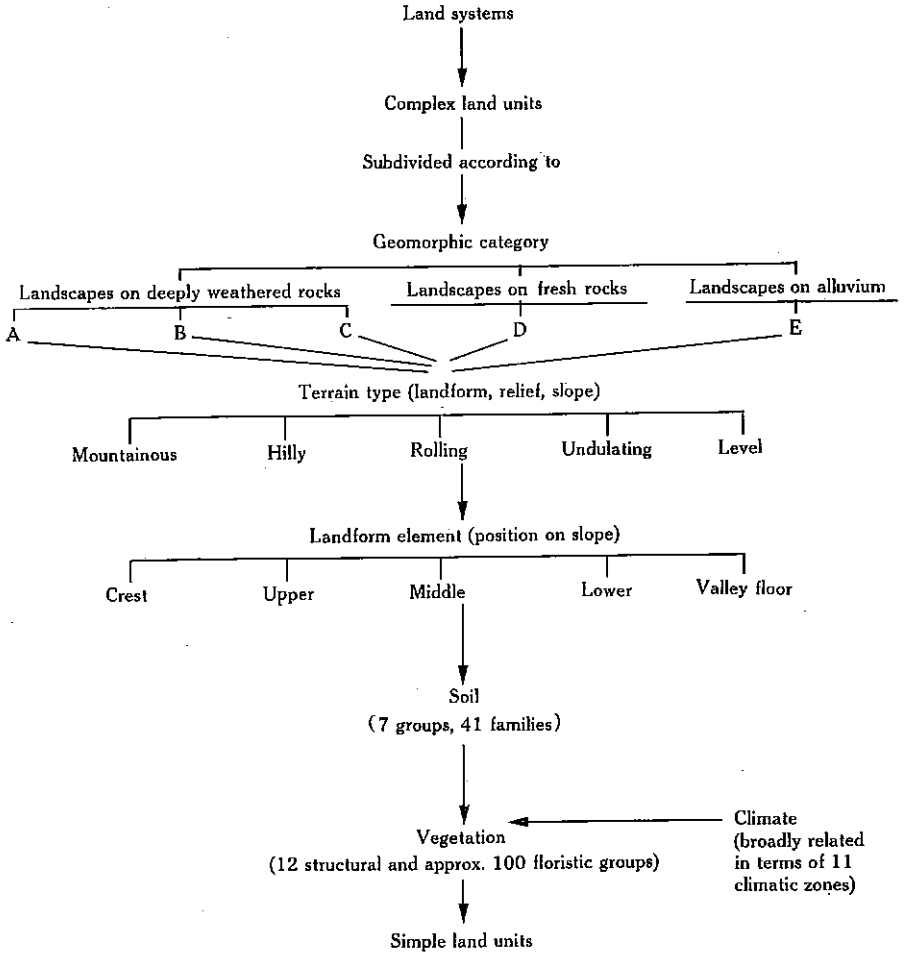

Fig. 2.—Subdivision of complex land units into simple land units.

numerous land systems. The occurrence of these land units in the land systems mapped previously in the three survey areas is shown in Tables 12–15 in Appendix I. These simple land units are the categories required for the planning and management of land for various purposes and generally they can be mapped in aerial photographs at scales of 1 : 10 000 to 1 : 25 000. They therefore provide a link between broad-scale surveys and more detailed studies required for land planning and development. The broad

distribution of these land units is shown in the accompanying map at a scale of 1 : 1 000 000. The boundaries of the mapped entities are those of land systems or groups of land systems. Mindful that this finding is based on the results of a rapid reconnaissance survey, it is probable that other land units may be recognized after more detailed studies have been undertaken. In addition, some of the land units described in Part V of this report may warrant further subdivision after closer examination.

TABLE 2

SUBDIVISION OF COMPLEX LAND UNITS INTO SIMPLE FORMS IN MONTEAGLE LAND SYSTEM (4450 KM²)

(Lowlands with box and duplex soils on slightly stripped Tertiary land surface)

Complex land unit and % area	Landforms	Soils	Vegetation	Simple land unit and % area
1, 10%	Interfluves, rises; undulating	Mainly loamy red and yellow earths	*E. melanophloia* woodland	6, 10%
2, 10%	Plains; level to gently undulating	Loamy red earths	*E. polycarpa–E. papuana* woodland	7, 4%
		Loamy red earths	*E. crebra–E. drepanophylla* shrub woodland	8, 4%
		Uniform sandy soils	*E. polycarpa–E. papuana* woodland	11, 2%
3, 5%	Breakaways and knolls	Skeletal soils	*A. shirleyi* open-forest	17, 3%
		Shallow duplex soils	*E. thozetiana* woodland	19, 2%
4, 60%	Plains, foot slopes, lowlands	Shallow duplex soils	*E. normantonensis* woodland	20, 5%
		Duplex soils	*E. populnea* grassy woodland	21, 5%
		Duplex soils	*E. populnea* shrub woodland	23, 50%
5, 10%	Depressions, lowlands	Duplex soils	*E. populnea–A. harpophylla* shrub woodland	22, 1%
		Duplex soils	*E. cambageana–A. harpophylla* open-forest	34, 3%
		Duplex soils	*A. cambagei* open-forest	35, 2%
		Duplex soils	*A. harpophylla* open-forest	37, 2%
		Cracking clay soils	*A. cambagei* open-forest	39, 1%
		Cracking clay soils	*A. harpophylla* open-forest	41, 1%
6, 5%	Alluvial flats; single deep channels	Duplex soils	*E. melanophloia* grassy woodland	120, 1%
		Duplex soils	*E. populnea* grassy woodland	121, 2%
		Various materials along channels	Fringing open-forest	122, 1%
		Duplex soils	*A. harpophylla* open-forest	127, 1%

The method of classification and presentation of data described in this study which places emphasis on the land unit level has been applied in the adjacent Balonne–Maranoa area (Fig. 1) covering 110 000 km² to the south of the Fitzroy region (Galloway *et al.* 1974). Many of the land units described in that area also occur in the Fitzroy region and clearly there is a need for correlation on a State-wide basis.

IV. Unifying Factors

The reason why relatively few different land units recur over such an extensive region is undoubtedly the common or similar genesis of many of the landscapes. The main controls have been climatic changes in the past or recent times, lithology and geomorphic history. Galloway (1967*a*, 1967*b*) referred to the accumulation of an almost complete mantle of sediments in the Tertiary, deep weathering, and subsequent erosion and deposition, as processes which have acted to produce a sequence of similar landforms, soils and vegetation in the central and western parts of the region. Remnants of the mantle are also extensive in the north of the Dawson–Fitzroy area (Wright 1968), and it is estimated that the 53 land units described in this study which occur on the intact surface or denuded weathered zones of the mantle cover about half of the region.

Where the weathered mantle has been removed a wide range of underlying older rocks has been exposed, but here too there are certain unifying influences. The Permian sediments and/or volcanics of the Bowen basin crop out over extensive areas in the north of the Dawson–Fitzroy and Isaac–Comet areas and in the east of the Nogoa–Belyando area. Similarly, a broad belt of Triassic and Jurassic sediments extends across the southern parts of all three areas. Extensive remnants of Tertiary basalt flows also occur throughout the region. These occurrences of similar or identical rocks which have been subjected to the same geomorphic processes over wide areas therefore give rise to similar land forms and soil parent materials. Hence land systems with similar assemblages of more or less identical land units recur widely.

Variations in climate, particularly the decrease in annual rainfall westwards and in winter rainfall northwards, cause variations in the distribution and form of plant species. The occurrence of mountain ranges and elevated tablelands causes fairly abrupt local changes in rainfall and possibly temperature, as reflected by the vegetation, but over most of the region the relief ranges between 150 and 370 m and climatic changes are gradual. There are therefore broad zones with uniform climatic conditions and, other factors being equal, uniform vegetation.

V. Acknowledgments

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PART II. LAND CLASSIFICATION CRITERIA: GEOMORPHOLOGY, SOILS AND MODE OF OCCURRENCE

By R. H. GUNN*

I. INTRODUCTION

No two points in any landscape are identical and almost infinite subdivision on the basis of variations in attributes is possible. These variations are caused principally by (1) changes in slope characteristics which influence moisture relationships such as infiltration, retention and run-off, and the balance between stability or erosion and deposition under particular rainfall regimes, (2) properties of the materials on which the slopes have formed (e.g. rock type and weathering status, soil thickness, texture, structure and porosity, and clay mineralogy) and (3) plant cover. It is therefore important to distinguish those differences in attributes that are judged to be of greatest significance for land use.

Land use based on the production of plant material for cropping, grazing or forestry is subject to two main limitations almost throughout the region, the availability of adequate soil moisture for optimum growth and the erodability of sloping lands. These limitations are primarily functions of climate, topography and the physical properties of the soils. Soil nutrient deficiencies or imbalances may also limit plant production in places but these problems are more readily overcome by the application of fertilizers and amendments. Excess soluble salt or alkali may limit or restrict the choice of plants in certain areas and present special problems on potentially irrigable lands. Factors important for other uses such as outdoor recreation and wildlife conservation are the relative usefulness of land for other purposes, the scenic attributes of terrain, the occurrence of prehistoric features, wetlands (such as lakes, lagoons, rivers, swamps, estuaries) and plant communities which provide cover and food for native fauna. In this study, the objective of land classification is the orderly grouping of landscapes with similar attributes in order that the uses to which they are best adapted may be assessed in the light of existing knowledge and that the results of research and experience gained within the region or elsewhere may be applied systematically. The land unit is the basic category in the classification and the criteria used to identify and differentiate land units are considered here and in Parts III and IV.

II. GEOMORPHIC CATEGORIES

The land units identified in the region and described in Part V have been grouped in the first instance into the five geomorphic categories of Galloway (1967*a*) as follows:

A. Tertiary land surface—intact to moderately stripped (upper catena).

B. Erosional-depositional surfaces within the Tertiary weathered zone (mid-catena).

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C. Erosional–depositional surfaces within the Tertiary weathered zone (lower catena).

D. Erosional surfaces below the Tertiary weathered zone.

E. Post-Tertiary alluvial land surfaces.

The map included with this report indicates the distribution of lands dominantly within these geomorphic categories.

Descriptions of the geomorphic history by Galloway (1967*a*, 1967*b*) and Wright (1968) indicate that a weathered mantle up to 90 m thick with a gently undulating surface covered most, if not all, of the region at one time. The mantle comprised mainly terrestrial deposits of Tertiary age derived from a wide range of older rocks but pre-Tertiary rocks and Tertiary basalt also occurred. The mantle was subjected to intense weathering which led to the development of deeply differentiated lateritic profiles. It is generally assumed that this was a long-continued geologic process of leaching, translocation and deposition of differentially soluble and mobile chemical constituents which took place under the influence of a fluctuating high water-table (Prescott and Pendleton 1952; Connah and Hubble 1960) and very gently undulating relief. The most important changes during chemical weathering were the mobilization and translocation of metal cations, silica and sesquioxides. In most situations the processes led to the formation of complete lateritic profiles with a surface cover of red or yellow earths underlain by ferruginous, mottled and pallid zones. Irregular sheets of silcrete (billy) up to 3 m thick formed by deposition of silica in various rocks beneath basalt sheets and in some mottled and pallid zones in labile sediments (Gunn and Galloway 1976). In places, deep weathering extended down into the older rocks underlying the Tertiary deposits. Lithological differences in the mantle led to variations in the nature of some weathering profiles. Resistant quartz sandstones, for example, crop out extensively in the region and because they are composed almost entirely of quartz and contain little or no weatherable material they have remained virtually unaltered and the lateritic profile is absent or poorly developed. Sandy, loamy or gravelly soils on remnants of the old surface almost certainly reflect differences in the source materials from which the mantle was derived.

The Tertiary sandstone, comprising consolidated terrestrial deposits in which lateritic profiles were developed most extensively in the Fitzroy region, is frequently exposed in scarps, outcrops, erosion gullies, stream channels and road or railway cuttings. It generally consists of uniformly ferruginized dark red to reddish brown, or irregularly mottled light grey and red gritty sandstone with abundant coarse white quartz grains and pebbles, and sometimes contains rounded or subangular slightly altered fragments of other rocks. It has coarse pores visible to the naked eye and frequently has numerous fine solution channels lined with secondary silica deposits. The overlying ferruginous or laterite horizon, if present, consists of concretionary or massive 'ironstone', comprising mainly hematite or magnetite concretions. The massive form is black to yellowish brown, heavy vesicular material consisting of masses of concretions cemented by ferricrete. In most profiles the ferruginous zone has been stripped off but thick exposures occur in places, e.g. near Rookwood, and blocks of massive laterite and concretionary gravels occur near Foxleigh in the Isaac–Comet area.

These latter deposits are detrital fragments of a lateritic profile that once lay above the present surface. Low-level 'creek' laterites are also detrital deposits that have been recemented by iron oxides thrown down by seepage waters.

The ferruginized or silicified mottled sandstone commonly grades into the uniformly bleached pallid zone, which is white or light grey massive material in which corestones are sometimes present in the lower parts. On scarps and steep slopes, small caves and undercuts caused by sloughing of the materials are common.

Thick sheets of silcrete formed in the mottled and pallid zones of some profiles and are also diagnostic features of deep weathering. The breakdown and transport of this material resulted in the accumulation of masses of gravel, stones and cobbles on the surface and in some soil profiles, e.g. Willows land system in the Nogoa–Belyando area.

In some exposures of lateritic profiles, notably on scarps near Rookwood and in the bank of the Isaac River west of Bombandy, the mottled and bleached sandstone is underlain disconformably by red and grey mottled heavy clay. McTaggart (in Cribb *et al.* 1960) noted the occurrence of an argillaceous sequence over 130 m thick in places at the base of the Tertiary deposits in the Rolleston–Springsure–Emerald–Clermont area. Owen (1954) noted also that as a general rule all bauxites are underlain by a zone of residual clay, usually of considerable thickness.

Subsequent denudation of the mantle and differential bevelling of the lateritic profiles left more or less intact remnants of the old surface on high ground (category A) and exposed the underlying weathered zones (categories B and C). It is certain that some reworking of these materials and accumulation of colluvial–alluvial deposits occurred, particularly on middle and lower slopes and below scarps where these are present. In this regard, Galloway (1967*a*) pointed out that the extent to which some of these landscapes are erosional rather than depositional is uncertain.

Over wide areas the weathered mantle was completely removed to expose the underlying older rocks which in places were also affected by deep weathering. Consequently, there are transitional belts of varying width between landscapes formed on deeply weathered, partially weathered and fresh rock materials. Other factors which possibly caused landscapes on weathered and fresh materials to occur in juxtaposition are the unevenness of the base of the weathering profile or weathering front (Mabbutt 1961) where denudation has reached this level, and also the more intense weathering in low-lying sites in the mantle (Galloway 1967*a*).

The 53 land units described in this study which occur on deeply weathered materials cover about half the region. Recognition of the distinguishing features and some of the main factors leading to the development of landscapes on the various zones of denuded lateritic profiles is therefore important in understanding the distribution of soils and vegetation over wide areas.

III. Lithology of Underlying Rocks

Lithological differences are masked or even obliterated in the deeply weathered landscapes but they exert a controlling influence over the nature of landforms and soils in the erosional landscapes underlain by 'fresh' rocks in geomorphic category D. Seven main groups of rock types, ranging from quartzose to argillaceous, occur in the

region—quartz sandstones, metamorphics, granite, mixed sediments, volcanics, shales and basalt. These lithological groups have been used to differentiate between land units in this geomorphic category.

Resistant quartz sandstones form mountainous to hilly terrain in various parts of the region, for example the Carborough and Shotover Ranges, parts of the Great Dividing Range and hills in the upper Dawson valley. They form characteristic drainage and dissection patterns and, because of steep slopes, resistance to weathering and the erodable nature of the sparse weathering products, soils are mainly skeletal. In undulating areas moderately deep to deep uniform sandy soils have developed. In the centre of the Nogoa–Belyando area about 2300 km^2 of hilly terrain is underlain by metasediments, mainly greywacke, mica-schist, slate and phyllite with abundant quartz veins. V-shaped valleys have short steep slopes which, combined with the resistant nature of these rocks, give rise to skeletal gravelly soils.

Granite forms hilly to undulating terrain with scattered outcrops and tors in the central part of the Nogoa–Belyando area and in the east of the Dawson–Fitzroy area. The parent materials derived from the granite give rise to moderately deep to deep texture-contrast soils.

Mixed sediments of various ages occur throughout the region and form mountainous to gently undulating terrain. Folded sediments with a high proportion of resistant quartz sandstone tend to form hilly to mountainous terrain with complex selective etching, as in parts of the Drummond Range. Flat-lying beds of alternating sandstones and softer rocks form characteristic benched slopes which are extensive in the Cherwell Range, and differential erosion in steeply dipping alternating strata gives rise to prominent strike ridges and vales in parts of the Drummond Range. In gently undulating areas of strongly folded mixed sediments there is a complex pattern of narrow linear belts following strike lines. Cracking clay soils have formed on shales and mudstones slightly affected by deep weathering and support brigalow open-forest while texture-contrast soils occur on sandstones and support open eucalypt woodlands. There is consequently conspicuous banding of the vegetation.

Acid to intermediate volcanic rocks underlie parts of the region and in places they are interbedded with sediments or occur in association with granite. They are most extensive in the east of the Dawson–Fitzroy area and in the north and centre of the Nogoa–Belyando area. There is a tendency for the acid, resistant rocks such as rhyolite and dacite to form hilly terrain with very shallow skeletal soils, e.g. the Bulgonunna and Peak Range Volcanics. The intermediate rocks, mainly andesite, tend to form rolling to undulating terrain with various shallow to moderately deep soils.

Flat-lying to gently dipping lithic sandstones, siltstones, mudstones and shales consist mainly of readily weatherable minerals and generally form lowlands of undulating to nearly level terrain. They underlie extensive areas throughout the region and form parent materials rich in swelling-clay minerals in which moderately deep to deep cracking clay soils have developed. The largest occurrences are on the Triassic and Permian sediments which extend across the southern part of the region and in the vicinity of Kemmis Creek, Leichhardt Downs and Mt Stuart in the north and centre.

Remnants of formerly more widespread olivine basalt flows occur in many parts of the region and are most extensive in the Rolleston–Springsure–Emerald–Clermont areas. Basalt also caps sandstone on the Great Dividing Range and the dissected

Consuelo Tableland which rise to above 900 m in the south-west and form the most elevated parts of the region. Areas underlain by basalt consist of terrain ranging from mountainous to nearly level plains. On the elevated tablelands, deep reddish brown krasnozemic soils have formed, on steeply sloping terrain shallow skeletal soils predominate and in gently undulating areas moderately deep to deep cracking clays are most extensive.

The map included with this report shows the distribution of these seven lithological groups underlying the erosional surfaces below or rising above the Tertiary weathered zone. The groups are subdivided according to variations in relief.

IV. Landforms

Variations in land surface morphology are generally correlated closely with the lithology of underlying rocks and the past history of weathering, erosion and deposition. These attributes form the basic criteria used to differentiate between simple land units, and together with vegetation are the principal factors causing differences in photographic patterns. In the evaluation of land for various purposes, the gradient, length, shape and distribution of slopes are important factors affecting the use of machinery (e.g. ploughing, seeding, harvesting, timber extraction) and accessibility to grazing. Together with soil and rainfall characteristics, management practices and hydrologic regimes, slope characteristics are also important factors in the assessment of accelerated erosion and flooding or drainage problems.

Table 3

Terrain, relief and slope classes

(After Galloway 1969)

Terrain	Local relief (m)	Modal slope (%)
Mountainous	>180	>23
Hilly	90–180	11–25
Rolling	60–120	6–14
Undulating	15– 60	2– 7
Level or nearly level (plains)	<20	0–2½

Different types of terrain consist of assemblages of predominantly one kind of landform such as mountains, hills, rolling and undulating land or plains. These landforms have been defined by Galloway (1969) in terms of local relief (i.e. difference in elevation between ridge crests or interfluves and drainage depressions) and modal slopes as shown in Table 3.

In differentiating between simple land units within the various terrain types the landform elements (Speight 1968) have been used generally. These are defined in this study in terms of crestal, upper, middle and lower slopes and valley floors in mountainous to undulating terrain. Other terms such as tablelands, mesas and scarps are used to describe some elements in variously denuded occurrences of the Tertiary weathered mantle described previously. Channels, levees, back slopes, back plains and terraces are the main landforms in alluvial plains but no subdivision into elements has been

made. The estimated range in slope is given for each land unit. Quantitative definitions of slopes in terms of length, width, convexity, concavity or contour curvature were not available in most cases from the reconnaissance survey data.

V. Soils

(*a*) *General*

The soils of the region have been described in terms of 7 major groups and 41 families (Gunn 1967*a*, 1967*b*; Sweeney 1968) (Table 4). Most of these soils are common to the three survey areas but a few families occur in only one or two of the areas. The major groups are differentiated mainly on the basis of texture following the uniform, gradational and duplex primary profile forms of Northcote (1971). The families within each group have been defined according to differences in attributes considered to be of importance to land use and are indicated in Table 4. The main objective was to group similar soils on the basis of attributes that were considered likely to affect the growth of plants significantly. The selection of these attributes was based on (1) present knowledge of the plant ecology of the region (based on the precept that local changes in plant communities within the region generally indicate significant differences in soil properties; it is recognized, however, that the growth requirements of mature trees often with deep, widely ranging root systems may differ markedly from those of crops or pastures with less extensive root systems), (2) observations on the present use of the soils and (3) intuitive judgment and experience. A single attribute or a combination of attributes may limit the choice of plants or significantly affect production if no ameliorative measures are taken. The problem is even more complex when climatic, topographic, biotic and management factors are also taken into account. It is not yet possible to measure all of these attributes in quantitative terms or to determine the full significance of their effects on plant growth and production. Clearly much work is still required in this regard under the varying climatic and topographic conditions in the region. The most important soil criteria, however, are considered to be those that affect root penetration and moisture supply. Accordingly, emphasis was given to depth, texture and thickness of horizons in the classification. When more detailed surveys are undertaken there should be further subdivision of the families on the basis of various other criteria, e.g. subsoil structure in soils with abrupt texture contrasts and reaction and salt and exchangeable sodium contents in some of the subgroups of the cracking clay soils.

Soil classification based on reconnaissance survey data is necessarily general and the assemblages of soil families in the mapping units (land systems) are soil associations. When specific projects such as irrigation schemes or the planning of properties for mixed farming enterprises are examined, more detailed classification and mapping will be required. In general, the more intensive the land use, the more detailed is the classification required and the lower the level of variability that can be accepted. For example, with intensive forms of land use such as the irrigation of high-value crops, soil variability may require the application of different methods and rates of watering owing to differences in infiltration and/or water retention, or may cause uneven germination, growth or ripening of crops leading to harvesting difficulties or poor-quality products. On the other hand, for semi-intensive use such as the establishment

TABLE 4

SOIL GROUPS AND FAMILIES IN THE FITZROY REGION

Major group	Family	Main characteristics	Appropriate or approximate equivalent names (Stace *et al.* 1968)	(Isbell and Hubble 1967)	Principal profile form (Northcote 1971)
Skeletal soils	Shotover	Very shallow, uniform coarse-textured soils	Lithosols	Shallow sands	Uc1.21
	Rugby	Very shallow, uniform medium- to fine-textured soils		Shallow loams	Um1.21, 1.4
Uniform coarse-textured soils	Petrona	Shallow to moderately deep sandy soils (< 90 cm)	Siliceous sands	Deep sands and deep leached sands	Uc1.2, 2, 4.1
	Highmount	Moderately deep to deep sandy soils (> 90 cm)			Uc1.2, 2.2, 4.1
Massive earths	Dunrobin	Deep loamy red earths	Red and yellow earths	Red and yellow sandy and loamy massive earths	Gn2.12, 2.11
	Struan	Deep loamy yellow earths			Gn2.22, 2.21, 2.62
	Annandale	Deep sandy red earths			Gn2.12, 2.11
	Forrester	Deep sandy yellow earths			Gn2.22, 2.21
	Gregory	Shallow red and yellow earths (< 60 cm)			Gn2.12, 2.11, 2.22
	Wilpeena	Deep red and yellow earths on alluvial materials			Gn2.12
Texture-contrast soils	*Shallow soils* (< 60 cm)		Mainly soloths, solodized solonetz and solodic soils; some red-brown earths and (?) podzolic soils	Acid, neutral or alkaline red, brown, yellow, grey or dark duplex soils, with or without bleached or mottled horizons	
	Southernwood	Sandy or loamy surface soils, acid to mildly alkaline subsoils			Dr2.12, Dy2.22
	Medway	Sandy or loamy surface soils, strongly alkaline subsoils			Dr2.13, Db1.13, Dy2.23
	Deep soils (> 60 cm)				
	Thick sandy surface soils (> 36 cm)				
	Luxor	Acid to mildly alkaline subsoils			Dy3.42, 3.22
	Broadmeadow	Strongly alkaline subsoils			Dy2.23, 3.23, 3.43
	Thin sandy surface soils (< 36 cm)				
	Springwood	Acid to mildly alkaline subsoils			Dr2.12, Dy3.12
	Taurus	Strongly alkaline subsoils			Dr2.13, Dy2.23
	Loamy surface soils (generally < 36 cm)				
	Wyseby	Acid to mildly alkaline subsoils			Dy2.22, Db1.32
	Retro	Strongly alkaline subsoils			Db1.13, 1.33, Dy2.13, Dd1.13

Dark brown and grey-brown soils	Gindie	Shallow uniform medium- to fine-textured soils on highly calcareous materials	(?) Rendzinas		Uf6.31
	Kinnoul	Shallow uniform medium- to fine-textured soils, alkaline subsoils	Prairie soils	Dark alkaline structured earths	Uf6.31, 6.21
	Cheshire	Deep, uniform or gradational, medium- to fine-textured soils, alkaline subsoils			Gn3.93, 3.43 Uf6.31
	Ingelara	Shallow, uniform medium-textured, neutral to strongly acid soils		Red, brown or grey acid structured earths	Um5.2, 4.2
	Bullaroo	Deep, gradational, coarse- to fine-textured, neutral to mildly alkaline soils			Gn4.31
	Carraba	Deep, uniform or gradational, medium- to fine-textured soils, strongly acid subsoils			Uf6.32, Gn3.12
Cracking clay	*Tertiary weathered zone parent materials*				
	Pegunny	Gilgaied deep clay soils, mainly dark grey-brown, strongly alkaline surface over mottled acid subsoils	Grey, brown and red clays	Grey and brown gilgaied deep cracking clays	Ug5.24, 5.25, 5.38
	Downfall	Slightly gilgaied deep clay soils		Grey and brown deep cracking clays	Ug5.24, 5.27
	Rolleston	Deep clay soils not gilgaied			Ug5.24, 5.15
	Transported Tertiary weathered zone or shale parent materials				
	Logan	Dark self-mulching deep clay soils, neutral to strongly alkaline at or near the surface, slightly to strongly acid at depth, gypseous	Grey and brown clays	Grey and brown deep cracking clays	Ug5.24, 5.16
	Natal	Dark self-mulching deep clay soils, moderately to strongly alkaline throughout			
	Sedentary on basalt and other volcanic rocks				
	Arcturus	Dark self-mulching, moderately shallow clay soils (60–90 cm)	Black earths	Dark cracking clays	Ug5.12, 5.14
	May Downs	Dark self-mulching, deep clay soils (>90 cm)			Ug5.12, 5.16
	Glenora	Dark brown to reddish brown deep clay soils	Brown and red clays		Ug5.34, 5.37

TABLE 4 (*Continued*)

Major group	Family	Main characteristics	Appropriate or approximate equivalent names (Stace *et al.* 1968)	(Isbell and Hubble 1967)	Principal profile form (Northcote 1971)
	Sedentary on various sedimentary rocks				
	Teviot	Dark self-mulching, moderately deep to deep clay soils	Grey and brown clays	Grey and brown medium to shallow cracking clays	Ug5.12, 5.14, 5.22
	Alluvial parent materials				
	Vermont	Dark deep clay soils	Grey and brown clays	Grey and brown deep cracking clays	Ug5.16, 5.24
	Shallow soils on various rocks				
	Bruce	Shallow clay soils (< 60 cm)	Grey, brown and red clays	Dark shallow cracking clays	Ug5.12, 5.37
Alluvial	Davy	Uniform coarse-textured	Alluvial soils		Uc1.22, 2.2, 5.2
	Clematis	Uniform medium- to fine-textured			Uf6.33, 6.23, Um6.42, Um5.4
	Warrinilla	Medium- to fine-textured on coarse-textured substrata			Um5.5
	Moolayember	Coarse- to medium-textured materials on fine-textured substrata			Gn3.22, Um5.5
	Consuelo	Stratified medium- and fine-textured materials			Um 5.5, Uf6.33
	Alma	Saline, uniform fine-textured soils	Solonchaks		Uf6.61

of improved pastures, greater soil variability may be acceptable because differential effects on the growth of pastures are of less significance and smaller capital outlays are involved.

The distribution of the soils in the region is closely related to the past history of weathering, erosion and deposition, the lithology of parent rocks and variations in slopes. Criteria used to distinguish between soils on deeply weathered and fresh rocks are outlined below.

(*b*) *Soil Catena on Weathered Sediments*

A catenary sequence of soils closely correlated with specific landforms and plant communities occurs on variously denuded laterite profiles in the region (Gunn 1967*c*). Land units 1–46 in geomorphic categories A, B and C occur in catenary sequence (Fig. 12) in Part V and are estimated to cover about 85 000 km^2 in the region. Some differ only in respect of vegetation in accordance with climatic variations. Apart from obvious signs such as exposures of the various weathered zones, this catena has been taken as evidence of deep weathering and has been used to place a particular land unit in the appropriate geomorphic category. Some land units are similar superficially to others in different geomorphic categories, for example poplar box (*E. populnea*) on texture-contrast soils occurs on plains and gently undulating terrain in categories B, D and E, but soil structure and underlying materials differ and they occur in association with different assemblages of land units. Other land units are specific to this catena and their associated landforms, soils and plant communities are diagnostic of weathered landscapes.

(*c*) *Soil Catena on Weathered Basalt*

Several land systems throughout the region have formed on Tertiary basalt. In some, notably Racecourse, Kinsale, Wondabah and parts of Eurombah (see Appendix I and land units 47–53), rock and soil materials have been affected in varying degrees by deep weathering. In soil profiles formed on 'fresh' basalt the transition between soil and hard unweathered rock is generally only a few centimetres thick, whereas in areas partially affected by weathering the C horizons consisting of soft, pale grey decomposed rock are often up to 1 m thick. These features have been used as indicators of varying degrees of weathering.

Where partially denuded remnants of weathering profiles in basalt occur, a soil catena has developed (Gunn 1974). On small flat-topped residuals, softwood thicket, dominated by bonewood (*Macropteranthes leichhardtii*) but associated with a wide range of other species, occurs on gravelly red soils with uniform clay textures. Below this zone almost pure stands of bonewood with tall emergent brigalow occur on shallow loams or clays underlain by highly calcareous materials. This zone grades to tall brigalow, belah or gidgee forest with various associated understorey species on deep brown, reddish brown or red alkaline clays. There are often abrupt boundaries between this lowest zone and dark grey to black, self-mulching clay soils under grassland on fresh basalt. This catenary sequence of soils on specific landform elements and with closely associated plant communities is a reliable indicator of weathering in Tertiary basalt. It is noteworthy that soils formed on materials derived from fresh basalt invariably support grassland with or without scattered eucalypts.

(*d*) *Soil Depth*

Soils developed *in situ* in materials derived from little-weathered rocks exposed below the Tertiary weathered zone are rarely more than 1–1·2 m in depth, even where parent materials are derived from readily weatherable rocks such as shales (cf. land units 75, 99 and 102 in Part V). In some situations, where there is little or no evidence of a former overlying weathered mantle, soil profiles are 1·5–2 m deep over bed-rock and soil reaction is frequently alkaline at or near the surface and acid beneath. These soil attributes are considered to indicate the residual effects of deep weathering that occurred in an overlying mantle which has subsequently been removed. They have been used to allocate particular land units to appropriate geomorphic categories.

(*e*) *Chemical Properties of Soils*

Other soil attributes which indicate the effects of deep weathering are often less obvious and can generally be determined only by chemical analysis. The soil catena on weathered basalt, for example, indicates the sequence of weathering of clay-size minerals and there is a progression from soils rich in sesquioxides and kaolinite and/or gibbsite to kaolinite–montmorillonite mixtures to predominantly montmorillonoid clays on fresh rocks. In the soil catena on weathered sediments there is also a progression from salt-free soils with low base status in the upper zones to soils with moderate or high proportions of soluble salts and/or exchangeable sodium and magnesium in the middle and lower zones. Carbonate and gypsum enrichment has also occurred in some basaltic soils which have been influenced by the deep weathering of a mantle that lay above them at one time.

(*f*) *Soils developed on Fresh Rocks*

On erosional landscapes below the Tertiary weathered zone, soil distribution is controlled mainly by the lithology of underlying rocks and slopes. The general pattern is dominance of skeletal soils on steep slopes underlain by quartz sandstones, mixed sediments, metamorphic and acid volcanic rocks; texture-contrast soils on gentle slopes underlain by mixed sediments, granite and old alluvial materials, and cracking clay soils on lithic sandstones, shales, mudstones, basalt and fine-textured alluvium. Soils with varying textural properties and minimal profile development occur in some recent alluvial landscapes.

In general there is a close relationship between the soils and other attributes of the land units described in Part V but in some cases soil boundaries are not clearly defined. This is to be expected as the soil changes which take place down a gradual slope, for example, are caused by the very nature of the slope. Similarly, there is often no clear boundary between deeply weathered, partially weathered and 'fresh' rocks. Soils which characterize one landform element may also occur in other elements. These gradational aspects of slopes and parent materials therefore account at least partly for the occurrence of more than one major group or family of soils in some land units.

VI. Mode of Occurrence of Land Units

The size, shape and distribution of more-or-less homogeneous land units are attributes which, in conjunction with others, affect their identification, classification

and use. These attributes have been used directly in differentiating some land units described in Part V and indirectly in the case of others. In relation to land use, Gibbons and Downes (1964) refer to the lower size limit of their land components as 'the smallest manageable size of the crop or the minimum area to which a farmer can give different treatment'. In practice, most areas of land used for arable agriculture, pasture or forestry consist of more than one landform element, soil or vegetation type where variations in these factors do not cause significant differences in management or productivity.

The degree to which they affect land use depends to a certain extent on the geographic location, the types of crop suited to the environment and the minimum economic size of crop, pasture or plantation. For example, small dispersed awkwardly shaped areas of a particular soil may be well suited to intensive horticultural production close to a market, but may be unsuitable for the production of an annual row crop such as cotton requiring a minimum area to justify the cost of planting and harvesting machinery. Where land suitable for agriculture, in terms of soil and topography, occurs in widely distributed units the costs of administration, transport and other services are increased unless they occur as viable single entities.

Although there are obviously wide variations in the size, shape and distribution of individual occurrences of land units, these parameters may be divided broadly on the basis of different causal factors and processes into two classes:

(*a*) Regular linear or curvilinear belts with sharply defined boundaries and horizontal and/or vertical zonality, the dimensions of which are controlled by the lithology and structure of underlying rocks or materials, and mode of deposition.

(*b*) Irregular belts with diffuse boundaries arranged in predictive and repetitive catenary or topographic sequences which are controlled primarily by variations in topography and/or local climate.

Examples of landscapes in these two classes are shown diagrammatically in Fig. 3. The two classes may occur in close association, for example where colluvial slopes have formed below strike ridges. Class (*a*) includes terrain with linear land units on steeply dipping, horizontal or inclined alternating beds of sedimentary rocks. Dimensions vary according to the thickness and angle of dip of the strata, their relative resistance to erosion and the selective etching which has occurred. Slumping of basalt underlain by shaly rocks on steep slopes also gives rise to linear ridge-and-vale landscapes, and dykes, faults and joints form similar features. Linear land units of varying dimensions parallel to watercourses or shorelines also occur in alluvial landscapes of riverine, lacustrine and marine origin. Similar features are formed in aeolian landscapes where linear dunes and swales are aligned according to the direction of prevailing winds.

The land units in the irregular belts of class (*b*) generally occur on particular landform elements closely associated with specific soils and vegetation. They are the result of variations in hydrologic conditions, differential erosion and deposition, and the spread of weathering and erosion products across slope profiles. Examples of these land units are widespread in landscapes formed on the Tertiary land surface and weathered zone (Fig. 12 in Part V) and in landscapes underlain by 'fresh' rocks of uniform lithology. Included in this class are land units differentiated according to

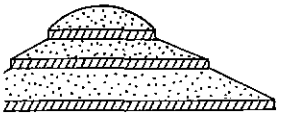
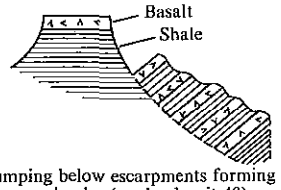
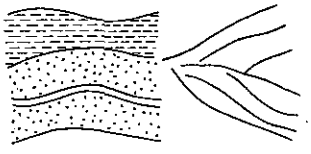
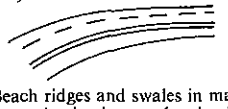
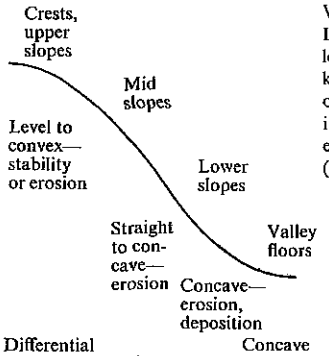
(*a*) Controls and processes (lithology, structure, deposition)	Dimensions
 Planation of folded, steeply dipping beds of varying lithology (see land units 66, 71–5)	Narrow parallel belts 20–750 m wide and 1–5 km long following the strike of underlying folded strata; complex of multilinear land units in areas of a few to several hundred square kilometres depending on exposure of strata
 Selective etching of inclined resistant and weatherable strata forming strike ridges (see land unit 65)	As above; asymmetrical slopes in hilly to mountainous terrain
 Horizontal bedding of alternating strata—benched slopes and escarpments, e.g. Cherwell Range	*Irregular linear, curvilinear or roughly circular land units on benched slopes* up to 750 m wide and several kilometres long separated by scarps or narrow steeply sloping belts up to 90 m wide
 Slumping below escarpments forming ridges and vales (see land unit 48)	Irregular belts of ridges and valleys 180–450 m wide and up to 3 km long, approx. parallel to escarpments and generally dissected by cross drainage
 Joints in various rocks (see land unit 83)	Very narrow lineations up to 45 m wide and 3 km long
 Channels. Levees and back plains on alluvial flats and fans (see land units 117, 133)	Variable, depending on size of stream and hydrologic regime; land units on levees and flood-plains ranging from a few metres to several kilometres in width and up to several hundred kilometres in length; approx. parallel to channels; generally not continuous
 Beach ridges and swales in marine and lacustrine landscapes (see land units 137–9)	Linear ridges up to 900 m wide and 10 km long with intervening swales or series of elongated depressions; parallel to shorelines

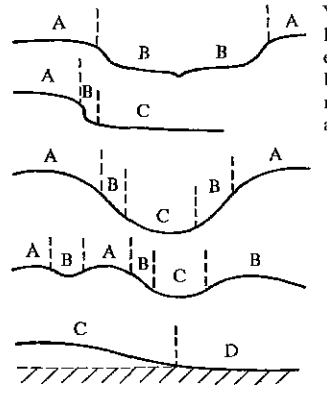
Fig. 3.—Size, shape and distribution of land units. In shape class (*a*), linear or curvilinear (horizontal and/or vertical zonality); in shape class (*b*) (opposite page), irregular belts in catenary or topographic sequence.

(*b*) Controls and processes (topography, climate, erosion, deposition)

Dimensions

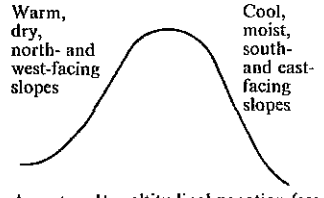


Variable, depending primarily on the gradient, length and shape of slopes. Land units generally in belts of varying width, and length aligned more or less at right angle to the slopes. On gentle slopes the belts may be several kilometres wide and form large uniform areas which are mappable in their own right. On steeper or irregular slopes the belts may be only a few metres in width and of variable length. In this case they form the component elements of patterns which are mappable only as associations or complexes (catenas)



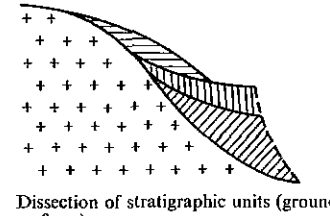
Differential erosion and bevelling of laterite profiles (letters refer to geomorphic category) (see land units 1–53)

Variable, depending on depth of dissection and erosional/depositional history; land units in the three geomorphic categories may occur in extensive areas several hundreds of square kilometres in extent, in narrow belts or in small irregularly shaped areas forming complex patterns or mosaics. Generally in irregular belts of varying width and length aligned approximately between specific contour intervals



Aspect and/or altitudinal zonation (see land units 85, 103)

Variable; depending on aspect and altitude; generally irregular belts up to 1 km wide and several kilometres long



Dissection of stratigraphic units (ground surfaces)

Variable; depending on mode of deposition and degree of dissection; some land units in geomorphic categories B and C on pediments may belong to this type

variations in aspect and/or altitude that give rise to changes in vegetation and, in some cases, soil. In class (*b*) the size, shape and distribution of land units are intimately related to the drainage patterns and degree of dissection and the nature of underlying materials. These factors in turn control the gradient, length and shape of slopes and the erosional and depositional processes that occur on them. Examples of drainage patterns in areas underlain by various rock types are shown in Fig. 13 in Appendix II.

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PART III. LAND CLASSIFICATION CRITERIA: CLIMATE

By H. A. Nix*

I. Introduction

The climatic factor is usually relegated to an *ex post facto* role in land surveys because the absence of comprehensive data (in both space and time) precludes any direct use in land classification. At the same time, the climatic factor is implicitly recognized in the use of vegetation patterns for delineating boundaries of mapped entities. The rationale here is that vegetation provides a useful measure of the total environment in general and of the climate in particular. This basic tenet is not disputed beyond pointing out that the environmental thresholds which differentiate the native vegetation may differ significantly from those for alternative land uses. In addition, closely similar microclimates can be generated through varying combinations of climate, terrain and soil.

II. General Climatic Description

Briefly, the Fitzroy region experiences a tropical to subtropical, subhumid to semi-arid climate with summer rainfall dominance and high rainfall variability. Apart from a relatively sharp disjunction between the more humid narrow coastal strip and areas inland, very broad transitions in climatic elements are the rule.

A detailed description of the climatic characteristics of the region is not warranted here. In addition to the comprehensive chapters on climate in each of the three Fitzroy region survey reports (Fitzpatrick 1967*a*, 1967*b*, 1968) and the Commonwealth Bureau of Meteorology regional climatic surveys (1960, 1961, 1962, 1965), a detailed analysis of the whole region has been published by the Department of National Development, Canberra (1965). However, a brief conspectus of regional climatic controls and the associated spatial and temporal variation in major climatic elements is presented as a frame of reference for the present study.

(*a*) *Regional Climatic Controls*

The Fitzroy region lies wholly within the mid-latitude high-pressure belt. A certain unity of climatic regime owes much to this single dominating influence and its associated trade winds. Seasonal change is due very largely to the sun-controlled shifts in latitudinal position of the high-pressure belt. These anticyclonic cells track between 37 and 38°S. in summer and between 29 and 32°S. in winter (Gentilli 1971). For convenience in presentation, the annual cycle of seasonal change can be divided into three more-or-less distinct periods.

(i) During the period May to August inclusive the high-pressure systems reach their northern limit and stable weather conditions with fine clear days and cold nights prevail. Daily mean temperatures throughout the region range between 20 and 25°C

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maxima and 5 and 10°C minima. Radiation frosts can occur throughout this period, with up to 20 days per year having screen minima below 0°C depending on latitude, elevation, local air drainage and proximity to the sea. Inland, and particularly in the south, winds have strong southerly and westerly components.

Normally, the few useful falls of rain during this period owe their origin to inflow of moist maritime air masses associated with troughs between successive highs. Throughout the region, the probability of rain reaches a maximum two to three weeks before and after the winter solstice (June 21). The proportion of mean annual rainfall received during this season varies from 14 to 20% from north to south, with mean seasonal totals ranging from 75 to 150 mm. Occasional cyclonic disturbances bring heavy falls of rain, but the probability of even low-level flooding is very low.

(ii) During the period September to December inclusive the high-pressure systems move to the south and dominant winds are north to north-easterly. Inland, temperatures increase rapidly with increased radiation, clear skies and longer days. Typically there is an alternation between spells of hot dry weather with inflow of continental air from northern inland Australia and humid stormy weather associated with active localized convection and inflow of moister maritime masses from the north-east. Weekly mean temperatures rise rapidly through a range of about 27 to 35°C maxima and 8 to 20°C minima. During this season the number of days with screen maximum temperature exceeding 38°C (100°F) ranges from zero at the coast to more than 15 in the north-west.

Localized convection mechanisms account for 70–80% of the total rainfall during this period. Accordingly, both spatial and temporal variations in rainfall are very high. The range in mean seasonal rainfall throughout the entire region during this season is not large (175–200 mm), but the proportion of mean annual rainfall received ranges from about 25% in the north to about 38% in the south.

(iii) Between January and April the high-pressure systems reach their southern limit and the associated trade winds have a long trajectory over warm seas. The prevailing winds are dominantly south-easterly to north-easterly. The inflow of moist maritime air masses increases both the frequency and duration of wet spells by comparison with the preceding season. Tropical cyclones exert a major influence on weather on average one year in two. Destructive winds and torrential rain mark their passage across the coastline, but on moving inland they tend to degenerate into rain depressions which bring days of high rainfall and consequent flooding. These cyclonic sources of rainfall, though erratic, play an extremely important role in the periodic recharge of soil profiles, aquifers and base stream flow.

The greater influence of cyclonic disturbances along the narrow coastal strip is reflected in mean seasonal rainfall totals ranging from 800 to 2000 mm. Inland, seasonal rainfall totals lie between 450 and 600 mm. This differential between near coastal and inland areas is also apparent in the proportion of total annual rainfall received during this season. In coastal areas this is 60–70% but inland it is 44–50%.

Weekly mean temperatures decline throughout this period from around 35 to 28°C maxima and from around 22 to 12°C minima. On average, January and December (of the previous period) are the hottest months. In years when the onset of the wet season is delayed, very high temperatures and heat-waves (successive days with maxima

exceeding 38°C (100°F)) are experienced inland from the coastal zone. During this season the average number of days with screen maximum temperature exceeding 38°C ranges from zero at the coast to about 15 days in the north-west.

(*b*) *Major Climatic Elements*

(i) *Solar Radiation.*—Temporal and spatial variations in this climatic element have been inferred from the maps published by the Bureau of Meteorology (1964). Direct measurements are restricted to a few short-term records at a few locations.

During the winter season (May–August) with its clear skies, incoming radiation is aligned along longitudinal gradients with only minor differences between coastal and inland areas. Mid-winter values of total daily solar radiation range from 300 cal cm^{-2} day^{-1} in the south of the region to 350 cal cm^{-2} day^{-1} in the north.

Increasing cloudiness coastwards during the two hotter seasons (September–December, January–April) induces gradients roughly parallel to the coastline. By September this change in orientation of the isorads is apparent. During the hot stormy season (September–December) total solar radiation receipts increase from 450–600 cal cm^{-2} day^{-1} along the coastal strip to 500–650 cal cm^{-2} day^{-1} inland. Increasing cloudiness during the hot wet season (January–April) together with the northward progression of the sun leads to a decline in radiation receipts, but the isorads still parallel the coastline. Along the coastal strip receipts decline from about 500 to 425 cal cm^{-2} day^{-1} and inland from 600 to 475 cal cm^{-2} day^{-1}. By April the return towards a latitudinal alignment of the isorads becomes apparent. From this brief description, it is clear that average daily solar radiation receipts are relatively high throughout the year. Thus, for more than nine months in the year average daily values exceed 400 cal cm^{-2} day^{-1} along the coast and 500 cal cm^{-2} day^{-1} inland. Clearly, light energy is not a major factor limiting biological productivity in the region.

(ii) *Temperature.*—The available station network is too restricted to allow much more than broad generalizations about temperature variations. The influence of latitude (the Fitzroy region extends over 5°) is modified to some extent by altitude, and to a much greater extent by proximity to the sea. Along the narrow coastal strip both diurnal and seasonal amplitudes in temperature variation are greatly dampened. Heat-wave conditions and freezing temperatures are rare, although both are experienced regularly inland from the coastal ranges.

Annual mean temperatures throughout the region fall within the narrow range of 20 to 23°C, but with seasonal means ranging from 23 to 24°C during the hot dry season (September–December), 24 to 26°C during the hot wet season (January–April) and 14 to 19°C during the winter (May–August). Although mean temperatures suggest favourable temperatures for plant growth throughout the year, low night temperatures and frost restrict the growth period of tropical-adapted species during the colder months (May–August) and very high day temperatures and heat-waves affect the performance of temperate-adapted species during the hotter months (November–March).

A measure of spatial variation in the values of extreme temperatures is provided by showing the isotherms for the highest weekly mean maximum temperature (Fig. 4) and the lowest weekly mean minimum temperature (Fig. 5) irrespective of the time

occurrence. These were derived from long-term monthly mean values using harmonic analysis (Fitzpatrick and Nix 1970). Highest daily maximum temperatures are reached in late December inland and in early January along the coast. The coastal plain

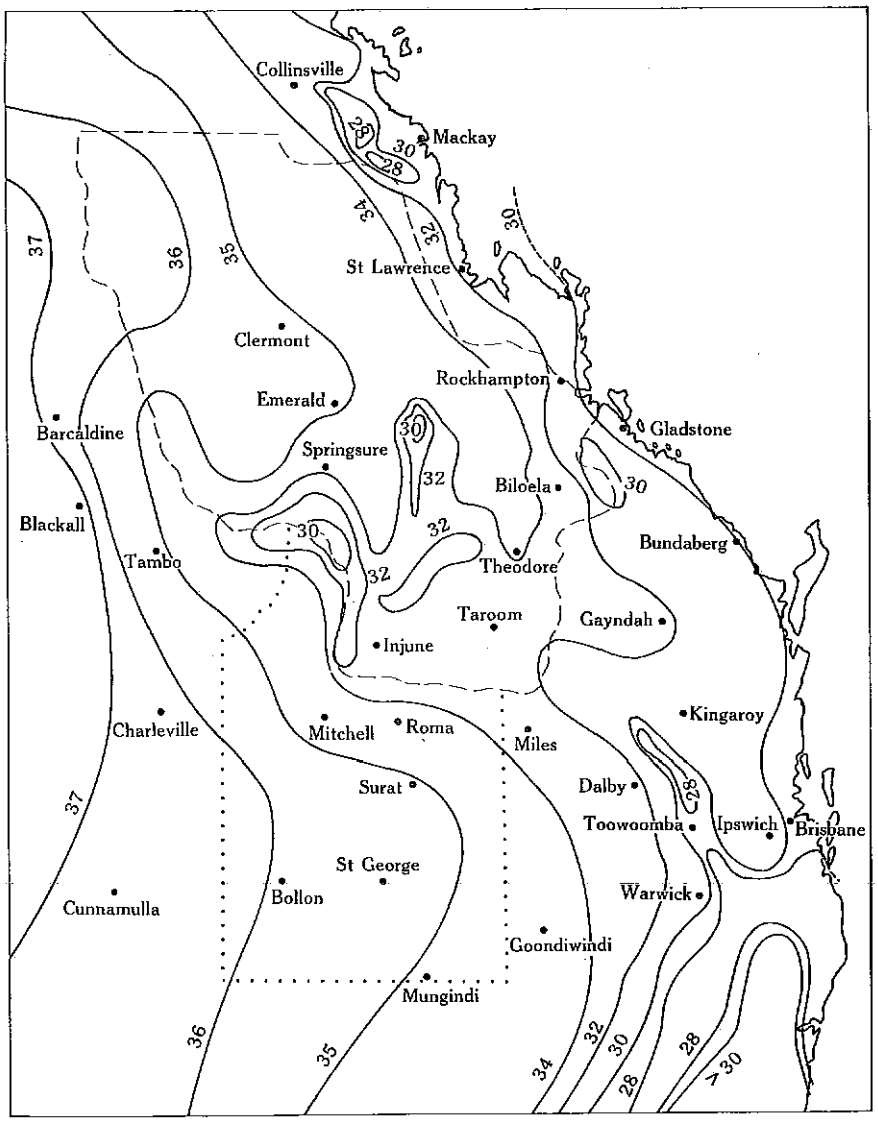

Fig. 4.—Mean daily maximum temperature (°C) of hottest week.

generally has values less than 32°C, but the coastal fringe and offshore islands have values less than 30°C. Inland, weekly maximum temperatures reach 38°C in the extreme north-west but otherwise fall below 36°C and even 34°C for areas south of the Tropic.

Lowest daily minimum temperatures occur in late July at all points in the region. As most of the stations recording temperature are located in broad valleys or basins, cold air drainage must play a significant role in the relatively low temperatures recorded. Thus, weekly mean minimum values of 4°C or less can be expected in subcoastal valleys and basins south of the Tropic of Capricorn, and 6–7°C or less in the north and north-west. The duration and severity of frost conditions bear a close relationship to the spatial pattern of lowest weekly minimum temperature. The possible significance of low-temperature conditions for distribution of important floristic elements of the natural vegetation is discussed in Part IV.

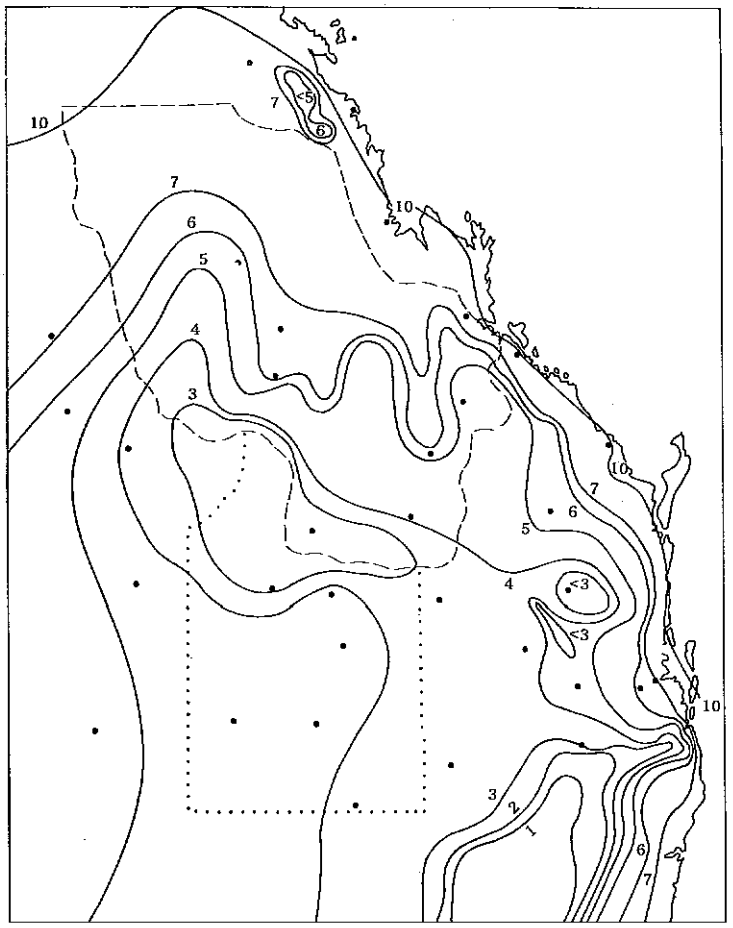

Fig. 5.—Mean daily minimum temperature (°C) of coldest week.

(iii) *Precipitation.*—Rainfall is by far the dominant mode of precipitation. Damaging hail storms occur sporadically, mainly in the south and east. Extensive snowfalls have been recorded only once since European settlement (1965). Apart from the marked disjunction between the coastal strip and inland areas there is a gradual decline in mean annual rainfall westward. Along the coast, annual rainfall everywhere

exceeds 800 mm and can reach 1800 mm in a few favoured locations on the windward side of near-coastal ranges. Inland from these coastal ranges, mean annual rainfall declines from about 800 to 500 mm on the extreme western edge of the region. Higher ranges inland, exceeding 500 m, do, however, modify the inflow of moist air masses and so distort the idealized pattern of east–west decline.

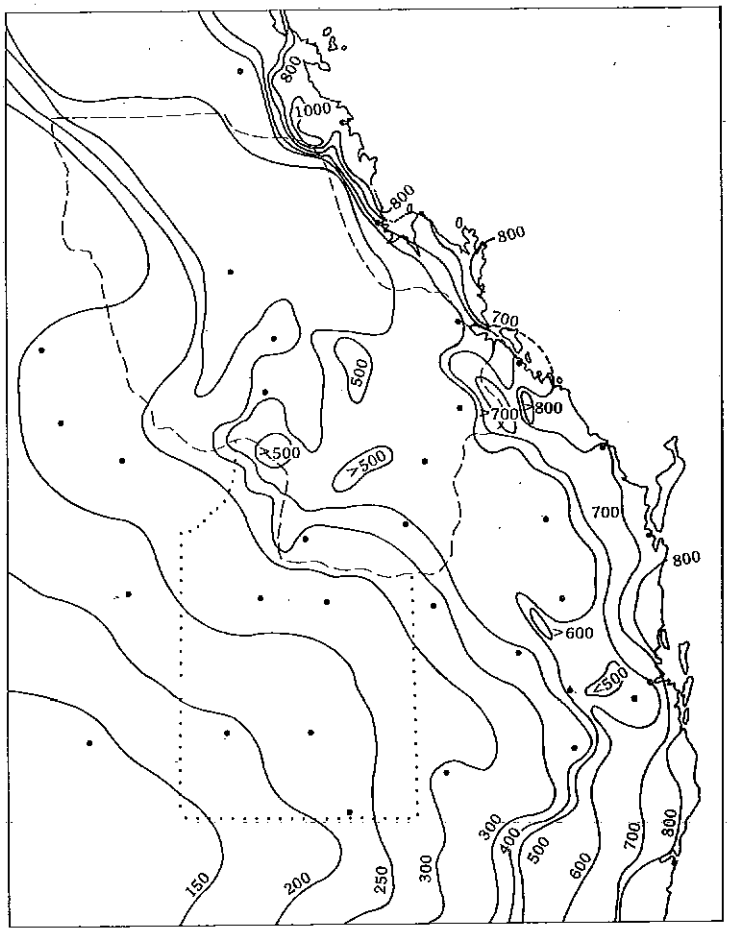

Fig. 6.—Summer (Nov.–Apr.) rainfall (mm) equalled or exceeded in 8 out of 10 years.

The net effect of these differences is to produce distinct seasonal modes of rainfall distribution at any given point within the region. Viewed more simply, the annual cycle can be divided into two equal segments. (*a*) A hot 'summer' period during which the major part of the annual rainfall occurs; the period taken is from November to April inclusive, which coincides with the crop cycle for warm-season crops such as grain sorghum, maize, cotton and peanuts and also roughly with the normal period of bare fallow between successive winter crops. (*b*) A cool, marginally wet to dry 'winter'

period, from May to October inclusive, which coincides with the crop cycle for cool-season crops such as wheat, barley, oats and safflower and also roughly with the normal period of bare fallow between successive summer crops.

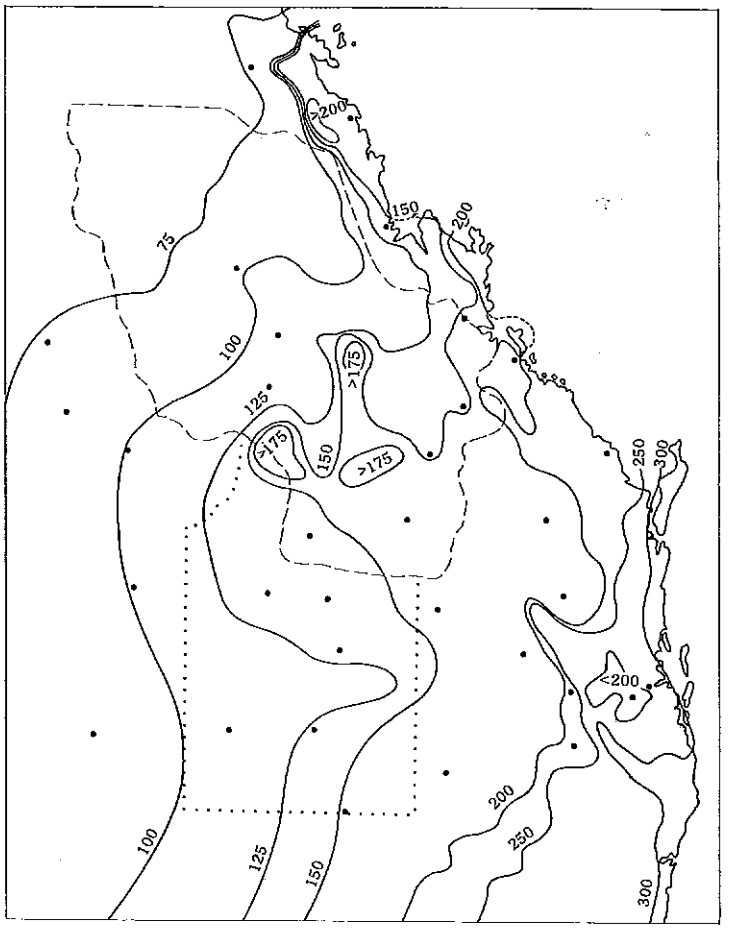

Fig. 7.—Winter (May–Oct.) rainfall (mm) equalled or exceeded in 8 out of 10 years.

Summer-season rainfall (November–April) equalled or exceeded in 8 years in 10 is shown in Fig. 6. Isohyets have a NW.–SE. orientation roughly parallel to the coastline, but with some perturbation caused by inland ranges. Winter-season rainfall (May–October) equalled or exceeded in 8 years in 10 is shown in Fig. 7. Here the isohyets show a characteristic NE.–SW. trend, cutting across the summer seasonal isohyets at a broad angle and thereby forming a series of discrete zones with differing summer/winter rainfall incidence. Probabilistic data for the summer and winter rainfall seasons have been used in a numerical taxonomic classification of rainfall regimes in a following section.

Rainfall intensity is a parameter of major significance for land planning and construction activity. The Fitzroy region has experienced extremely high rainfall intensities; totals exceeding 500 mm in 24 hours have been recorded at coastal locations. Such prolonged heavy rainfall is invariably associated with summer cyclonic activity.

Estimates of expected rainfall intensities within defined durations and recurrence intervals have been calculated using the Stormwater Standards frequency equations (Institution of Engineers, Australia 1958). Experience within the region suggests that these values are slight overestimates, but the error does not detract from their utility in planning engineering structures. Because high-intensity rainfall is associated with summer-season convectional storms and intense depressions, the isopleths have a

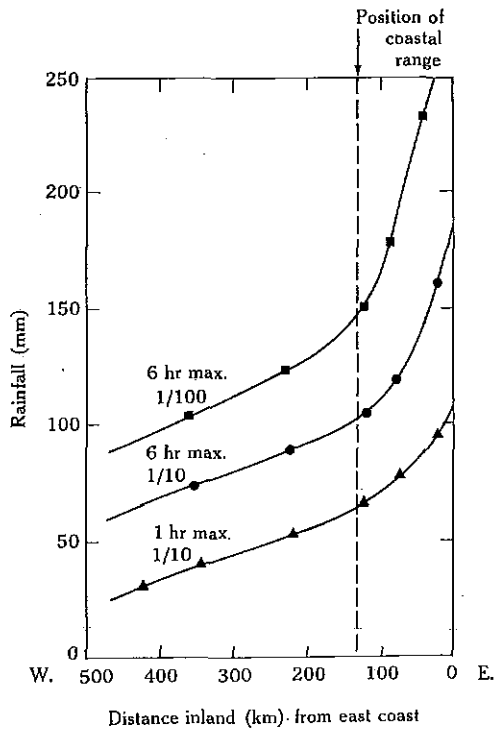

Fig. 8.—Probable maximum rainfall as a function of distance from coast along a NE.–SW. transect from Byfield to Augathella.

characteristic orientation, roughly parallel to the coast. A transect at right angles to these isopleths is shown in Fig. 8 which again illustrates the contrast between coastal and inland locations. Although there is an overall decrease in expected rainfall intensity inland from the coast, there is a sharp discontinuity in the rate of decline at the coastal ranges.

A crude measure of average rainfall intensity is provided by calculating mean rainfall per wet day (rainfall in excess of 0·01 in. or 0·25 mm). Using this measure for seasonal comparisons, maximum rates occur during the hotter summer months, with values commonly between 20 and 25 mm per day along the coastal strip, but declining sharply to 12–15 mm per day inland. This differential between coastal and inland

locations is much less pronounced during the cooler winter season when values fall mainly within the range 8–12 mm per day throughout the region.

These average values for rainfall intensity tend to mask the realities of the situation because the major part of the annual rainfall tends to fall on less than half of the statistical wet days. However, the wet days do provide a crude measure of cloudiness and relative durations of periods of high humidity. Along the coastal zone there are 70–100 or more wet days per year, declining to 50–60 wet days per year inland. Inland locations in broad valleys such as the Nogoa or Belyando at some distance from elevated land may have less than 40 wet days on average. Upland sites or those close to mountains or ranges may have up to 10 wet days per year more than adjacent lowland or broad valley sites.

(iv) *Evaporation.*—Evaporation from the Australian sunken tank closely mirrors spatial and temporal trends in solar radiation receipts. The sparse network of instruments does not allow any detailed regional analysis, but the major trends are clear. Annual totals along the coastal zone are 1500–1600 mm, increasing inland to between 1600 and 1900 mm, and exceeding 2000 mm in the far west and north-west.

Maximum daily values in summer range between 7 and 10 mm and minimum daily values in the cool winter season between 2 and 3 mm. Preliminary data from the new network of Class A pan instruments indicate that summer values may be more than 20% higher and winter values slightly lower than the Australian sunken tank.

(v) *Relative Humidity.*—The mean index of relative humidity again illustrates the relatively sharp discontinuity between near-coastal and inland locations, with a much more gradual decline inland from the coastal ranges. Annual average values exceed 70% along the coastal zone and 60% throughout the major part of the region, but drop to about 50% in the west and north-west.

Seasonal and diurnal variations in relative humidity are greatly dampened in the coastal zone, but show some contrast inland. Lowest average values everywhere are attained during the hot stormy season (September–December). On the coast, 9 a.m. values generally exceed 60% and 3 a.m. values 55%. Inland, 9 a.m. values generally exceed 50% but 3 a.m. values may drop as low as 30% during this period.

(vi) *Winds.*—The prevailing winds are dominantly easterly (SE.–NE.), but with a stronger southerly component (SW.–SE.) during the winter months. Low mean wind speeds are the rule, but severe thunderstorms and occasional cyclones can wreak havoc.

III. Climatic Classification

The utility of general-purpose classifications is limited to very broad comparisons between large regions. Thus, the classifications of Köppen (1931) and Thornthwaite (1948) place the major part of the region in a mesothermal subhumid to semi-arid category. The agriculturally oriented classification of Papadakis (1966) is more relevant, but the lack of climatic input data limits its use in this study. Each of these three systems indicates that broad homoclimes of the Fitzroy region are extensive only in the Gran Chaco of Argentina, and that more restricted areas occur in East Africa, Madagascar, Mexico, the upper Ganges plain in India and southern China.

A more recent numerical taxonomic study of homoclimes of the entire brigalow region (Russell and Moore 1970), while much more rigorous in terms of basic data analysis, confirms these earlier results.

Although subject to criticism, the recent classification of Oliver (1970) represents an interesting and commendable attempt to use air mass frequency as a major descriptive parameter. This study confirms the dominating influence of the trade winds on the climatic pattern of the Fitzroy region. Thus, coastal zones on the windward side of coastal ranges with a north–south orientation have maritime Tropical (*mT*) air masses dominant throughout the year. Inland, most of the region falls within a compound category in which defined air masses are not dominant for more than six months of the year. The strongly seasonal environment so typical of northern Australia, with seasonal alternation of moist air masses in summer (*mT*) and dry air masses in winter (*cT*) (continental Tropical) is clearly defined only in the extreme north-western section of the region.

The classification of climate at the scale required for this study presents many problems, not the least of which are scale and availability of data. The only meteorological element which provides an adequate cover of spatial and temporal variation is rainfall. However, since the variation in other meteorological elements tends to parallel that of rainfall and since the water regime is by far the most important factor limiting plant growth, this data limitation may not be too restrictive.

Numerical taxonomic techniques were used to order various sets of rainfall data. The classificatory technique adopted was that of Lance and Williams (1967*a*, 1967*b*) using the computer program CLASS. Of the alternative strategies available, the final classification adopted uses the Gower coefficient and the flexible sorting procedure. The basic parameters used were derived from a set of seasonal rainfall probabilities calculated for a standard 50-year period (1916–65) at 130 locations in and adjacent to the region. Median, upper and lower quartile values for summer (November–April) and winter (May–October) seasonal rainfall were the attributes chosen to characterize rainfall distribution. The resultant classification and zonation are shown in Fig. 9. A large section of north-eastern Australia was included in the analysis in order to place the Fitzroy region in a broader perspective and also to allow freer expression of climatic boundaries.

A first-order boundary separates the humid coastal strip from all inland stations. In places where high ranges occur close to the coast this strip is no more than 15–20 km wide. A second-order boundary roughly parallels the first-order boundary at 150–200 km from the coast, but is influenced to some degree by the alignment of inland ranges. This second boundary may be taken to separate subhumid from semi-arid environments. A third-order boundary is placed far to the south of the Fitzroy region, in the vicinity of the Queensland–New South Wales border. These first three boundaries coincide reasonably well with the eastern, western and southern limits of the major occurrences of brigalow (*A. harpophylla*) open-forests.

A fourth-order boundary cuts across the lower third of the Fitzroy region, roughly east–west, but influenced by the Expedition and Carnarvon Ranges. Lower-order boundaries subdivide the larger segments created by the first four boundaries and follow logical patterns with north–south-trending isolines separating wetter and drier

sections and east–west-trending lines differentiating sections on relative summer–winter seasonal rainfall dominance.

From this climatic zonation it is clear that most of the surveyed area falls within the intermediate subhumid zone. However, four major subdivisions are represented:

(1) A relatively small eastern segment of the surveyed area which falls within the humid coastal zone of the classification. It occupies the central part of the Gladstone–St Lawrence coastal corridor which has a marginally humid climate. Annual rainfall totals average 900–1000 mm, but the coastal zones to the north and to the south have annual totals exceeding 1200 mm and even 1500 mm in places.

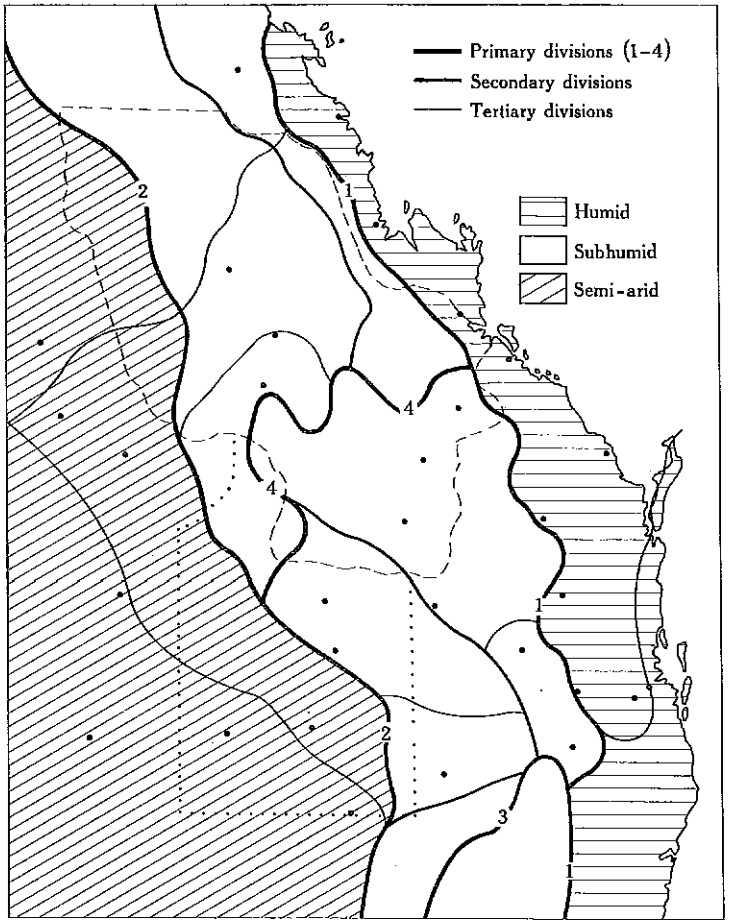

Fig. 9.—Climatic divisions in the Fitzroy region and adjacent areas.

(2) A sizable southern segment which has close affinities with the Upper and South Burnett and Darling Downs and, to a slightly lesser degree, with the Western Downs and Eastern Maranoa. Annual rainfall totals within the larger region average between 650 and 750 mm with between 60 and 70% falling in the summer season

(November–April). The larger climatic region, of which the Fitzroy segment forms part, exhibits a certain phytogeographic unity, with *Acacia*, *Eucalyptus* and *Callitris* open-forests and *Eucalyptus* woodlands exhibiting a high degree of structural and floristic similarity.

(3) A large northern segment occupying a major part of a climatic region which extends northwards into the Bowen and lower Burdekin basins. Here again annual rainfall totals fall within the range 650 to 750 mm, but 70–80% falls in the summer season. Winter-season rainfall is still significant, but erratic. The fourth-order boundary which separates this segment from the previous one also closely parallels the 4°C isotherm for lowest weekly minimum temperature. This isotherm provides a measure of frost incidence and severity which appears to have some significance for plant distribution. The declining incidence and erratic occurrence of winter rainfall mean that the duration of dry spells increases markedly from SE. to NW. within this segment, and the four subdivisions within it reflect such trends. Again there is a certain phytogeographic unity with elements such as yellowwood (*Terminalia oblongata*) and cabbage-gum (*Eucalyptus papuana*) assuming prominence. Towards the north-western parts of this segment, gidgee (*A. cambagei*) and blackwood (*A. argyrodendron*) tend to replace brigalow (*A. harpophylla*) in *Acacia* open-forests, and *E. brownii* replaces *E. populnea* in eucalypt woodlands.

(4) A sizable north-western segment which falls outside the subhumid zone and forms the northern portion of a broad arc of semi-arid zones. Annual rainfall is in the range 500–650 mm with 70–80% in the summer season. Rainfall in all seasons is erratic and highly variable. The distinctive phytogeographic character of this segment owes as much to the presence of large areas of relatively intact Tertiary weathered surface as it does to climate. Groved yellowjack woodlands (*E. similis*) and silver-leaved ironbark (*E. melanophloia*) woodlands with xeric mid-height grass and spinifex are prominent. A subdivision within this segment separates out a smaller southern section that has close affinities with the Blackall–Tambo–Augathella area. Although many land units and vegetation communities fall neatly within the areal subdivisions of this climatic classification, a great many do not. This is to be expected. A general-purpose classification based on raw climatic data cannot take account of the specific requirements of individual species. Nevertheless the climatic boundaries erected do represent important changes in a dominant climatic control, namely rainfall.

In another study (Gunn and Nix 1970) this numerical taxonomic classification was used to assign catchments to 12 broad agroclimatic divisions within the Fitzroy region (Fig. 10). Allocation of catchments to these agroclimatic divisions was based on the location of better-quality agricultural and pastoral land within the catchment. This procedure allowed comparisons to be made between assessed land and water resources and emphasized the significance of catchments in developing planning and conservation.

The occurrence of each land unit in relation to these agroclimatic divisions is noted in the land unit descriptions in Part V. In addition, estimates of the mean values and range of summer and winter seasonal rainfall equalled or exceeded in 8 years in 10 for each unit are provided. These values give a useful indication of the amount and reliability of rainfall during crop and antecedent fallow periods. A further index of

climatic conditions is provided in the land capability assessment. Where a land unit has been downgraded in land capability because of climatic limitations this has been indicated.

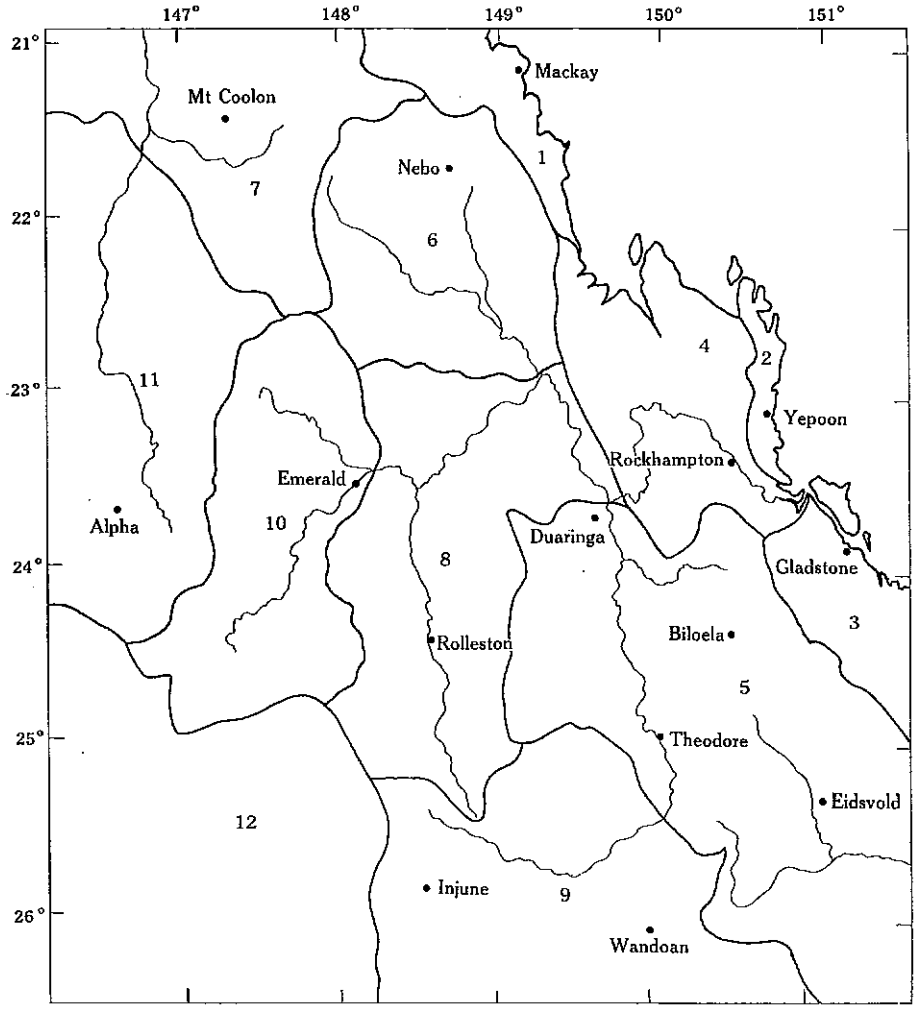

Fig. 10.—Climatic zones.

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PART IV. LAND CLASSIFICATION CRITERIA: VEGETATION

By H. A. NIX*

I. INTRODUCTION

The use of vegetation as an index of site quality has its roots in antiquity. Primitive man clearly recognized that the natural vegetation reflected environmental conditions and that it could be used to predict site quality for various purposes. Modern man has added very little to this basic concept, which is one of transfer of information by analogy, rather than any deep understanding of the biophysical processes involved.

The whole history of land development in Australia bears witness to the widespread adoption and continued use of native vegetation as an indicator of land quality for agricultural and pastoral purposes. The more recent development of land survey techniques based upon air-photo interpretation places no less reliance on vegetation patterns. In general, these techniques rely more on structural than on floristic differences. However, recent remote-sensing developments may permit more accurate floristic differentiation in future.

Common usage has established the role of vegetation as a descriptor or label for types of land. In the Fitzroy region the natural vegetation plays a very important role in communicating land data, as most of the area is dominated by relatively few tree species which are known to most potential users. Thus, the land unit classification devised in this study places as much emphasis on this key role of communicating land data to land users as it does on the role of vegetation as an indicator of environmental conditions.

Certainly, vegetation results from the integration of habitat conditions, but various combinations of terrain, soil and climate can generate similar environments. Such interactions and substitutions heighten the difficulty of specifying the environmental requirements of any given species or community. Vegetation alone is not an adequate descriptor of land type and can be misleading unless considered in relation to other parameters such as terrain and soil. The fallacies attendant on the use of such broad terms as 'brigalow' lands or 'brigalow' soils have been amplified in the original survey reports.

II. CLASSIFICATION

The need for a unified classification of the vegetation in the Fitzroy region became evident at the very outset of this study. Three different classification schemes had been used in the three adjoining CSIRO survey areas. Thus, Pedley (1967) followed the synusial treatment of Perry and Lazarides (1964); Story (1967) used a somewhat modified Beadle and Costin (1952) system; Speck (1968) described the 74 floristic communities within four major structural formations (which followed Webb (1959) for closed formations and Beadle and Costin (1952) for other structural forms).

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These differences in the form and content of the original site data from each of the three surveys precluded the use of numerical taxonomic techniques in devising a unified classification.

The classification adopted here follows that of a working document prepared by Professor R. L. Specht in collaboration with a number of Australian botanists and since published (Specht 1970). Although the origins of this classification are evident in the earlier works of Beadle and Costin (1952) and Wood and Williams (1949), significant improvements have been made. The key role of the upper stratum in regulating the energy and water balance of the whole community is recognized in the choice of two primary parameters—(1) projective foliage cover, (2) height of life form of the tallest stratum. Further subdivision of these two primary parameters is admittedly somewhat subjective, but is explicit. Most importantly, confusing and conflicting nomenclature has been eliminated wherever possible. The deciding factor in the choice of this classification was its excellent prospect of becoming a widely used system within Australia. Indeed, a new vegetation map, forming part of the Atlas of Australian Resources and based essentially on the Specht system, is in preparation by Dr J. Carnahan of the Australian National University.

The classification is set out in the form of a two-way table (Table 5) which is unmodified from that proposed by Specht (1970). The structural formations which occur in the surveyed area are shown in italics and the estimated areas occupied by them are shown as a percentage of the total area. Clearly, woodland and open-forest formations dominate the region. An analysis of vegetation structure and floristics in relation to environment is given in Section V.

The basic categories proposed by Specht can be subdivided further on the basis of lower canopy layers, using qualifying adjectives such as grassy, shrubby or layered. Of course floristic differences can be used to subdivide further any structural formation. Although the basic structural classification is considered to be satisfactory in its present form, it is clearly capable of further refinement and development.

Objective allocation of vegetation units to structural categories hinges on the development of quantitative sampling and enumeration techniques. As one instance, rapid and accurate measurement of projective foliage cover is essential. Standardized sampling and enumeration techniques would allow comparative analysis of data from vegetation formations throughout the continent and permit a more objective definition of class intervals in the primary parameters. For example, analysis of all available site data suggests that for the Fitzroy region 12 m and 22 m are more meaningful height class intervals than Specht's 10 m and 30 m. Many vegetation units in the surveyed areas had a modal height of 10 m which made allocation to a height class somewhat problematical.

In this study, each land unit is described in terms of a distinct assemblage of terrain, landform, soil and vegetation elements. The vegetation is described in terms of its structural form and, where relevant, the characteristic dominant woody species. Because the environmental limits for individual species rarely coincide, two or more associated tree species are normally involved. In all cases, codominant species are bracketed. Estimated height of the canopy is expressed in terms of mean and standard deviation values. These procedures are followed for all canopy layers. Herbaceous elements are described in terms of very broad associations as a more detailed classi-

TABLE 5

STRUCTURAL FORMS OF VEGETATION IN AUSTRALIA (AFTER SPECHT 1970)

Formations in the Fitzroy region in italics and the proportion of the area they occupy in parenthesis

Life form and height of tallest stratum	Projective foliage cover of tallest stratum: Dense 70–100%	Mid-dense 30–70%	Sparse 10–30%	Very sparse <10%
Trees* >30 m	Tall closed-forest	*Tall open-forest* (<1·0)	Tall woodland	Tall open-woodland
Trees 10–30 m	*Closed-forest*‡ (<0·1)	*Open-forest* (36·9)	Woodland (47·9)	*Open-woodland* (<1·0)
Trees 6–10 m	*Low closed-forest* (3·2)	*Low open-forest* (4·3)	*Low woodland* (<1·0)	Low open-woodland
Shrubs† 2–8 m	Closed-scrub	*Open-scrub* (<1·0)	Tall shrubland	Tall open-shrubland
Shrubs 0–2 m	Closed-heath	*Open-heath* (<1·0)	Low shrubland	*Low open-shrubland* (<1·0)
Hummock grasses 0–2 m			Hummock grassland	Open-hummock grassland
Herbs (appropriate name for community will depend on the dominant herb, e.g. grass, sedge, fern, moss)	Closed-herbland	Herbland	Open-herbland	
	(1) Closed-tussock grassland	(1) *Tussock grassland* (4·9)	(1) Open-tussock grassland	
	(2) *Closed-grassland* (<1·0)	(2) Grassland	(2) Open-grassland	
	(3) Closed-herbfield	(3) Herbfield	(3) Open-herbfield	
	(4) Closed-sedgeland	(4) Sedgeland	(4) Open-sedgeland	
	(5) Closed-fernland	(5) Fernland	(5) Open-fernland	
	(6) Closed-mossland	(6) Mossland	(6) Open-mossland	

* A tree is defined as a woody plant >6–8 m tall, usually with a single stem.

† A shrub is a woody plant <6–8 m tall, frequently with many stems arising at or near the base (slightly modified from Beadle and Costin 1952).

‡ Emergent trees in a predominantly low closed-forest or closed-forest and scattered emergent trees or shrubs in tussock grassland are ignored in terms of structural definition, but are named as emergents.

fication would imply a degree of precision that was not attained. The grass communities of the region are always in a state of dynamic flux through the exigencies of grazing, burning and weather sequences.

III. Plant–Environment Interactions

The structural development of vegetation in the region is dominated by water and to a lesser extent by nutrient regimes. Thermal regimes appear to have little influence on structural expression, but have an important influence on floristic composition. Thus, open-forest and woodland communities occurring on upland (> 300 m) sites are dominated by warm-temperate taxa, while similar lowland formations have taxa with subtropical or tropical affinities.

The projective foliage cover and height of the tallest stratum provide a crude index of standing biomass. Maintenance of a high biomass and canopy cover demands an essentially continuous supply of water and nutrients. Given an adequate nutrient supply, the maximum development of biomass and structural expression bears a close relationship to the duration and severity of the driest period in the year. To some extent there is a degree of substitution between water and nutrient regimes. Thus, a given structural formation may develop on infertile soils in areas wetter than the norm and on highly fertile soils in areas drier than the norm.

The water regime of a plant community is a complex function of climate, terrain, soil and plant parameters. However, climate exerts an overriding influence within which other factors must operate. The complex patterning of seasonal rainfall regimes described in Part III can be resolved using simple parameters derived from a water-balance analysis. Using long-term weekly mean data, Fitzpatrick and Nix (1970) derived weekly water balance estimates for almost 300 locations on the Australian continent. The ratio E_a/E_t (*actual evapotranspiration/potential evapotranspiration*) was used as a measure of stress and was termed the moisture index. Calculation of running weekly mean moisture indices for consecutive 13-week periods allowed comparison of wettest and driest quarters regardless of time of occurrence.

Structural development of vegetation is closely related to the moisture index value for the driest quarter. Thus, closed-forest communities do not occur where this value falls below 0·4 and are best developed where this value exceeds 0·5. Open-forest communities are restricted to areas with values exceeding 0·2 and tall open-forest where these exceed 0·4. Woodlands are exposed to greater seasonal stresses, and occur in areas where the moisture index for the driest quarter exceeds 0·1. Where values for the wettest quarter exceed 0·8 then woodlands occur in areas where the driest quarter moisture index falls below 0·1 (monsoonal northern Australia). The distribution of the mean moisture index values of the driest quarter in the Fitzroy region is shown in Fig. 11. The real significance of the winter-rainfall component is its role in diminishing both the duration and severity of water stress in the dry spring–early summer period. Thus, the alignment of driest seasonal moisture index values tends to parallel winter seasonal rainfall isohyets (see Fig. 7 in Part III). The gradient in driest seasonal moisture index values from SE. to NW. is closely followed by changes in proportion of mesic- and xeric-adapted species and in the diversity and biomass of shallower-rooted shrub species.

Replacement of one species by another in structurally similar formations is another phenomenon characteristic of this gradient. Thus, in the driest parts of the region gidgee (*Acacia cambagei*) replaces brigalow (*A. harpophylla*) in open-forest

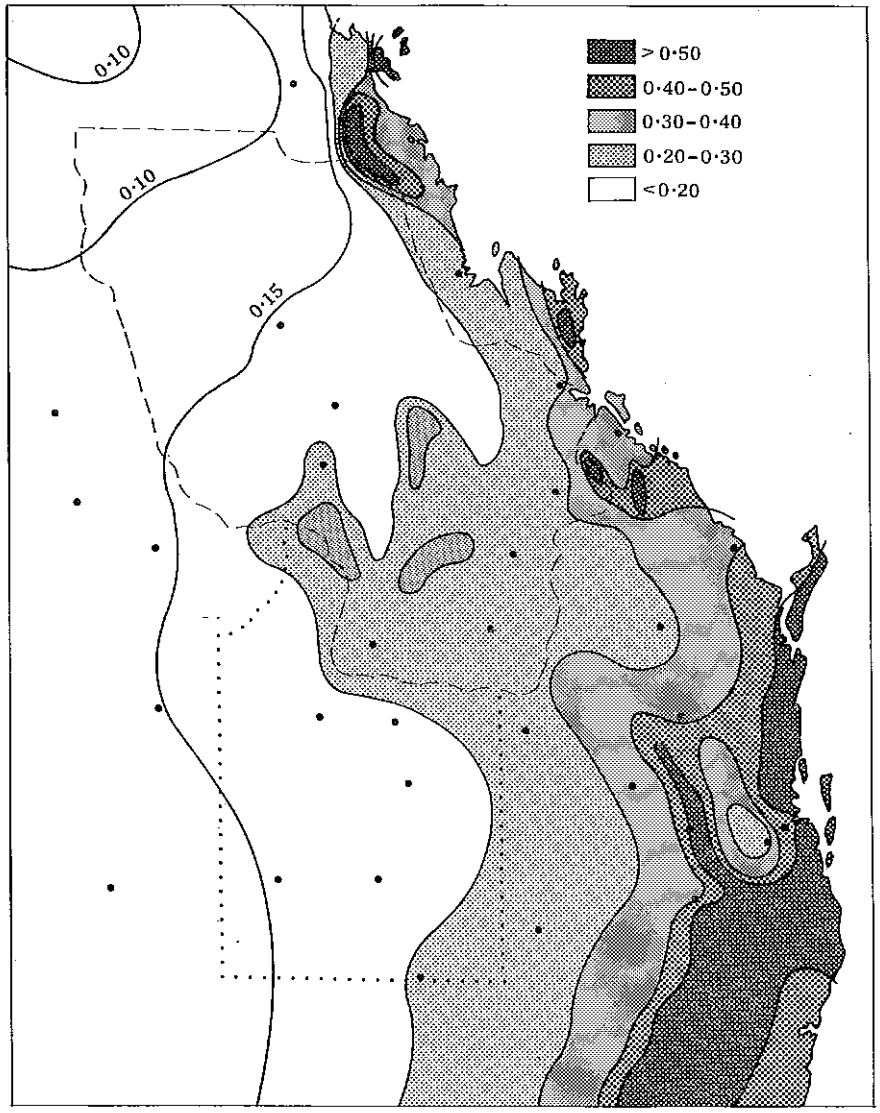

Fig. 11.—Mean moisture index values (E_a/E_t) of driest quarter.

formations. Blackwood (*A. argyrodendron*) is another species which occupies an intermediate dry-season stress environment between *A. harpophylla* and *A. cambagei.*

TABLE 6

AREA OF MAJOR VEGETATION FORMATIONS AND THEIR DISTRIBUTION IN MAJOR GEOMORPHIC CATEGORIES

Major vegetation formations	Total area (km²)	Area within geomorphic categories (km²) A	B	C	D	E
Closed-forest						
Closed-forest (vine forest)	90	—	—	—	90	—
Low closed-forest (vine thicket)	6280	165	200	1225	4690	—
(mangrove)	55	—	—	—	—	55
Total	6425	165	200	1225	4780	55
Open-forest						
Tall open-forest (eucalypt)	550	—	—	—	340	—
Open-forest (eucalypt)	17320	455	1340	—	13810	1925
(*Acacia*)	53865	155	14020	22150	11720	5820
(*Callitris*)	1265	—	390	—	875	—
(*Casuarina*)	260	—	260	—	—	—
Low open-forest (*Acacia*)	8480	—	8480	—	—	—
Total	81740	610	24490	22150	26745	7745
Woodland						
Woodland (eucalypt)						
(mixed grass/shrub)	51780	15240	3830	—	20215	12495
(grassy)	27625	—	2210	—	15980	9435
(shrubby)	15180	4070	11110	—	—	—
(*Grevillea*)	95	—	—	—	—	95
Low woodland (eucalypt)	1100	—	1100	—	—	—
Total	95780	19310	18250	—	36195	22025
Open-woodland						
Open-woodland (eucalypt)	1710	—	—	1405	305	—
Total	1710	—	—	1405	305	—
Open-scrub						
Open-scrub	555	555	—	—	—	—
Total	555	555	—	—	—	—
Open-heath						
Open-heath	1000	1000	—	—	—	—
Total	1000	1000	—	—	—	—
Low open-shrubland						
Low open-shrubland (samphire)	70	—	—	—	—	70
Total	70	—	—	—	—	70
Grassland						
Closed (saltwater couch)	150	—	—	—	—	550
Tussock (blue grass)	9730	—	—	855	7855	1020
Total	9880	—	—	855	7855	1570
Bare mud	550	—	—	—	—	150
Grand total	197710	21640	42940	25635	75880	31615

Similarly, *Eucalyptus brownii* replaces *E. populnea* in woodland communities. With severe dry-season stress in the north-west of the region, *E. normantonensis* forms low woodland communities.

Within any given climatic regime, soils exert a major influence and commonly cause sharp disjunctions in vegetation. Thus, contrasts between deeply weathered coarse-textured soils and deeply weathered clays are always prominent. Again, the soil characteristics which influence soil water regime are of major importance. Plant species which can maintain high leaf or phyllode water potentials (e.g. *A. harpophylla*) are at a positive advantage on deep clays where much water is held at high tensions and where soluble salts also influence soil water potential. The net effect is a graduated release or metering of soil water, so that continuity of supply is maintained, albeit at a low level, through dry periods.

With many species it is possible to recognize a sequence of changes in terrain and soil components that combine to produce an apparently similar water regime, e.g. narrow-leaved ironbark (*E. crebra*/*E. drepanophylla*) is a dominant species in a continuum from woodland to open-forest formations. In the driest areas in the north-west, these narrow-leaved ironbark woodlands occur on deep loamy red earths on tablelands, mesas and gently undulating terrain. In intermediate areas with higher rainfall they mostly occur on moderately deep to deep texture-contrast soils on moderate slopes in undulating to hilly terrain. In humid eastern areas they are largely restricted to skeletal or shallow duplex soils on steeper slopes in hilly and mountainous terrain.

The higher mountains and ranges, particularly in the south, exert a major influence on plant environment. Reduced temperatures and more frequent cloud cover diminish the evaporative demand. More frequent, lighter falls of rain are effective on the mainly coarser-textured soils in maintaining transpiration rates. Aspect is important, particularly on steeper slopes in dissected terrain, in varying the insolation and evaporation demand. Steep southern slopes generally have more mesic-adapted communities than northern and western slopes. Evaporation reduction is carried to an extreme in deeply shaded narrow gorges such as are found in the Mesozoic sandstones in the south. Closed-forest elements and mesic hardwood species such as the turpentine (*Syncarpia glomulifera*) survive in such microhabitats far inland.

Fire is undoubtedly a major component of plant environments in the region. However, no definitive studies have been undertaken which would allow objective discussion of this component. Both Leichhardt (1847) and Mitchell (1848), the first explorers in the region, drew attention to the almost constant fires deliberately lit by Aborigines. Both commented on the mosaic of burnt and unburnt woodland and grassland which they encountered. Such patterning seems to indicate that any given area would be burnt at irregular intervals at a frequency of less than once a year.

The advent of European settlement introduced an era of semi-annual firing of standing herbage during the hot stormy season (September–December). Such burning-off took place over a major part of the area settled for grazing. The apparent spread and continued dominance of black spear grass (*Heteropogon contortus*) in many herbaceous communities have been attributed to this practice.

Initial settlement favoured the grasslands and grassy woodlands with mid-height grass dominated by *Themeda australis*, and these areas were very heavily grazed by sheep. Various factors, including the spread of *Heteropogon contortus*, induced a

swing to beef cattle before the turn of the century. Changes in the herbaceous vegetation can only be guessed at; however, a notable feature of these natural grassland and grassy woodland communities is the continued importance of native grasses and herbs and the general insignificance of sown exotic species.

TABLE 7

DISTRIBUTION OF MAJOR STRUCTURAL FORMATIONS IN MAJOR GEOMORPHIC CATEGORIES (EXPRESSED AS PER CENT OF THE TOTAL AREA OF EACH FORMATION)

Major structural formation	Geomorphic categories				
	A	B	C	D	E
Closed-forest (6425 km²)	2·5	3·1	19·0	74·4	<1·0
Open-forest (81740 km²)	<1·0	30·0	27·0	32·7	9·5
Woodland (95780 km²)	20·2	19·0	—	37·8	23·0
Open-woodland (1710 km²)	—	—	82·2	17·8	—
Open-scrub (555 km²)	100·0	—	—	—	—
Open-heath (1000 km²)	100·0	—	—	—	—
Low open-shrubland (70 km²)	—	—	—	—	100·0
Grassland (10280 km²)	—	—	8·3	76·4	15·3

The mixed shrub/grass woodlands were next favoured, then *Eucalyptus* open-forests and lastly *Acacia* open-forests. Partial clearing, ring-barking and selective logging all reduced tree density. The post-war development of mechanized clearing techniques has, in turn, led to massive private and public investment in clearing and

TABLE 8

PROPORTIONAL REPRESENTATION (PER CENT OF THE TOTAL AREA IN EACH GEOMORPHIC CATEGORY OF THE MAJOR VEGETATION FORMATIONS)

Major structural formation	Geomorphic categories				
	A	B	C	D	E
Closed-forest	<1·0	<1·0	4·8	6·3	<1·0
Open-forest	2·8	52·7	86·4	35·2	24·5
Low open-forest	—	4·3	—	—	—
Woodland	89·2	42·5	—	47·7	69·7
Open-woodland	—	—	5·5	<1·0	—
Open-scrub	2·6	—	—	—	—
Open-heath	4·6	—	—	—	—
Low open-shrubland	—	—	—	—	<1·0
Grassland	—	—	3·3	10·4	5·0

development of the more densely timbered communities. The Brigalow Development Scheme, when complete, will virtually eliminate most of the *Acacia* open-forests, low closed-forests (softwood thickets) and many of the woodlands developed on alluvium and better-class soils in the Fitzroy region.

Analysis of the distribution of major structural formations in relation to major geomorphic categories affords some insights. The areas of major structural formations and important floristic subgroups are shown in Table 6. The proportion of each structural formation occurring in each geomorphic category is shown in Table 7. Lastly, the proportional representation of structural formations in each geomorphic category is presented in Table 8.

IV. Phytogeography

The Fitzroy region is of considerable phytogeographic interest because of the interdigitation of tropical- and temperate-adapted floristic elements. Burbidge (1960), in a major phytogeographical analysis of the Australian continent, assigned the major floristic affinities of the region to the tropical zone and the tropical–Eremean (inland) overlap zone. However, she drew attention to the lack of data on the flora of the region at the time of the study. In another much broader study, Doing (1970) places most of the region within a major botanical province, which he labels the 'brigalow province'. His research places much greater emphasis on the dominant and characteristic species of the vegetation than on detailed taxonomic analysis.

Eucalyptus is the dominant tree genus, with communities occupying more than half (52·4%) of the total area. Although more than 40 species have been recognized in the survey of the region, most are insignificant in terms of areal extent. Three species together dominate more than 60% of the area occupied by *Eucalyptus* communities. In each case (*E. melanophloia*, *E. crebra*/*E. drepanophylla*, *E. populnea*) the Fitzroy region occupies a central or north-central position in what is essentially a mesothermal subhumid eastern Australian distribution. Other species such as *E. orgadophila* and *E. tessellaris* conform with this pattern. Only three known species (*E. cambageana*, *E. thozetiana*, *E. citriodora*) are widely distributed within but largely restricted to the Fitzroy region.

Species that have an extensive distribution in tropical northern Australia such as *E. àlba* and *E. papuana* are not prominent elements of the vegetation and are restricted to northern or north-eastern parts of the region. Lowest minimum weekly temperatures of 5 and 4°C respectively appear to correlate with the southern distribution limits of these species. The bloodwoods (*E. polycarpa*, *E. trachyphloia* and *E. dichromophloia*) are a group requiring taxonomic revision and are therefore of little value in this analysis. However, these bloodwoods are usually subdominant or at least codominant members of *Eucalyptus* communities in the region.

The point of greatest phytogeographic interest hinges on the relatively large number of *Eucalyptus* species with clear temperate affinities and forming disjunct distributions with the major occurrences in south-east Queensland and northern New South Wales. These species are essentially restricted to cooler upland areas, mainly in the south and central parts of the region. Some of these species are isolated on the highest tablelands and are disjunct by some 200–300 km from the nearest other populations. Further studies are required to determine whether and to what degree these isolated populations differ from the main stocks. *Eucalyptus saligna*, *E. propinqua*, *E. punctata*, *E. melliodora* and *E. eugenioides* are examples of this group. Some of the warmer temperate-adapted species such as *E. acmenioides* and *E. cloeziana* occur in disjunct elevated areas as far north as the Atherton Tableland.

A number of species with obvious temperate affinities reach their northern limit, but are quite extensively distributed in the south of the region, e.g. *E. maculata* and *E. dealbata*. *Angophora costata* and *A. floribunda* also fit this pattern. An extremely disjunct occurrence of a form of the mallee *Eucalyptus* species *E. oleosa* was noted by Pedley (1967) near Lake Buchanan. This may be a relict population arising from a cooler, arid period during the most recent glacial epoch (Nix and Kalma 1972).

In summary, the *Eucalyptus* elements of the vegetation demonstrate strong southern temperate affinities with only limited representation by northern tropical species. The most common eucalypts have a subhumid mesothermal distribution pattern in central eastern Australia.

Acacia-dominated communities occupy 36% of the total area. More than 30 species were recognized as significant members of described plant communities, but a great many more species occur. One species, brigalow (*Acacia harpophylla*), is overwhelmingly dominant in terms of areal extent. The mesothermal subhumid eastern Australian distribution of this important species was delineated by Isbell (1962) and some aspects of its ecology and physiology were discussed by Johnson (1964), Russell *et al.* (1967), Moore *et al.* (1967), Connor and Tunstall (1968), van den Driessche *et al.* (1971) and Connor *et al.* (1971). The closely related blackwood (*A. argyrodendron*) has a limited distribution, being largely confined to the northern sectors of the Fitzroy region, while gidgee (*A. cambagei*), another related species, is important in the west and north-west and has an extensive distribution in the semi-arid and arid zones of western Queensland.

Lancewood (*A. shirleyi*) has an extensive tropical northern Australian distribution and is the dominant species forming low open-forests on scarps and breakaways in the Fitzroy region. Bendee (*A. catenulata*) tends to replace *A. shirleyi* on similar sites to the south of the region. Desert oak (*A. coriacea*) is a prominent under-storey component of woodlands developed on virtually intact Tertiary weathered surfaces in the north-west.

Some species such as yarran (*A. omalophylla*) and myall (*A. pendula*) have an essentially southern temperate distribution, but reach their northern limits in the Fitzroy region. A small disjunct occurrence of the arid-zone mulga (*A. aneura*) was noted in the far north-west of the region near Lake Buchanan.

The general patterning of *Acacia* distribution closely parallels that of the *Eucalyptus* species. The dominant species are centred in or closely adjacent to the Fitzroy region, many southern temperate species reaching their northern limits and a few tropical species their southern limits within the region. *Callitris*- and *Casuarina*-dominated communities show strong southern temperate affinities.

V. General Description of Plant Formations and Communities

The distribution of the major vegetation formations occurring within the surveyed area is shown in the small-scale map accompanying this report. The map is based on land system and original mapping unit boundaries together with modifications derived from the field survey associated with this study. Only the dominant formations are shown, and where possible these have been subdivided into major floristic subgroups, e.g. *Eucalyptus* open-forest and *Acacia* open-forest.

The following description of the major formations and communities is intended to provide a broad framework for viewing the vegetation of the Fitzroy region. Detailed descriptions of component communities and their distributions can be obtained by direct reference to the land units in Part V.

(*a*) *Closed-forests* (*estimated area 90 km*^{2})

Known locally as rain forest, vine forest or vine scrub these are structurally and floristically complex communities. (See Webb (1959, 1968) for a physiognomic classification and ecological analysis of closed-forests in eastern Australia.) Canopy closure is almost complete with a height of 15–20 m, often with scattered emergents of 30 ± 10 m. Characteristic plant families are Apocynaceae, Celastraceae, Euphorbiaceae, Ebenaceae, Leguminosae, Meliaceae, Moraceae, Myrtaceae, Rubiaceae, Rutaceae, Rhamnaceae, Sterculiaceae, Ulmaceae, Verbenaceae and many others. Palms, ferns and lianes are present.

Maintenance of a high biomass and canopy cover requires an essentially continuous supply of soil water. In the Fitzroy region generally, such a requirement can be met only in a few localized situations along the humid coastal strip. Evaporation reduction through reduced insolation (due to slope, aspect and increased cloud cover) and/or reduction in temperature due to elevation is as important as amount and distribution of precipitation. Thus, pockets of closed-forest occur on crests, upper slopes and drainage lines in mountainous and hilly terrain where annual precipitation exceeds 1000 mm, extending to less favourable sites and soils where precipitation exceeds 1500 m. They are broadly restricted to areas where mean moisture index values for the driest quarter exceed 0·5 (Fig. 11). Characteristic soils are dark brown and grey-brown soils overlying freshly weathered rock and rubble.

Hoop-pine (*Araucaria cunninghamii*) is a prominent emergent in many occurrences and where accessible has been logged, together with veneer timbers such as *Eugenia* spp., *Heritiera* spp., *Bielschmiedia* spp., *Toona australis*, *Elaeodendron* spp. and many others. Apart from their relatively minor role as timber sources, these scattered closed-forests (land unit 106) have a vital role in maintaining floral and faunal diversity within the region.

(*b*) *Low Closed-forests* (*estimated area 6335 km*^{2})

These formations replace closed-forests where nutrient and/or water regimes become more limiting. Canopy closure is still almost complete, but the height of the canopy is less than 10 m. Two distinctive elements occur.

(i) *Vine Thicket* (*estimated area 6280 km*^{2}).—Known locally as softwood scrub or bottletree scrub, these complex layered communities occupy the drier end of the closed-canopy continuum. The gradient from humid to subhumid environments is reflected in the attenuation in both canopy height and structural and floristic complexity. Adaptations to the drier environment such as smaller, thicker leaves, swollen roots and stems and facultative deciduous habits are prominent. Although widely distributed throughout the surveyed area, these communities are most extensive in the east and south and are best developed where mean moisture index values for the driest quarter exceed 0·2 (Fig. 11). Three broad floristic assemblages have been recognized,

largely on the basis of presence or absence of prominent indicator species and the nature of the underlying surface material. A large proportion of species are, however, shared.

(1) Vine thickets on relatively fresh rock material; principally labile sediments (land units 77, 91–93, 95, 106, estimated area 4690 km^2).—These are complex layered communities with a more or less continuous canopy of slender densely packed trees (*Bauhinia carronii, Geijera parviflora, Denhamia obscura, Atalaya hemiglauca, Alstonia constricta, Alphitonia excelsa* and many other species), 8 ± 3 m high; a discontinuous emergent tree layer, commonly with bottletrees *Brachychiton rupestre* and/or *B. australe*, occasionally *A. harpophylla* or *Eucalyptus orgadophila*, 14 ± 3 m; a moderately dense to dense shrub layer depending on the density of the upper canopy (*Exocarpos latifolius, Citriobatus spinescens, C. parviflora, Croton phebaloides, Acalypha eremorum, Heterodendrum diversifolium, Carissa ovata* and many other species), 2 ± 1 m; over deep litter, ferns, mosses and sparse scrub grass. Lianes are common.

These communities commonly occur on crests and upper slopes in gently undulating and hilly terrain. Soils are usually well-drained red earths or shallow loams with moderately high levels of nitrogen and phosphorus. The initial soil fertility and absence of serious regrowth problems have led to selective and extensive clearing of these communities for sown pasture and crop.

(2) Vine thicket on deeply weathered basalt and secondary carbonate (estimated area 1225 km^2).—Locally known as bonewood scrubs, these communities (land units 48, 49) are dominated by bonewood (*Macropteranthes leichhardtii*) and locally may form almost monospecific canopy layers, 6 ± 2 m. In other respects these communities do not differ greatly from those already described. Emergents of *Acacia harpophylla, Brachychiton rupestre* and *Geijera parviflora* are often present and a lower shrub layer is usually well developed.

Bonewood thickets occur on crests and upper slopes on shallow gravelly loams or clays often overlying a layer of secondary carbonate. They are most extensively developed in the Nogoa and Comet catchments, in the mid-central and southern parts of the region. In many cases they are selectively cleared and worked as a source of gravel and stone for road-making.

(3) Vine thickets on deeply weathered sediments (estimated area 365 km^2).—These communities (land units 14, 30) are commonly distinguished by the presence of *Flindersia australis* as both a canopy component and an emergent. In many occurrences *Cadellia pentastylis* is a prominent emergent. The canopy layer usually has *Alstonia constricta, Alphitonia australis, Denhamia obscura, Geijera parviflora* and *Flindersia australis* as common elements. The lower shrub layer is dense to moderately dense with many species present, including *Exocarpos latifolius, Acalypha eremorum, Heterodendrum diversifolium* and *Carissa ovata.*

Massive red earths and deep texture-contrast soils on crests and upper slopes are normal sites. Relatively high nitrogen and phosphorus levels are anomalous when compared with similar soils under *Eucalyptus* woodland or open-forest vegetation. It may be that the closed nutrient cycling of these vine thicket communities has preserved nutrients from parent materials no longer in evidence.

All three types of vine thicket community have been greatly reduced in total extent, and in some areas completely eliminated, by clearing for sown pasture and crop. More detailed study of these unique communities and conservation of selected areas are warranted.

(ii) *Mangrove Thicket* (*estimated area 55 km*^{2}).—These communities (land unit 142) occur on littoral plains and fringe anastomosing channels of the Fitzroy estuary. Extensive areas occur in Broadsound and Shoalwater Bay in the north-east and in the shallow channel separating Curtis Island from the mainland in the south-east. In many situations mangrove thicket grades into vine thicket or even vine forest upslope from tidal channels.

Normally there is a distinctive zonation of monospecific canopy layers from the tidal channels to the less frequently flooded back plains. Common species are *Avicennia marina*, 10 ± 3 m; *Ceriops tagal*, *Aegicerus corniculatum*, *Osbornia octodonta*, *Bruguiera gymnorhiza* and *Rhizophora stylosa*, 3 ± 2 m.

A third, undescribed, closed-canopy community occurs along the coastal strands, both north and south of the Fitzroy estuary. This could be termed dune thicket as it occurs on the lee side of foredunes and in interdune basins. Although floristically less complex it has close affinities with vine thicket. It has a closed to semi-closed canopy of 5 ± 2 m often with emergent palms (*Livistona australis*).

(*c*) *Tall Open-forests* (*estimated area 550 km*^{2})

These impressive forests are restricted to three separate upland areas, generally at elevations exceeding 700 m and extending to summit tablelands exceeding 1000 m. The dominant *Eucalyptus* species are essentially warm-temperate in adaptation and are disjunct from their major occurrences in southern Queensland and northern New South Wales. Projective foliage cover is within the range 40–60 % and canopy height from 30 to 45 m. Although the dominant tree species differ, these communities (land units 56, 85, 103) characteristically have a sparse to moderately dense lower tree layer (*Casuarina torulosa*, *Acacia* spp.), 12 ± 3 m, over a grassy ground layer of *Themeda australis*, *Imperata cylindrica* and other forest grass species. Bracken (*Pteridium esculentum*) may be locally common and *Xanthorrhoea* sp. and *Macrozamia* sp. are often present. Palms (*Livistona australis*) and ferns may be prominent in moister sites.

Along the crest of the Dawes Range and Calliope Range at elevations of 700–900 m in the east, the dominant tree species are *E. acmenioides*, *E. phaeotricha*, *E. saligna* and *E. andrewsii* (Queensland Forestry Department, unpublished report). Further to the west on the isolated Blackdown Tableland (elevation 700–900 m), *E. acmenioides*, *E. phaeotricha*, *E. saligna* and two undescribed members of the stringybark and ironbark groups are prominent (R. Henderson, personal communication). The isolated Consuelo Tableland and other smaller basalt remnants in the Carnarvon Ranges to the south-west of the Blackdown Tableland have an elevation of 750–1000 m. The magnificent stands on the Consuelo Tableland are dominated by *E. saligna* and *E.* sp. aff. *acmenioides*. Smaller basaltic plateaux to the south have *E. eugenioides* and *E. saligna*. All of these tall open-forest communities are warm-temperate 'islands' in a subtropical 'sea' and warrant more detailed study of their floral and faunal affinities.

(*d*) *Open-forests* (*estimated area 72 950 km²*)

These formations are almost as extensive as woodland. Five broad floristic groups are recognized on the basis of dominant tree genera. *Acacia*-dominated open-forests are by far the most extensive and occur mainly on clay soils in broad lowlands and gently undulating terrain throughout the region. *Eucalyptus*-dominated open-forests are best developed on upland areas, mostly above 300 m, in the more humid south and east. *Angophora*-dominated communities have a similar distribution. *Callitris*- and *Casuarina*-dominated open-forests are commonly associated and occur on deep sands or duplex soils with a coarse-textured surface horizon, mainly in the south.

(i) Acacia *Open-forests* (*estimated area 53 865 km²*).—The dominant *Acacia* tree species is brigalow (*A. harpophylla*), which occurs throughout the entire region but is partially or completely replaced by blackwood (*A. argyrodendron*) in the Suttor drainage in the north and by gidgee (*A. cambagei*) in the Belyando drainage to the north-west. Bendee (*A. catenulata*) forms almost monospecific stands in localized areas and is extensive only on red earth residuals north of Duaringa. Rosewood (*A. rhodoxylon*) commonly occurs associated with the ironbarks *Eucalyptus crebra* and/or *E. melanophloia* and is most extensive on shallow, stony or duplex soils in hilly terrain in more humid eastern sectors.

Brigalow (*A. harpophylla*), blackwood (*A. argyrodendron*) and gidgee (*A. cambagei*) communities are closely related structurally and floristically. Projective foliage cover of the canopy dominants normally ranges from 35 to 45% and sometimes higher, with tree height ranging from 12 ± 3 m in the driest areas to 15 ± 5 m in more humid eastern areas. These communities are characteristically layered with a prominent mid storey of smaller trees, a moderate to dense shrub layer and a sparse to moderate ground layer of grasses, herbs and ferns. In many instances, where *A. cambagei* or *A. argyrodendron* replaces *A. harpophylla* in the upper tree stratum, the lower layers remain essentially unchanged floristically, although density may be reduced.

Communities dominated by *A. harpophylla*, *A. cambagei* and *A. argyrodendron* are differentiated on the presence or absence of associated tree or shrub species. Thus, in seasonally flooded units the lower layers may be completely absent. Usually other species are present in the upper tree stratum, the most frequently occurring being *Casuarina cristata*, *Brachychiton rupestre*, *Bauhinia carronii*, *Heterodendrum oleifolium*, *Ventilago viminalis*, *Atalaya hemiglauca* and *Geijera parviflora*. Two eucalypts, *E. cambageana* and/or *E. thozetiana*, occur with *A. harpophylla* on gilgaied clays (land unit 46) and *E. cambageana* is a prominent associate over extensive areas with duplex soils (land units 34, 38).

Two distinctive mid-storey elements are largely differentiated on the presence or absence of yellowwood (*Terminalia oblongata*), a small tree (5–10 m) which does not occur south of the 5°C lowest weekly minimum isotherm (see Fig. 5 in Part III). To the south of this boundary, tree wilga (*Geijera parviflora*), vine-tree (*Ventilago viminalis*) and *Bauhinia carronii* are prominent in this niche. False sandalwood (*Eremophila mitchellii*) is normally a prominent smaller tree (3–6 m) element in this southern assemblage but is much less common and often absent from the northern communities where *Terminalia oblongata* dominates. The shrub layer also has a dichotomy based

on the presence or absence of shrub wilga (*Geijera parviflora*). Here the decisive factor appears to be water regime, as this form of *Geijera parviflora* is restricted to the south and east, where mean moisture index values during the driest quarter exceed 0·15, and is most prominent where this value exceeds 0·2. *Myoporum deserti*, another element in the shrub layer, appears to have a similar control. Currant bush (*Carissa ovata*) is ubiquitous in the shrub layer throughout the region.

Bendee (*A. catenulata*) forms dense, almost monospecific communities on deep loamy red and yellow earths on tablelands and mesas to the north and north-west of Duaringa (land unit 9). Normally the understorey is very sparse or absent, but in some occurrences in the Comet valley a distinctive vine thicket understorey has developed which eventually replaces bendee.

(ii) Eucalyptus *Open-forests* (*estimated area 15 520 km²*).—These communities are most extensive in undulating to hilly mountainous terrain on relatively fresh or unweathered rocks in the south and east. However, the best timber stands commonly occur on residual tablelands, benches and colluvial slopes with deeper soils formed directly or indirectly by deep weathering processes.

Narrow-leaved ironbark (*E. crebra*/*E. drepanophylla*) is dominant or codominant in many land units and is an important source of timber. It is commonly associated with spotted gum (*E. maculata*) or the closely related lemon-scented gum (*E. citriodora*). Most of the more favoured sites, where tree canopy heights exceed 20 m, are controlled by the Forestry Department as timber reserves or state forests. Normally these higher-quality forests have a rather sparse understorey of smaller trees such as acacias and, where deeply weathered materials are present, of *Alphitonia excelsa* and *Petalostigma pubescens*. Grass-trees (*Xanthorrhoea* spp.) and cycads (*Macrozamia* spp.) may be present. A grassy ground layer of mesic mid-height grass or forest grass is commonly well developed.

A series of complex communities is developed on quartzose sandstone in the south. Structurally they grade from open-forest to woodland in less favourable sites. In this study, these communities have been grouped into two sets. One of these is centred in the south-east where red earths are developed on deeply weathered sandstone (land unit 13). Many *Eucalyptus* species occur in close association, together with *Angophora costata* and *Callitris columellaris*. There is a sparse lower tree layer and a moderately dense to dense, floristically rich shrub layer. A closely allied set of communities occurs on shallow to moderately deep sandy soils on quartz sandstone, where evidence of deep weathering is not so obvious (land unit 55). Yellow stringybarks or yellowjacks (*E. watsoniana*, *E. peltata*) are usually prominent and the gum-topped ironbark (*E. decorticans*) tends to replace narrow-leaved ironbark (*E. crebra*/*E. drepanophylla*). Both sets of communities share a floristically rich shrub and herb layer, which has numerous genera with southern temperate affinities. Four national parks (Isla Gorge, Robinson Gorge, Carnarvon and Salvator Rosa) include large areas of these sandstone communities.

Queensland blue gum (*E. tereticornis*) open-forest communities are essentially restricted to alluvial situations where underground water is available at depth (land units 122, 136). Carbeen (*E. tessellaris*) is commonly associated and, in the south, smooth-barked apple (*Angophora costata*).

On favoured sites, mainly in the more humid eastern sector, communities which occur extensively as woodland formations attain open-forest dimensions. Examples are poplar box (*E. populnea*) codominant with *A. harpophylla* (land unit 97); gum-topped box (*E. moluccana*) (land units 82, 98); silver-leaved ironbark (*E. melanophloia*) (land unit 105).

Along the crests and upper slopes of coastal ranges of the Fitzroy region a community dominated by white stringybark (*E. acmenioides*) is widespread, but it is not extensive within the surveyed area. Further inland, east of the Expedition Range, *E. acmenioides* and *Angophora costata* form open-forests on level to undulating terrain with thick sandy-surfaced duplex soils (land unit 31).

On the shelving and stripped margins of the Blackdown, Consuelo and smaller isolated tablelands in the Carnarvon Ranges scattered pockets of open-forest are dominated by species with distinctly southern temperate affinities, such as *E. propinqua*, *E. punctata* and *E. melliodora* (land unit 104).

(iii) Angophora *Open-forests* (*estimated area 1800 km²*).—Smooth-barked apple (*Angophora costata*), usually associated with tumble-down gum (*E. dealbata*), forms open-forests in gently undulating terrain on deep sandy soils in the south of the region. These sites occur on deeply weathered surfaces (land unit 15) or on fresh quartz sandstones (land unit 60).

Rough-barked apple (*Angophora floribunda*) is an element in fringing forest along streams and drainage lines in the extreme south.

(iv) Callitris *Open-forests* (*estimated area 1265 km²*).—Cypress pine (*Callitris columellaris*) is widely distributed on coarse-textured soils throughout the southern half of the region and is often present as an element in the drier *Eucalyptus* open-forests. The better stands have been reserved by the Forestry Department and a number of sawmills are engaged in milling this valuable termite-resistant timber. Projective foliage cover ranges from 30 to 50%, height 15 ± 4 m. The preferred sandy soils may be derived from deeply weathered material (land unit 28) or quartz sandstone (land units 57, 61). Bull oak (*Casuarina luehmannii*) is a frequent associate. Shrub and ground layers are usually sparse or absent.

(v) Casuarina *Open-forests* (*estimated areas 260 km²*).—Bull oak (*Casuarina luehmannii*) forms dense open-forest with trees 12 ± 3 m and scattered emergent blue gum (*E. tereticornis*) on deep duplex soils on gently undulating terrain in the Mimosa Creek drainage basin (land unit 29).

Belah (*Casuarina cristata*) normally occurs as a subdominant species with brigalow (*A. harpophylla*) in the Fitzroy region, but small pockets of belah-dominant open-forest occur in the Dawson, Comet and Nogoa drainage basins in the south and east.

(*e*) *Low Open-forests* (*estimated area 8480 km²*)

This formation is dominated by lancewood (*Acacia shirleyi*) which commonly forms almost monospecific stands with projective foliage cover of 35–60% and height 8 ± 3 m (land unit 17). In the east, rosewood (*A. rhodoxylon*) may be codominant. Towards the south-west, bendee (*A. catenulata*) is more frequently present and may replace *A. shirleyi* entirely. Characteristically, this formation occupies talus slopes

and breakaways fringing lateritic residuals. Soils are generally shallow, gravelly or stony with extensive outcrops of mottled, pallid or silicified zones. Yapunyah (*Eucalyptus thozetiana*) shows a preference for such sites and is commonly associated with *A. shirleyi* throughout the region. In the east, lemon-scented gum (*E. citriodora*) is often present, but ironbarks (*E. crebra, E. decorticans*) and the peppermint (*E. exserta*) may also occur. The relatively dense canopy appears to inhibit shrub and grass layers.

(*f*) *Woodlands* (*estimated area 94 680 km²*)

These formations occupy almost half the total land area of the surveyed region and occur throughout the entire area, but are most extensive in the drier western sectors. *Eucalyptus* is the dominant tree genus. The only exception is a small localized community dominated by beefwood (*Grevillea striata*) (land unit 137).

Projective foliage cover most commonly falls within the range 15–25%, with wide spacing between trees. The height of the tallest stratum ranges from around 10 m on unfavourable sites to upwards of 25 m on fertile alluvium in humid eastern sectors. A lower tree layer is normally absent or sparse. Shrub density forms a continuum and this has been used as a basis for the following broad subdivision:

(i) Grassy woodland: shrubs absent or very sparse; grass layer well developed.

(ii) Shrub woodland: shrubs moderately dense to dense; grass layer sparse to moderately developed.

(iii) Mixed shrub/grass woodland: shrubs sparse to moderately dense; grass layer moderately developed.

Shrub density is influenced by disturbance through grazing and burning and by episodic weather events that favour dispersal and establishment of shrubby species. The survey data do not provide a basis for analysis of such phenomena, so that any such broad classification must be arbitrary and subjective.

A fourth type of woodland is very clearly distinguished by the presence of a groved pattern, very evident in aerial photographs. This community (land unit 1) occupies extensive areas in the north-west and is dominated by yellowjack (*E. similis*).

(i) *Grassy Woodlands* (*estimated area 27 635 km²*).—These communities are extensively developed on gentle to moderate slopes and on alluvium in the south and centre of the region. Silver-leaved ironbark (*Eucalyptus melanophloia*) is the dominant tree species on 11 land units which together occupy more than 40% of the area of grassy woodland. Mountain coolibah (*Eucalyptus orgadophila*) is commonly associated with *E. melanophloia* but is the dominant tree species on large areas of shallow to moderately deep clay soils developed on basalt in the central part of the region.

Poplar box (*Eucalyptus populnea*) is the dominant tree species on more than 25% of the area of grassy woodland. Deep texture-contrast soils on colluvial slopes and alluvium are favoured. Mainly restricted to alluvium, blue gum (*E. tereticornis*) grassy woodland is most extensive in the south and east. Disjunct occurrences of this community occur in broad, rounded swampy depressions in the Tertiary weathered surface (land unit 10).

Tumble-down gum (*E. dealbata*) grassy woodland is restricted to relatively small, scattered occurrences in the south, where it occurs on deep sands on quartz sandstone

in undulating terrain (land unit 59). Communities dominated by poplar gum (*E. alba*) are restricted to the north-eastern section of the surveyed area, becoming much more extensive north-east and north of the survey boundaries (land unit 27). Narrow-leaved ironbark (*E. drepanophylla*) grassy woodlands are relatively limited in area, and are most extensive in mountainous to hilly terrain on skeletal or shallow duplex soils. Xeric mid-height grass and/or spinifex form the ground cover in the drier western occurrences of this community (land unit 83).

(ii) *Shrub Woodlands (estimated area 15 180 km²).*—These communities are most extensively developed on erosional–depositional surfaces within the Tertiary weathered zone, i.e. geomorphic category B, but also occur to a lesser extent on the more-or-less intact weathered surface, i.e. geomorphic category A. Poplar box (*E. populnea*) is overwhelmingly dominant, occurring on more than 98% of the total area. The closely related *E. brownii* replaces *E. populnea* to some extent in shrub woodland in the north. The largest community (land unit 23) has *E. populnea* or *E. brownii* in the tree layer, with a lower tree layer of wilga (*Geijera parviflora*), vine-tree (*Ventilago viminalis*), false sandalwood (*Eremophila mitchellii*) and other species and a shrub layer of currant bush (*Carissa ovata*) and others. Another large community (land unit 22) probably represents an ecotone between *Acacia* open-forest and *Eucalyptus* woodland. Again poplar box (*E. populnea*) is the dominant tree, but has a prominent lower tree layer of brigalow (*A. harpophylla*) together with a shrub understorey characteristic of the brigalow community.

In the more humid eastern sectors a shrub woodland dominated by narrow-leaved ironbark (*E. crebra*)–bloodwood (*E. polycarpa*)–mahogany (*E. tenuipes*) and with a moderately dense understorey with abundant shrubs occurs on shallow sands to sandy loams on the Tertiary weathered surface (land unit 12). A variant of the poplar box shrub woodland occurring on deep loamy red earths has a rather localized occurrence, near Alpha, in the Belyando basin (land unit 5).

(iii) *Mixed Shrub/Grassy Woodlands (estimated area 51 780 km²).*—These communities have a sparse to moderately developed shrub layer together with a moderate to well-developed grass layer. It seems very likely that many units grouped within this category may be in transition between the grassy or shrub categories through grazing, fire, past weather events or a combination of all three. However, the survey data do not allow such reconstructions. Also, the concept of a climax community implies some temporal stability which may not be real. Accepting mixed shrub/grassy woodland as a descriptive category only, it nonetheless has a remarkably wide distribution and must be adjudged to have some ecological significance. In contrast to the grassy woodlands which are dominated by silver-leaved ironbark (*E. melanophloia*) and to a lesser extent poplar box (*E. populnea*) in the east and south, and shrub woodlands which are dominated by *E. populnea*, these communities are characterized by a number of different eucalypts. Communities dominated by narrow-leaved ironbark (*E. crebra*/*E. drepanophylla* and *E. decorticans*) are very extensive, particularly on shallow soils developed on relatively fresh rocks in hilly and mountainous areas. Median canopy height is 12–15 m and a lower tree layer of 6–8 m is usually present. Species widely represented in this layer are *Petalostigma pubescens*, *Alphitonia excelsa*, *Acacia*

cunninghamii, *Lysicarpus angustifolius* and sometimes *Callitris columellaris* and *Casuarina luehmannii*. A sparse to moderately dense shrub layer is commonly present.

Silver-leaved ironbark (*E. melanophloia*) communities are almost as extensive. The most extensive of these (land unit 2) occurs in the extreme north-west on red and yellow earths on Tertiary residual tablelands and mesas. Desert oak (*Acacia coriacea*) is a characteristic understorey species, together with many other acacias and other shrubby species. The ground layer is spinifex or xeric mid-height grass or a mosaic of both. An apparently related community on red earths further to the east lacks the desert oak type understorey and the ground layer is mesic mid-height grass (land unit 6). Other communities dominated by *E. melanophloia* occur on relatively unweathered sediments (land units 63, 73) or on coarser-textured alluvial fans (land unit 112) or terraces (land unit 119).

Communities dominated by box (*E. populnea*/*E. brownii*) occur mainly on texture-contrast soils on moderate to gentle slopes on relatively unweathered rocks or alluvium (land units 71, 96, 114, 124). One community occurs on deep red and yellow earths on alluvium (E118). Median canopy height is 12 m and false sandalwood (*Eremophila mitchellii*) and a number of *Acacia* species are usually represented in the understorey. Currant bush (*Carissa ovata*) is almost always present in the shrub layer.

Coolibah (*E. microtheca*)-dominated communities are almost as extensive as those dominated by box. Understorey and shrub layers are extremely variable in density, depending on the frequency of flooding on the alluvial sites (land units 125, 135). Often, dense seedling thickets of *E. microtheca* or *A. salicina* are present. False sandalwood (*Eremophila mitchellii*) is often present and, in the north, *Bauhinia hookeri* and *Terminalia oblongata*. The ground layer may be absent or may be sparse frontage grass and/or blue grass.

Bloodwood–cabbage gum (*E. polycarpa–E. papuana*)-dominated communities are quite extensively developed on loamy and sandy massive earths on the Tertiary weathered surface (land units 7, 11) or on deep, sandy soils on alluvium (land units 113, 115, 116). Carbeen (*E. tessellaris*) is commonly present in the tree stratum and silver-leaved ironbark (*E. melanophloia*) to a lesser extent. Understorey species commonly represented are *Petalostigma pubescens*, *Acacia cunninghamii*, *Lysicarpus angustifolius* and *Callitris columellaris*.

Gum-topped box (*E. moluccana*)-dominated communities occupy similar sites to those of *E. populnea* and are very much restricted to the more humid south and east. They occur on texture-contrast soils on gentle slopes on weathered, relatively unweathered and alluvial materials (land units 26, 82, 128).

Beefwood (*Grevillea striata*) forms a unique and distinctive community on sand plains and old beach ridges adjacent to the inland Lake Buchanan (land unit 137).

(*g*) *Low Woodlands* (*estimated area 1100 km²*)

These formations are represented by a single community dominated by Normanton box (*E. normantonensis*), which has a characteristic multi-stemmed habit with a median canopy height of 9 m. It occurs in the extreme north of the surveyed area on texture-contrast soils in undulating terrain (land unit 20).

(*h*) *Open-woodlands* (*estimated area 1710 km²*)

These communities represent one end of the grassy woodland continuum, where trees are very scattered and projective foliage cover of the tree stratum is less than 10%. In many cases they represent an ecotone between grassy woodland and grassland. The three communities recognized each have counterparts in woodland communities. Mountain coolibah (*E. orgadophila*) communities are extensively developed on moderately deep to deep cracking clays over weathered basalt in the central parts of the region (land unit 47). Coolibah (*E. microtheca*) communities are restricted to seasonally flooded alluvium developed from weathered basalt in the same general region (land unit 44). Silver-leaved ironbark (*E. melanophloia*) communities are widespread on shallow to moderately deep cracking clays on relatively unweathered basalt. Bloodwood (*E. dichromophloia*) and sometimes *E. orgadophila* are associated species (land unit 111). The ground layer in all three communities is blue grass and/or mesic mid-height grass.

(*i*) *Open-scrub* (*estimated area 555 km²*)

These communities are restricted to the drier north-western segment of the region. Both are virtually monospecific, dominated by bendee (*A. catenulata*) (land unit 9) in one and *Melaleuca tamariscina* in the other (land unit 3). Median canopy height is about 5 m.

(*j*) *Open-heath* (*estimated area 1000 km²*)

Only one community has been described (land unit 3) although others of very restricted extent occur. Again, this community is restricted to the north-west where it occurs in close association with the open-scrub community. Shrubby wattle (*A. leptostachya*) and/or tea-tree (*Melaleuca uncinata*) are the dominants, with a median canopy height of 2 m. Scattered emergent trees are commonly present (*E. setosa*, *E. papuana*, *E. melanophloia*). A sparse spinifex or xeric mid-height grass layer may be present. This community is developed on shallow to moderately deep earths overlying concretionary or massive laterite.

(*k*) *Low Open-shrubland* (*estimated area 70 km²*)

Samphire (*Arthrocnemum* spp.) dominates a series of seral communities which are restricted to saline soils in intermittent tidal locations at the mouth of the Fitzroy River, and inland on outer lake floors and beach ridges of Lakes Galilee and Buchanan. The median canopy height is less than 1 m.

(*l*) *Grassland* (*estimated area 10 280 km²*)

These communities belong to two broad structural categories. Closed-grassland has a projective foliage cover greater than 70% and in the Fitzroy region is represented by a single, virtually monospecific community (land unit 141). Saltwater couch (*Sporobolus virginicus*) closed-grassland occurs on deep, fine-textured saline soils on slightly elevated portions of littoral or lacustrine plains subject to seasonal flooding. This community is well developed on appropriate sites, both in the coastal Fitzroy estuary and in the inland lake basins.

Open-grassland has a projective foliage cover ranging between 30 and 70% with individual tussocks clearly discernible. These tussock grasslands are well represented,

particularly in the central parts of the Fitzroy region. All the tussock grassland communities occur on moderately deep to deep self-mulching cracking clay soils in level to gently undulating terrain. The clay soils are developed on relatively fresh basalt and argillaceous sediments and have a dominantly montmorillonitic clay mineral composition. Phosphate status is often moderate to high on basalt, but can be very low on clays developed on Permian volcanics and sediments.

The tussock grasslands have been subjected to intensive grazing for more than a century, and during the last decade a significant proportion of the total area has been cultivated on a bare fallow–crop rotation. Sheet and gully erosion are widespread.

The floristic composition of these tussock grasslands is always in a state of dynamic flux. Superimposed upon the natural fluctuations due to wet and dry weather sequences are the effects of grazing by domestic stock and regular seasonal firing. Despite the variation in floristic composition from point to point due to these varying influences, two communities have been recognized. Each of these tussock grasslands has a characteristic spectrum of species, although many may be shared.

Blue grass communities are the most extensive and Queensland blue grass (*Dichanthium sericeum*) is normally present and provides the broad label. Other species commonly present are *Aristida latifolia*, *A. leptopoda*, *Panicum decompositum*, *P. queenslandicum*, *Enneapogon flavescens*, *Thellungia advena* and *Ophiuros exaltatus*. In some seasons *Astrebla lappacea* may be prominent. Ephemeral forbs and herbs commonly fill the tussock interspaces in favourable seasons.

Mesic mid-height grass communities are most prominent in the ground layer of woodlands, but form tussock grasslands in localized areas, commonly in narrow belts following the strike of underlying strata (land unit 74). Kangaroo grass (*Themeda australis*) and black spear grass (*Heteropogon contortus*) are characteristic elements.

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PART V. LAND UNITS OF THE FITZROY REGION

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I. INTRODUCTION

In this Part the 142 land units that have been identified in the region are described. The land units are numbered consecutively and are arranged in five geomorphic categories A to E. Categories A, B and C include landscapes formed on the variously denuded, weathered Tertiary mantle, category D includes landscapes mainly on erosional surfaces underlain by 'fresh' rocks below the weathered mantle and alluvial landscapes are grouped in category E. The land units in category D are divided into seven lithological subgroups ranging from quartz sandstones to shales and basalt. The distribution of the land units within these categories is shown in Fig. 12 and Tables 9–11. The climatic zones in which each land unit occurs and the lithology of the underlying rocks are given at the head of each description.

TABLE 9

OCCURRENCE AND EXTENT OF LAND UNITS IN THE FITZROY REGION

Geomorphic category	Land units	Extent (km²)
A Intact to moderately stripped, upper catenary Tertiary land surfaces	1–16	21640
B Erosional/depositional, mid-catenary land surfaces within the Tertiary weathered zone	17–38	42940
C Erosional/depositional, lower catenary land surfaces within the Tertiary weathered zone	39–53	25635
D Erosional surfaces below the Tertiary weathered zone on various rocks:		
Quartz sandstone	54–61	16945
Metamorphics	62–63	1770
Mixed sediments	64–75	17075
Granite	76–82	2720
Volcanics	83–90	8910
Argillaceous sediments	91–102	16095
Basalt	103–111	12365
E Post-Tertiary alluvial surfaces:		
Sandy fans	112–115	1830
Coarse-textured alluvium	116–122	10405
Medium- to fine-textured alluvium	123–136	18435
Lacustrine and marine alluvium	137–142	945
		197710

The land units are described in the order from highest to lowest in relief and generally from low to high rainfall within the range of occurrence of each category or

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TABLE 10

DISTRIBUTION OF LAND UNITS ON MATERIALS EXPOSED BELOW TERTIARY WEATHERED ZONE

Rock type	Quartz sandstone		Meta-morphics	Mixed sediments		Granite		Volcanics		Argillaceous sediments		Basalt		
Vegetation	Eucalypt forest or woodland	Cypress pine/ bull oak forest	Eucalypt woodland	Eucalypt woodland or forest	Acacia forest	Eucalypt woodland or forest	Vine thicket	Eucalypt woodland or forest	Eucalypt woodland or forest	Acacia forest or vine thicket	Grass-land	Eucalypt woodland or forest	Vine thicket	Grass-land
Mountainous terrain	54–56			64				83–86				105	106	
Hilly terrain			62–63	65–67, 69		76	77			91				
Rolling terrain						78		87–90				107		
Undulating to level terrain	58–60	57, 61		68, 70, 71, 73, 74	72, 75	79, 82			94, 96–98	92, 93, 95, 100, 101	99, 102	103, 104, 108, 111		109, 110

TABLE 11

DISTRIBUTION OF LAND UNITS ON ALLUVIUM

	Uniform sandy soils *and sandy texture-contrast soils;* eucalypt woodland	Massive earths *and sandy texture-contrast soils;* eucalypt woodland	Texture-contrast *and alluvial soils*		Cracking clay and fine-*textured alluvial soils*			Saline clays, *grassland,* mangroves or barren
			Eucalypt woodland	Acacia forest	Eucalypt woodland	Acacia forest	Grassland	
Sandy alluvium and colluvium on fans below sandstone ranges and Tertiary residuals in the west	112–115							
Coarse-textured alluvium on levees, back plains, terraces and channels	116, 117, 122	118–121	122					
Medium- to fine-textured alluvium on levees, back plains terraces, drainage floors and channels			124, 126, *128, 129*	123, 127	125, *133–136*	130, 132	131	
Lacustrine and marine alluvium:								
(*a*) Coarse-textured materials on beach ridges	137			138				139
(*b*) Fine-textured materials on plains								140–142

Geomorphic category		A (21 640 km 2)			B (42 940 km 2)				C (25 635 km 2)	
Landform		Tablelands, mesas and gently undulating terrain – crests and upper slopes			Scarps, stripped margins	Undulating terrain – middle and lower slopes			Level to gently undulating terrain – lower slopes and bottom lands	
Variously denuded laterite profiles		Rounded depressions – sporadic occurrence; Base of Tertiary			(not always present) weathered zone					
Soils and vegetation		Red earths; eucalypt woodlands	Various soils; blue gum woodland	Yellow earths; eucalypt woodlands	Skeletal or truncated soils; acacia scrub or forest	Shallow texture-contrast soils; eucalypt woodlands	Deep texture-contrast soils; eucalypt woodlands	Deep texture-contrast soils; eucalypt – acacia forest	Cracking clay soils; acacia forest	Gilgaied cracking clay soils; acacia forest
Land units	Xeric	1–7, 9, 11	10	2–4, 6, 7	17, 18	19, 20	21–25	34–37	39–44	45, 46
	Mesic	6–9, 11–14, 16	10	6–8, 12, 14, 15	17, 18	19	21–33	34, 37, 38	41	46

Fig. 12.—Distribution of land units on deeply weathered sediments in two broad climatic divisions.

subgroup. The total extent of each land unit has been estimated from data given in the three survey reports referred to in Part I. These estimates are subject to errors of up to about 30%. Most of the land units recur in various land systems throughout the region and their occurrence is shown in the alphabetical lists of land systems in Tables 12–14 in Appendix I. It will be noted that in these tables there is generally a much larger number of land units in each land system than is given in the survey reports. This is because the complex land units in the reports have been subdivided into simple forms. It is stressed that these land units are not necessarily all present in each occurrence of a land system. In general, one land unit is dominant within a land system and it occurs in association with two or more subdominant land units. Other land units, generally of small extent, may occur only sporadically or in specific geographic locations in the region. In some land systems, particularly those underlain by rocks of varying lithology and weathering status (compound or complex patterns), two or three land units may occur in approximately equal proportions and are codominant, e.g. Disney and Rutland land systems in Table 12 in Appendix I. The number of land systems in which the various land units occur is shown in Table 15.

The small maps included with the descriptions show the estimated distribution of the land units throughout the region. They are not intended to indicate the areal extent of the land units. The shaded areas are based on land system boundaries and indicate the range of occurrence. Areas in which the land unit covers $>40\%$ of a land system or group of land systems are shown in black, 10–39% in medium grey and $<10\%$ in pale grey.

The stereograms illustrate the characteristic appearance of the photographic patterns reflected by the land units together with some of their associated or adjacent landscapes. They were selected from photographs taken at scales of 1 : 50 000 or 1 : 85 000. In certain cases it was difficult to select good examples of representative patterns because of land clearing, small size or other reasons. The patterns shown in the stereograms were delineated in the laboratory and have not been checked in the field. Wherever possible, examples of patterns were chosen in which field observations had been made. All the stereograms are oriented in the same direction, namely with north at the upper edges. A note on photographic patterns is given in Appendix II.

The land units are described in terms of four main characteristics: terrain type, landform element, soil and vegetation. These factors are considered in Parts II–IV and further information is given in the survey reports. The vegetation is described firstly in terms of a heading giving the common name of the dominant species and the structure of the community following the classification of Specht (1970).* Specific names of the dominant species are then given with the names of subdominant or commonly associated species in parenthesis. The modal height and range are given. This procedure is also followed in respect of lower tree and shrub layers where these occur. A list of specific and common names of plants is given in Appendix III. The land capability classification for agriculture and grazing is given for each land unit. Further information on land capability in the region is given by Gunn and Nix (1970).†

* Specht, R. L. (1970). Vegetation. In 'The Australian Environment', 4th ed, ed. G. W. Leeper. (CSIRO and Melbourne Univ. Press: Melbourne.)

† Gunn, R. H., and Nix, H. A. (1970). Land Capability. Supplement to Rural Production, Resources Series; Fitzroy Region Queensland. (Dep. Natl Development: Canberra.)

II. Identification of Land Units

One of the main objectives of this report is to facilitate the identification of land units in the field. It is probable that most users of the report will be associated with the planning, development and conservation of land in particular districts in the region, while some may be interested in other aspects such as teaching or study in one or several scientific disciplines. Whatever the purpose, the basic requirements of the user are that he should be able to identify the various terrain types and the landform element or slope segment, and that he should have at least a working knowledge of the geology of the district and the principal tree species and soils. It is assumed that the user will have access to the relevant land system map and aerial photographs and will be able to locate his position accurately on the map and photograph. He can then proceed in one of several different ways.

(*a*) He can identify the land system in which he is located by reference to his position on a road or track or by estimating the distance and bearing from a known point on the ground and map. A list of the component land units of the specified land system in the area will be found in Appendix I. By observing the landform, soil and vegetation at his location and by referring to the land unit descriptions, he may then by process of elimination be able to identify the correct land unit. He can then check the photographic pattern or pattern element in which he is located with that in the stereogram.

(*b*) By reference to geological maps or observation of rock outcrops at the surface, in gullies or road and railway cuttings, he can identify the lithology and weathering status of the rock. If there is evidence of deep weathering (presence of ferruginous, mottled, pallid or silicified zones) the site is located in geomorphic categories A, B or C. Land units in category A are located on mesas, tablelands or crests of rises in gently undulating terrain and the dominant soils are red and yellow massive earths. The land unit can then be identified by reference to the plant community. Land units in category B, with the exception of scarps with lancewood, bendee or rosewood on skeletal soils, generally occur on middle or lower slopes in gently undulating terrain and have dominantly texture-contrast soils with various eucalypt woodlands or forests, or acacia forests with or without emergent eucalypts. Land units in category C occur mainly on plains or very gently undulating terrain and have dominantly cracking clay soils commonly with gilgai microrelief. Acacia forests and/or softwood thickets are dominant. Land units in these three categories generally occur in catenary sequences and observations on adjacent land units will aid identification (see Fig. 12).

(*c*) If there is no evidence of deep weathering reference should be made to the relevant lithological subgroup in category D and the land unit can be identified by observation of the landform, soil and vegetation, and in some cases by their mode of occurrence, e.g. narrow linear shapes on folded sediments (see Fig. 3). The lithology of underlying rocks is indicated in the land system map references in most cases.

(*d*) Alluvial land units occur widely throughout the region in almost level to gently sloping terrain on valley floors. Where they are large enough, they have been mapped separately in several land systems; where they are of small extent, they have been included as separate land units in various land systems. They can be identified

by their commonly linear shape or occurrence in irregular belts parallel to present or prior stream channels or shore lines. They can also be identified according to the texture of materials and mode of formation. Sandy materials on fans and on levees and high terraces form two groups, both of which have eucalypt woodland vegetation. Medium- to fine-textured materials on fluvial plains or lacustrine and marine plains form the other two groups. They have mainly cracking clays, fine-textured alluvial soils and texture-contrast soils with thin loamy surface horizons. Eucalypt woodlands and/or acacia forests predominate.

Land Unit 1 (1525 km²)

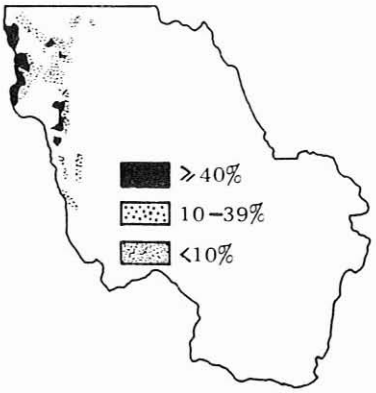
Field Criteria.—Tablelands, groved yellowjack woodland, red earths.

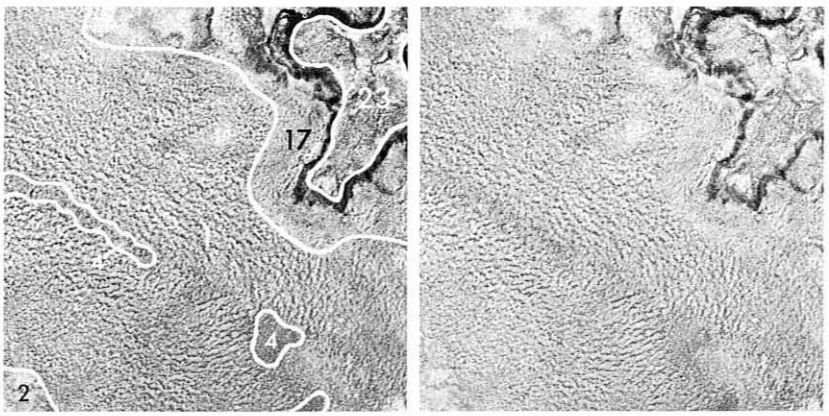
Climatic Zones.—11(7). Median rainfall: Nov.–Apr., 350 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests, upper and middle slopes, mainly less than 2%.





Soil.—Massive earths: deep to moderately deep loamy red earths, Dunrobin (Gn2.12); sandy red earths, Annandale (Gn2.12, 1.12), extensive in places; no concretionary ironstone recorded. Occurrence of loamy and sandy red earths probably reflects stratigraphic variations in Tertiary or older sediments.

Vegetation.—Groved yellowjack woodland: *E. similis* (*E. setosa*, *E. trachyphloia*, *E. drepanophylla*), 10 ± 2 m, aligned in groves across the slope; moderately dense to dense understorey of *A. leptostachya* (*A. leptocarpa*, *A. tenuissima*, *A. coriacea*, *Alphitonia excelsa*, *Petalostigma banksii*, *Bursaria incana*, *Gastrolobium grandiflorum*), 4 ± 2 m, over xeric mid-height grass. *Themeda australis* common under tree canopies. Narrower treeless intergroves with spinifex, *Triodia mitchellii* (*T. pungens*).

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

LAND UNIT 2 (7460 KM²)

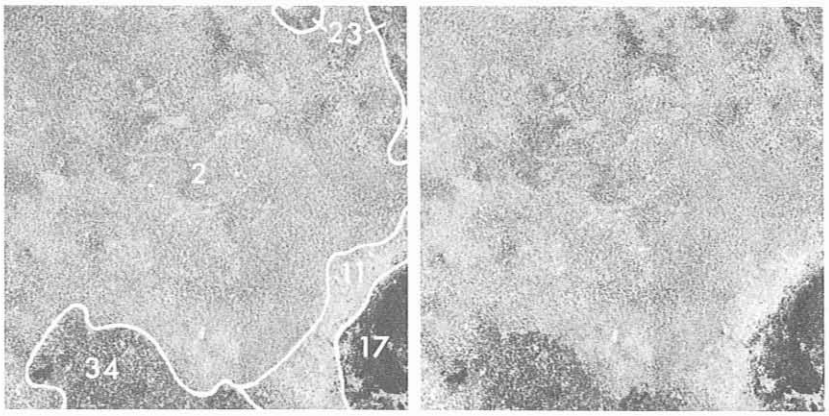
Field Criteria.—Tablelands, gently undulating terrain, silver-leaved ironbark woodland, yellow and red earths.

Climatic Zones.—11(7). Median rainfall: Nov.–Apr., 350 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and upper slopes, generally less than 3%, up to 5%. Numerous conical termite mounds commonly occur.



Soil.—Massive earths: deep loamy yellow earths, Struan (Gn2.22); extensive loamy red earths, Dunrobin (Gn2.12); minor sandy red and yellow earths, Annandale (Gn2.12, 1.12) and Forrester (Gn2.22); small amounts of concretionary ironstone in lower parts of some profiles.

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia* (*E. polycarpa*, *E. papuana*), 10 ± 2 m; sparse to moderately dense understorey of *A. coriacea* (*A. tenuissima*, *Petalostigma pubescens*, *Albizia basaltica*, *Eremophila mitchellii* and *Callitris columellaris* in southern occurrences), 4 ± 2 m, over spinifex, xeric mid-height grass, or a mosaic of both. N.B. May be open-woodland in some occurrences.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

Land Unit 3 (1255 km²)

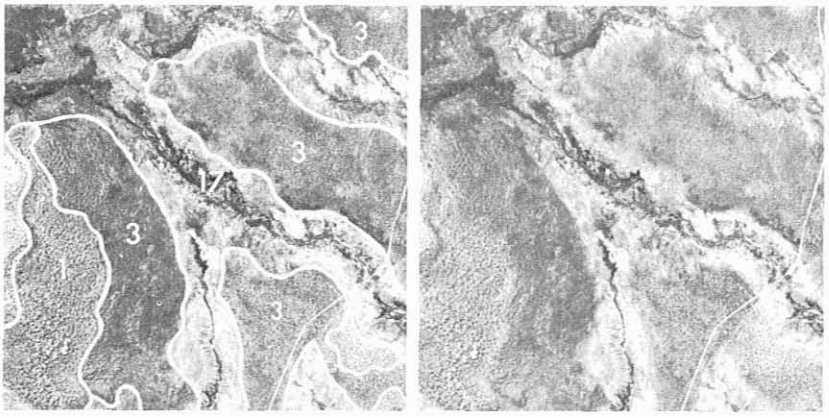
Field Criteria.—Gently undulating terrain, acacia–tea-tree heath, red and yellow earths.

Climatic Zones.—11(7). Median rainfall: Nov.–Apr., 350 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—*Tablelands, mesas and gently undulating terrain.*

Position on Slope.—Crests and upper slopes, generally less than 3%, up to 5%.



Soil.—Massive earths: shallow to moderately deep red and yellow earths, Gregory (Gn2.12), Dunrobin (Gn2.12) and Struan (Gn2.22); shallow sandy soils, Petrona (Uc1.23), extensive in some occurrences; all underlain by concretionary or massive laterite at depths ranging from 60 to 120 cm.

Vegetation.—Open-heath: *A. leptostachya* and/or *Melaleuca uncinata*, 2 ± 1 m, occasional scattered emergent trees (*E. setosa*, *E. papuana*, *E. melanophloia*), 6 ± 2 m, more rarely a low open-woodland of *E. melanophloia* over a dense *A. leptostachya* or *M. nervosa* understorey, 2 ± 1 m, sparse spinifex and/or xeric mid-height grass. Included within this unit are associated areas of open-scrub with virtually monospecific stands of *M. tamariscina*, 4 ± 2 m.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

LAND UNIT 4 (670 KM²)

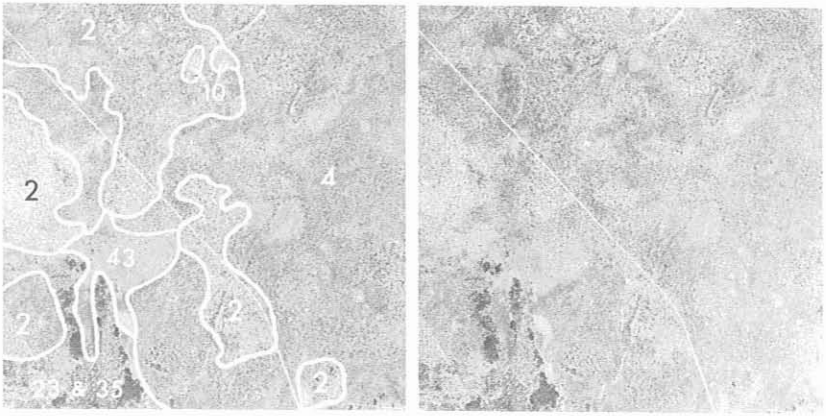
Field Criteria.—Gently undulating terrain, narrow-leaved ironbark woodland, red and yellow earths.

Climatic Zones.—11(7). Median rainfall: Nov.–Apr., 375 ± 50 mm; May–Oct., 100 ± 50 m.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and gentle slopes, generally less than 3%, up to 5%.



Soil.—Massive earths; deep loamy red and yellow earths, Dunrobin (Gn2.12) and Struan (Gn2.22); minor sandy red earths, Annandale (Gn2.12).

Vegetation.—Narrow-leaved ironbark woodland: *E. drepanophylla* or *E. decorticans* in the south (*E. polycarpa*, *E. papuana*, *E. peltata*, *E. melanophloia*), 10 ± 2 m; understorey absent or sparse to moderately dense *A. leptostachya* or *M. nervosa* (*Petalostigma banksii*, *Alphitonia excelsa*, *A. cunninghamii*), 4 ± 2 m, over xeric mid-height grass, spinifex, or a mosaic of both.

Land Capability.—VIm_4n_4. Downgraded on account of low and less effective rainfall.

LAND UNIT 5 (220 KM²)

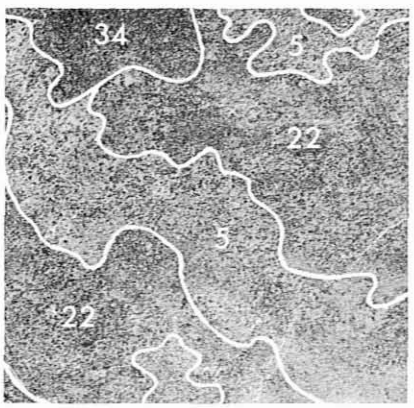
Field Criteria.—Gently undulating terrain, poplar box shrub woodland, red earths.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 125 ± 10 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Crests and upper slopes, mainly less than 2%, up to 4%.



Soil.—Massive earths: deep loamy red earths, Dunrobin (Gn2.12).

Vegetation.—Poplar box shrub woodland: *E. populnea* (*E. melanophloia*), 14 ± 3 m; dense understorey of *Ventilago viminalis*, *Geijera parviflora*, *Albizia basaltica*, *Eremophila mitchellii*, *Heterodendrum oleifolium*, 8 ± 3 m, sometimes occurring without upper stratum; shrub layer moderately dense *Carissa ovata*; sparse xeric mid-height grass or scrub grass where upper layers dense.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

LAND UNIT 6 (2525 KM²)

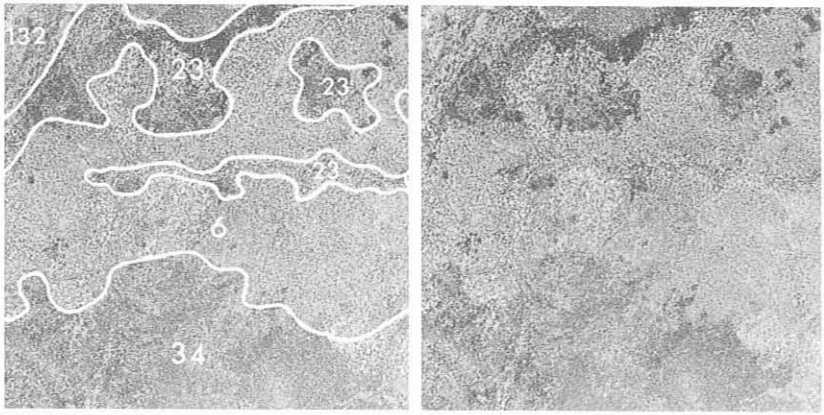
Field Criteria.—Gently undulating terrain, silver-leaved ironbark–bloodwood woodland, red and yellow earths.

Climatic Zones.—10,8,6,5. Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 150 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests, upper and middle slopes, generally less than 3%, up to 5%.



Soil.—Massive earths: deep loamy red and yellow earths, Dunrobin (Gn2.12) and Struan (Gn2.22, 2.42); minor sandy red and yellow earths, Annandale (Gn2.12) and Forrester (Gn2.22).

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia* (*E. polycarpa*, *E. papuana*, *E. populnea*), 12 ± 4 m; sparse to moderately dense understorey of *Petalostigma pubescens*, *Alphitonia excelsa*, *Eremophila mitchellii* (*Lysicarpus angustifolius*), 4 ± 2 m; mesic mid-height grass.

Land Capability.—IVm_4,n_4.

Land Unit 7 (1885 km²)

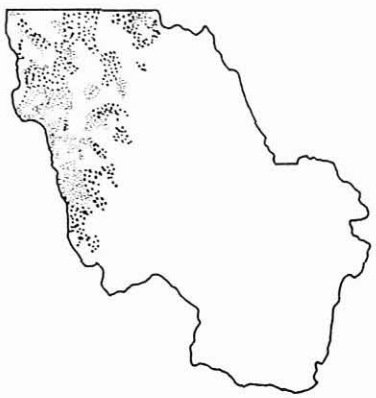
Field Criteria.—Gently undulating terrain, bloodwood–cabbage gum woodland, red earths.

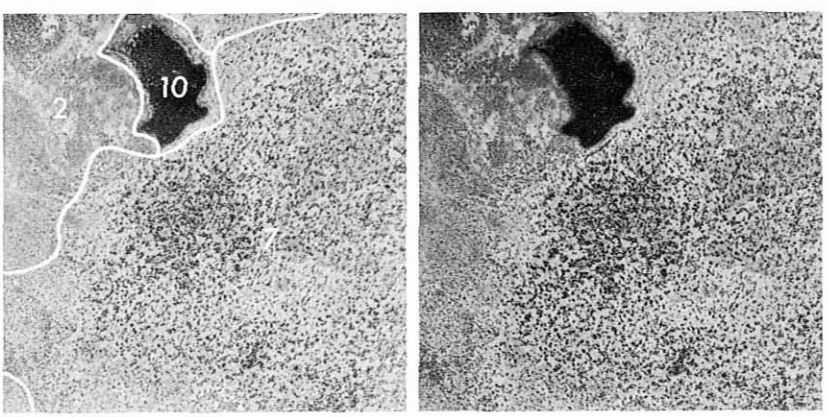
Climatic Zones.—11(7,6). Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 125 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and upper slopes, generally less than 3%, up to 5%.





Soil.—Massive earths: deep loamy red earths, Dunrobin (Gn2.12); minor loamy yellow earths, Struan (Gn2.22), and sandy red and yellow earths, Annandale (Gn2.12, 1.12) and Forrester (Gn2.22).

Vegetation.—Bloodwood–cabbage gum woodland: *E. polycarpa–E. papuana* (*E. tessellaris*), 13 ± 3 m; understorey commonly absent, but where present is sparse to moderately dense *Petalostigma pubescens*, *A. cunninghamii*, *Callitris columellaris*, *Persoonia falcata* (*Lysicarpus angustifolius*), 4 ± 2 m; xeric mid-height grass and/or spinifex.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

LAND UNIT 8 (3655 KM²)

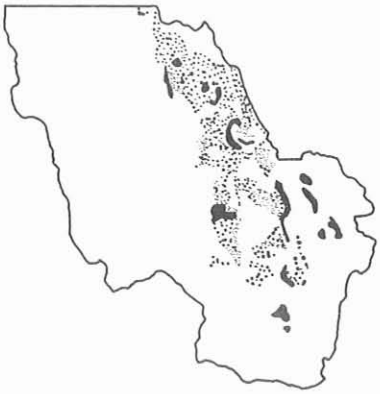
Field Criteria.—Gently undulating terrain, narrow-leaved ironbark shrub woodland, red earths.

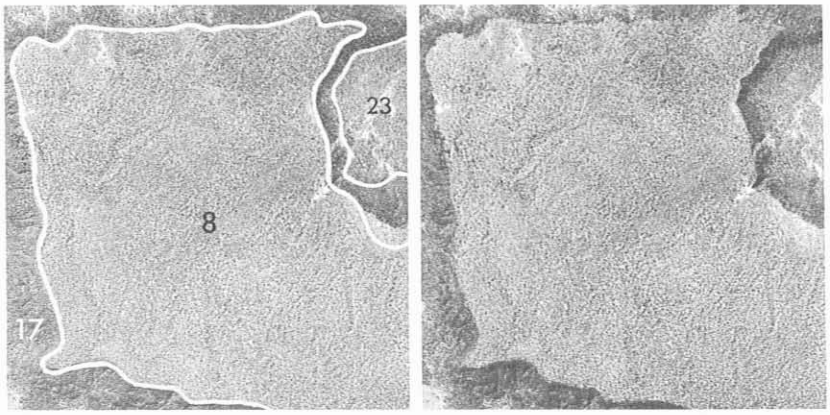
Climatic Zones.—5,6,8(7,9). Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 150 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and gentle upper slopes, generally less than 3%.





Soil.—Massive earths: deep loamy and sandy red earths, Dunrobin (Gn2.12) and Annandale (Gn2.12, 2.11); minor loamy yellow earths, Struan (Gn2.22)

Vegetation.—Narrow-leaved ironbark shrub woodland: *E. crebra*/*E. drepanophylla* (*E. polycarpa*, *E. papuana*, *E. tenuipes*, *E. exserta*), 15 ± 4 m, sparse to moderately dense understorey of *Alphitonia excelsa*, *Petalostigma pubescens*, *A. cunninghamii* (*Lysicarpus angustifolius*, *Cassia brewsteri*), 4 ± 2 m, with abundant shrubs, *Grewia retusa*, *Acacia* spp., *Dodonaea* spp., *Carissa ovata*, 1 ± 0·5 m; sparse mesic mid-height grass. N.B. This unit grades into open-forest formation in the east.

Land Capability.—IVm$_4$,n$_4$.

Land Unit 9 (455 km²)

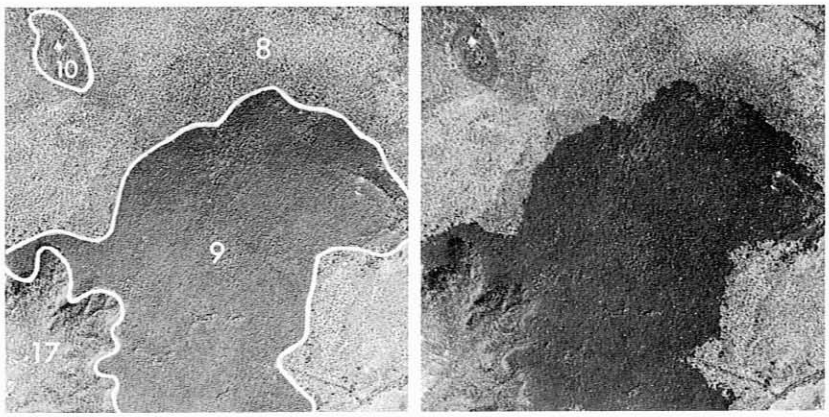
Field Criteria.—Gently undulating terrain, bendee open forest, red and yellow earths.

Climatic Zones.—6(5,8,7,11). Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 150 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and gentle upper and middle slopes, mainly less than 2%, attaining 5% locally.



Soil.—Massive earths: deep loamy red and yellow earths, Dunrobin (Gn2.12, Um5.2) and Struan (Gn2.21); minor sandy red earths, Annandale (Gn2.12).

Vegetation.—Bendee open-forest: *A. catenulata*, 10 ± 2 m, in dense, virtually monospecific stands; understorey absent or very sparse (*Lysicarpus angustifolius*, *Alstonia constricta*, *Micromyrtus* sp.), 4 ± 2 m; litter and very sparse arid scrub grass. N.B. Scattered stands of an attenuated form of this community occurring in the west and north-west have been included. These communities have an open-scrub formation, 4 ± 2 m.

Land Capability.—IVm_4,n_4.

LAND UNIT 10 (415 KM²)

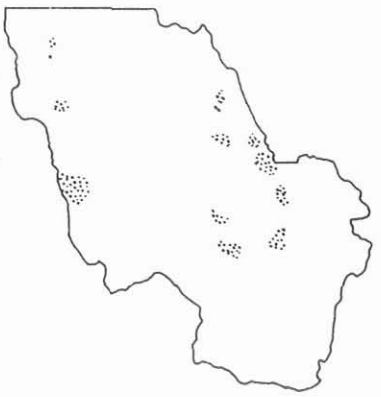
Field Criteria.—Rounded depressions, blue gum woodland, various soils with ironstone concretions.

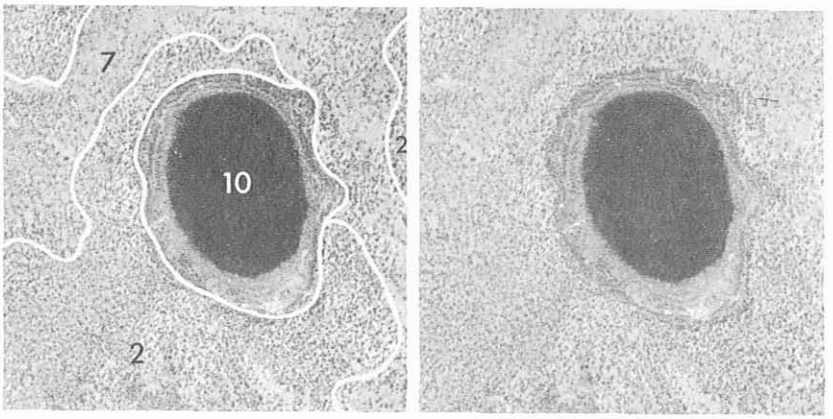
Climatic Zones.—5,6,8,11. Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 125 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Shallow rounded depressions; seasonally flooded; up to 15 m below the level of bordering land, commonly with sandy fringes; up to 1.6 km in diameter; sporadic occurrence.





Soil.—Various: deep cracking clays, Vermont (Ug5.2); shallow skeletal soils in some occurrences, commonly with blocks and outcrops of massive laterite and a surface strew of concretionary ironstone; minor texture-contrast soils, Springwood (Dy3.22).

Vegetation.—Blue gum woodland/open-forest: *E. tereticornis*, 15 ± 5 m; understorey absent or very sparse (*A. stenophylla* in some western occurrences); annual grasses and sedges when not flooded. Margins of depressions commonly fringed by dense stands of *Melaleuca* spp. with *Tristania suaveolens* in the east.

Land Capability.—V–VIw_5, d_{2-6}.

Land Unit 11 (875 km²)

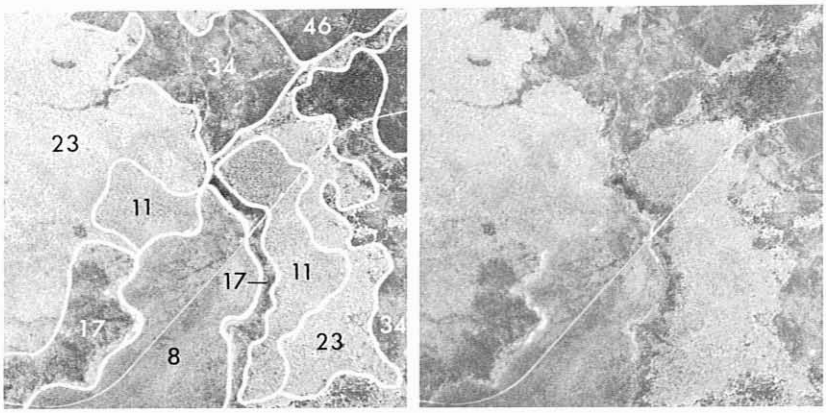
Field Criteria.—Sandy aprons, bloodwood–cabbage gum woodland, sandy soils.

Climatic Zones.—11,10,8,7,6,5. Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 125 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Middle and lower slopes on sandy aprons, generally less than 3%, up to 8%; sporadic occurrence.



Soil.—Uniform coarse-textured: moderately deep to deep sands to sandy loams, Petrona (Uc1.22, 1.23) and Highmount (Uc1.23, 4.21), and deep sandy red massive earths, Annandale (Gn2.12), on colluvium derived from massive earths upslope; concretionary ironstone common in lower profiles.

Vegetation.—Bloodwood–cabbage gum woodland: *E. polycarpa–E. papuana–E. tessellaris* (*E. crebra*, *E. drepanophylla*), 15 ± 5 m; understorey absent to sparse, commonly *Melaleuca* spp. (*A. cunninghamii*, *A. bidwillii*, *Bursaria incana*), 4 ± 2 m; xeric mid-height grass. N.B. This unit commonly merges with and intergrades into adjacent units, particularly *Callitris columellaris* communities.

Land Capability.—VIm_{4-6},n_4,e_4.

LAND UNIT 12 (195 KM²)

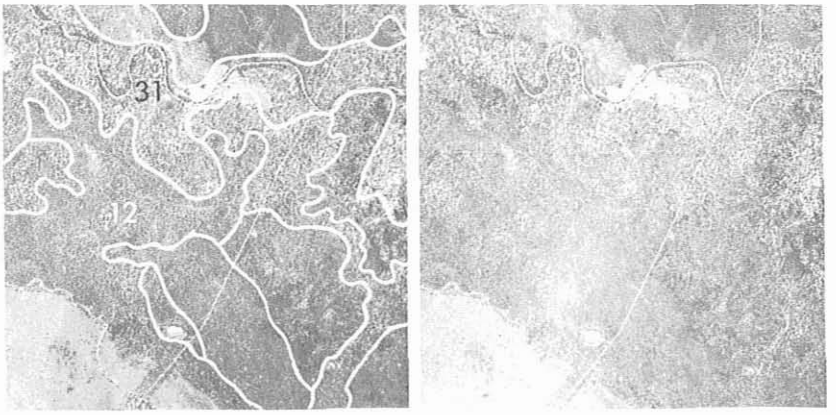
Field Criteria.—Gently undulating terrain, narrow-leaved ironbark shrub woodland, uniform sandy soils.

Climatic Zones.—8,5. Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 150 ± 20 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Crests and upper slopes, mainly less than 3%, up to 5%.



Soil.—Uniform coarse-textured soils: moderately shallow sands to sandy loams, Petrona (Uc1.21), underlain by concretionary ironstone.

Vegetation.—Narrow-leaved ironbark shrub woodland; *E. crebra–E. polycarpa–E. tenuipes*, 15 ± 4 m: moderately dense to dense understorey of *Alphitonia excelsa*, *Petalostigma pubescens*, *Lysicarpus angustifolius*, *A. cunninghamii*, 4 ± 2 m, with abundant shrubs. *Grewia retusa*, *Dodonaea* sp., *Acacia* spp., 1 ± 0.5 m; sparse xeric mid-height grass.

Land Capability.—VIm_{4-6},n_4,d_4.

Land Unit 13 (30 km²)

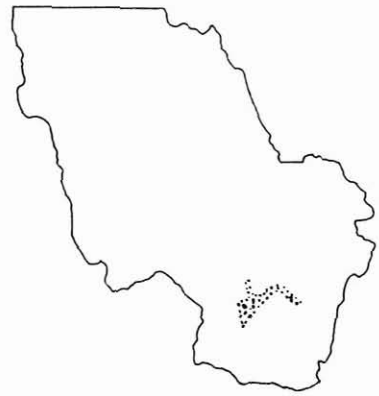
Field Criteria.—Stripped tablelands, sandstone forest, red earths.

Climatic Zones.—9,8. Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 200 ± 10 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Mesas and tableland remnants.

Position on Slope.—Crests and upper slopes, mainly less than 5% but attaining 10% at margins.

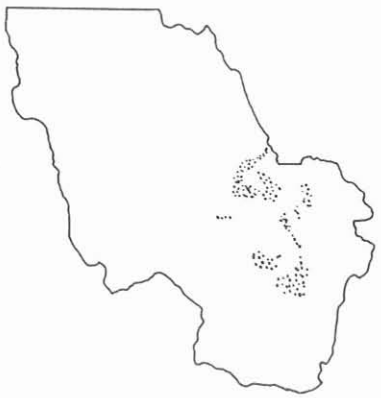


Soil.—Massive earths: deep loamy red earths, Dunrobin (Gn2.11), commonly containing gravel; local exposures of concretionary ironstone and mottled material.

Vegetation.—Sandstone shrubby open-forest: *E. crebra–E. tenuipes–E. polycarpa–E. cloeziana* (*E. maculata*/*E. citriodora*, *Angophora costata*, *Callitris columellaris*), 20 ± 5 m; sparse lower tree layer of *Casuarina inophloia*, *Callitris columellaris*, *Alphitonia excelsa*, *Lysicarpus angustifolius*, 8 ± 2 m, over a moderately dense to dense and floristically rich shrub layer with *Xanthorrhoea* sp., *Acacia* spp., *Boronia* spp., *Leptospermum* spp., *Dodonaea vestita*, *Grevillea longistyla*, *Petalostigma glabrescens*, *Notelaea longifolia*, 2 ± 1 m, and numerous forbs (*Cryptandra amara*, *Mirbelia pungens*, *Helichrysum* spp., *Stylidium* sp., *Actinotus* sp., *Isotoma* sp.); sparse forest grass and/or spinifex.

Land Capability.—IVm_4,e_4,n_4.

Land Unit 14 (165 km²)



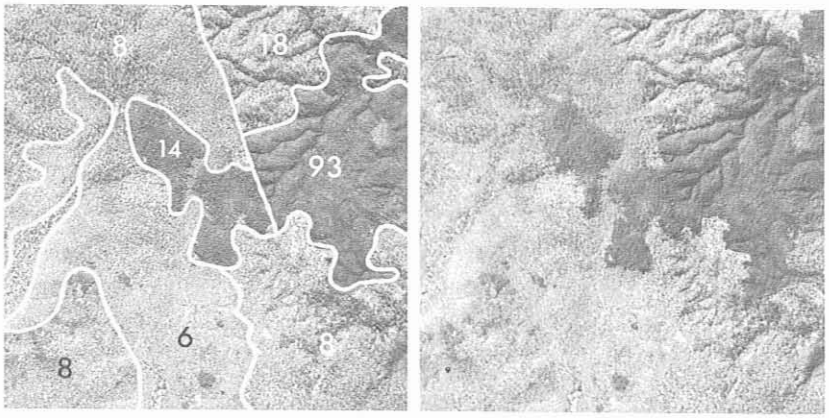
Field Criteria.—Gently undulating terrain, vine thicket, red and yellow earths.

Climatic Zones.—5,6,8. Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Tablelands, mesas and gently undulating terrain.

Position on Slope.—Crests and upper slopes, level or gentle slopes, generally less than 3%.



Soil.—Massive earths: moderately deep to deep, loamy red and yellow earths, Dunrobin (Gn2.12, 2.11) and Struan (Gn2.22).

Vegetation.—Vine thicket; a complex, layered community with a more or less continuous canopy of slender, densely packed trees (*Flindersia australis*, *Alstonia constricta*, *Alphitonia excelsa*, *Excoecaria dallachayana*, *Geijera parviflora*, *Denhamia obscura*, *Diospyros* sp. common, but not constant), 8 ± 2 m; a discontinuous emergent tree layer, principally *Brachychiton rupestre*, *Flindersia australis*, *A. harpophylla*, 15 ± 5 m; a floristically rich shrub layer (*Exocarpus latifolius*, *Acalypha eremorum*, *Heterodendrum diversifolium*, *Carissa ovata* and many others), 2 ± 1 m, over deep litter, ferns, mosses and sparse scrub grass. Lianes common.

Land Capability.—IVm$_4$,n$_4$.

LAND UNIT 15 (190 KM²)

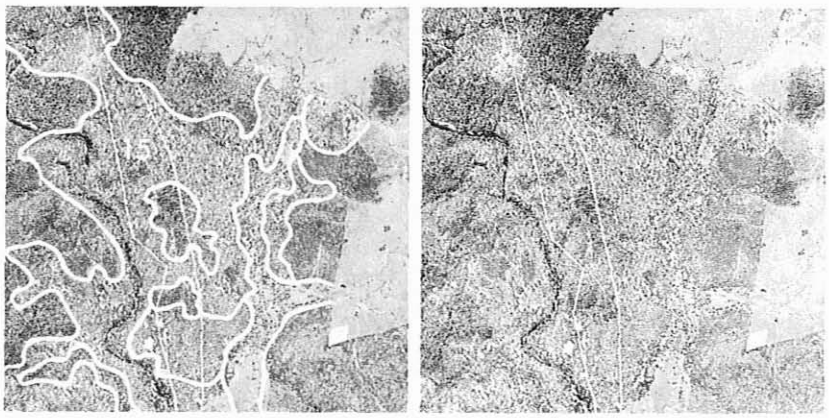
Field Criteria.—Undulating terrain, apple and tumble-down *gum forest, yellow earths* and texture-contrast soils.

Climatic Zone.—9. Median rainfall: Nov.–Apr., 475 ± 25 mm; May.–Oct., 200 ± 10 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Undulating.

Position on Slope.—Upper and middle slopes, up to 5%.



Soil.—Massive earths grading to texture-contrast soils: deep sandy yellow earths, Forrester (Gn2.61), grading to deep texture-contrast soils with thick sandy surface horizons and acid mottled subsoils, Luxor (Dg4.41).

Vegetation.—Apple and tumble-down gum open-forest: *Angophora costata–E. dealbata* (*E. polycarpa, E. crebra, Tristania suaveolens*), 15 ± 4 m; moderately dense understorey of smaller trees (*Alphitonia excelsa, Petalostigma pubescens, A. cunninghamii, A. glaucocarpa*), 6 ± 2 m; sparse forest grass.

Land Capability.—IVm_4,n_4.

Land Unit 16 (120 km²)

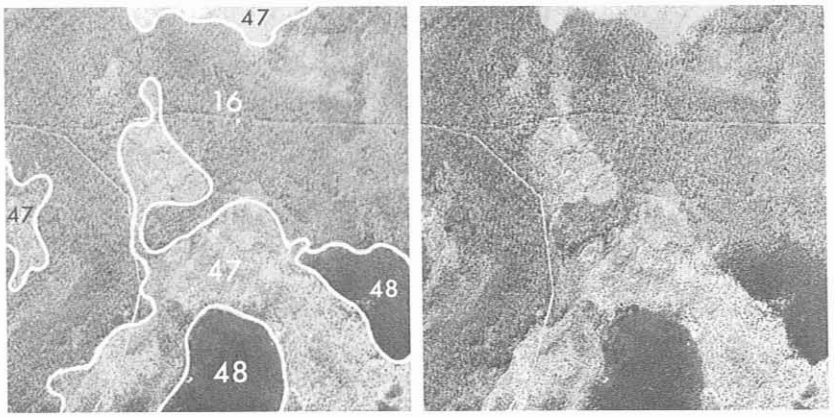
Field Criteria.—Undulating terrain, spotted gum forest, red earths.

Climatic Zone.—9. Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 200 ± 10 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Undulating.

Position on Slope.—Crests and upper slopes, mainly less than 2%, up to 5% locally.



Soil.—Massive earths: deep loamy red earths, Dunrobin (Gn2.12, 2.11); minor sandy red earths, Annandale (Gn2.12), and loamy yellow earths, Struan (Gn2.21).

Vegetation.—Spotted gum open-forest: *E. maculata* (*E. crebra*, *E. polycarpa*), 22 ± 5 m; sparse understorey (except where canopy opened up through logging operations) of *A. glaucocarpa*, *A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma pubescens*, 6 ± 2 m; sparse forest grass.

Land Capability.—IVm_4,n_4.

Land Unit 17 (8480 km²)

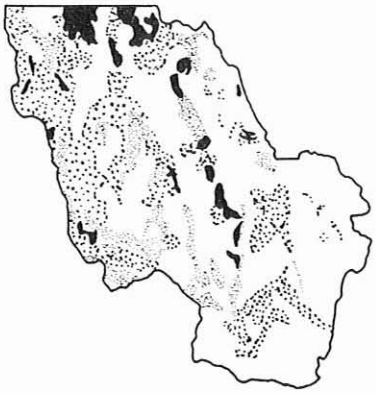
Field Criteria.—Scarps, dissected hilly terrain, lancewood open-forest, shallow soils.

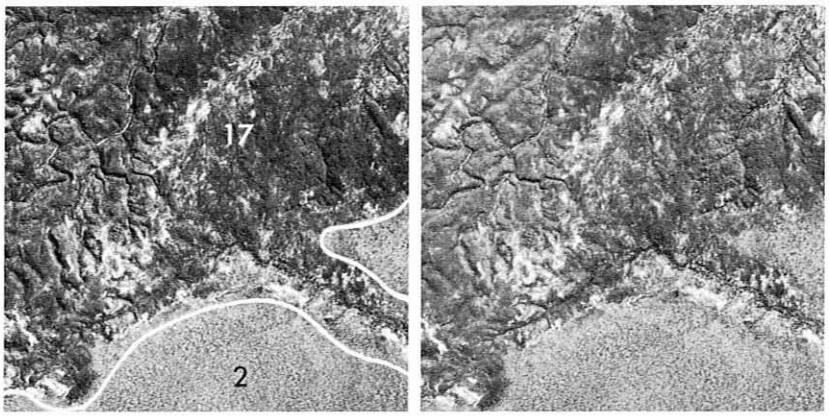
Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 130 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary sediments and volcanics.

Terrain.—Hilly to mountainous.

Position on Slope.—Slopes on breakaways, dissected scarp zones, hills and strike ridges, 10 to 100%.





Soil.—Skeletal soils: mainly very shallow, gravelly or stony soils, Shotover (Uc1.2) or Rugby (Um1.4); extensive shallow red and yellow earths on stripped upper margins, Gregory (Gn2.11, 2.12); minor deep soils, Dunrobin (Gn2.12) and Struan (Gn2.22), uniform coarse-textured soils, Petrona (Uc1.21), and shallow to moderately deep texture-contrast soils on lower margins, Southernwood (Dy2.32, Dr3.11), Medway (Db1.33) and Luxor (Dy3.42); extensive outcrops of mottled, pallid and silicified zones; stones and cobbles on surface.

Vegetation.—Lancewood low open-forest: *A. shirleyi* (*A. catenulata*, *A. rhodoxylon*), 8 ± 3 m, as monospecific stands or associated with occasional other tree species such as *E. thozetiana* (throughout), *E. normantonensis* and *Melaleuca tamariscina* (in north), *E. crebra*, *E. decorticans*, *E. citriodora* or *E. exserta* (in south), 10 ± 3 m; understorey absent or sparse (*A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma* spp., *Erythroxylum* sp.), 5 ± 3 m; sparse arid scrub grass.

Land Capability.—VII–VIIIt_{7-8},r_{7-8},d_{6-7}.

Land Unit 18 (720 km²)

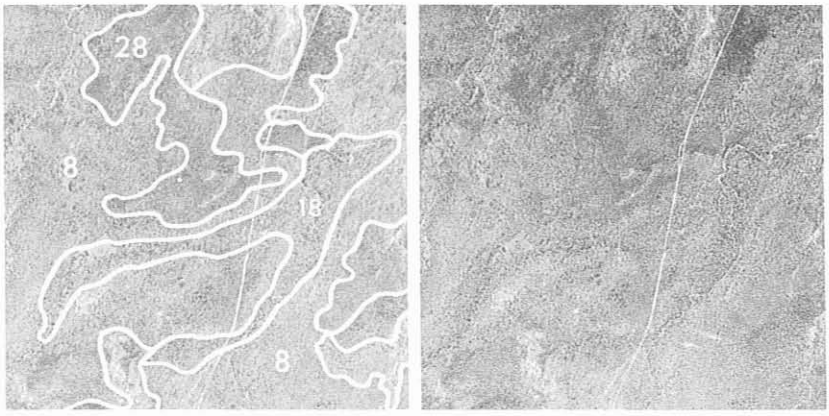
Field Criteria.—Foot slopes, sandstone hills, lemon-scented gum open-forest, shallow soils.

Climatic Zones.—All zones except 7, but mainly south of Tropic. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 180 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary rocks.

Terrain.—Hilly.

Position on Slope.—Upper, middle and lower slopes up to 20%, generally in narrow belts on lower slopes below breakaways, strike ridges or sandstone ranges.



Soil.—Skeletal and shallow sandy soils: very shallow to shallow sandy soils, Shotover and Petrona (Uc1.2), generally gravelly or stony with outcrop, extensive shallow to moderately deep red and yellow earths, Gregory and Dunrobin (Gn2.11, 2.12) and Struan (Gn2.22); minor texture-contrast soils, Springwood (Db1.32) and Wyseby (Dy3.41).

Vegetation.—Lemon-scented gum open-forest: *E. citriodora* (*E. crebra*/*E. drepanophylla*, *E. polycarpa*, *E. tenuipes*), 21 ± 5 m; understorey sparse, sometimes moderately dense (*A. cunninghamii*, *Alphitonia excelsa*, *Lysicarpus angustifolius*, *Petalostigma pubescens*, *Bursaria spinosa*, *Persoonia falcata*, *Xanthorrhoea* sp., *Acacia* spp.), 6 ± 4 m; sparse forest grass. N.B. This community often thinned through selective logging and on drier sites may be a woodland formation.

Land Capability.—VIt_6,d_{4-6},r_{4-6}.

Land Unit 19 (850 km²)

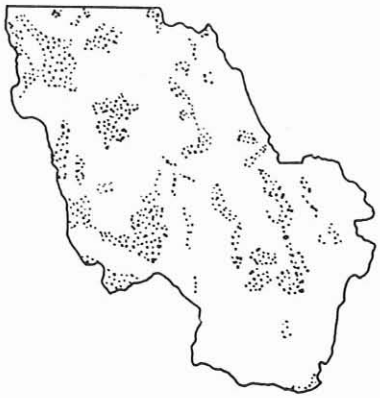
Field Criteria.—Lower scarp slopes, yapunyah woodland with lancewood or bendee, texture-contrast soils.

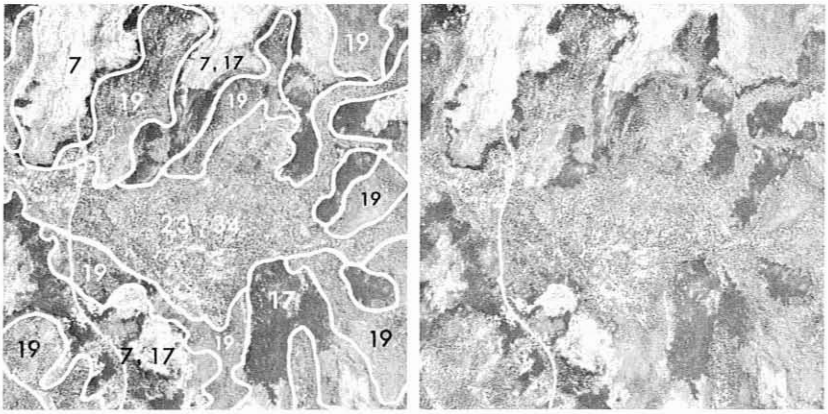
Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 430 ± 125 mm; May–Oct., 180 ± 30 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate, some pre-Tertiary rocks.

Terrain.—Undulating to hilly.

Position on Slope.—Foot slopes below scarps and rocky low hills, up to 20%.





Soil.—Shallow texture-contrast soils: Medway (Db1.33, 1.43, Dy3.43) and Southernwood (Dr3.11, Db3.11, Dd1.32); minor deep soils, underlain by hard weathered-zone materials, Taurus (Db1.33) and Luxor (Dy2.42, 3.41), commonly with gravelly upper horizons and stony surfaces.

Vegetation.—Yapunyah woodland: *E. thozetiana* (*A. shirleyi*, *A. catenulata*), 10 ± 3 m; understorey absent in some occurrences, but commonly moderately dense to dense *Geijera parviflora*, *Eremophila mitchellii*, 4 ± 2 m, over a shrub layer of *Carissa ovata*, 1 ± 0·5 m; sparse xeric mid-height grass.

Land Capability.—VIt_6,d_{4-6},r_{4-6}.

LAND UNIT 20 (1100 KM²)

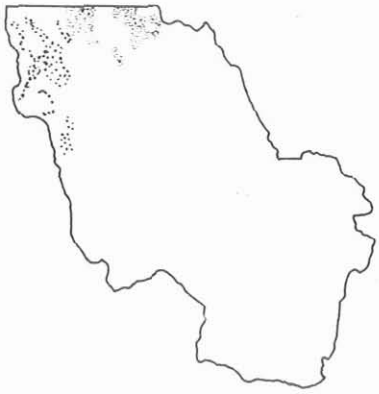
Field Criteria.—Undulating lowlands, Normanton box woodland, texture-contrast soils.

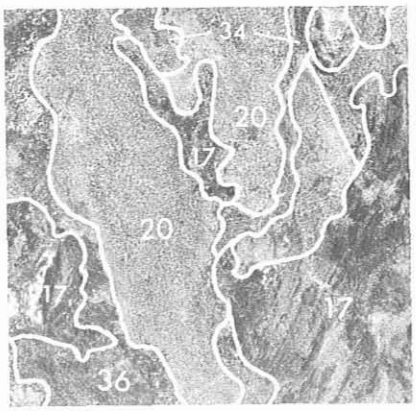
Climatic Zones.—7(11). Median rainfall: Nov.–Apr., 380 ± 75 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary rocks.

Terrain.—Undulating.

Position on Slope.—Middle and lower slopes, 1–5%.





Soil.—Texture-contrast soils: shallow to moderately deep soils, mainly Medway (Dr2.13, Db1.43, Dy2.43, 3.43), Southernwood (Dr2.32, 3.12, Db1.42) and Luxor (Dy2.22, 2.42, 3.42), commonly with columnar structure; minor Taurus (Db1.33), Broadmeadow (Dy2.23) and Wyseby (Dr2.22).

Vegetation.—Normanton box low woodland: *E. normantonensis*, 9 ± 2 m, with a characteristic clumped multi-stemmed habit; understorey absent or very sparse (occasional *Casuarina luehmannii* in the NE.) with scattered shrubs (*Carissa ovata*); xeric mid-height grass and/or spinifex.

Land Capability.—VId_{4},p_{4},s_{3-4}. Downgraded on account of low and less effective rainfall.

LAND UNIT 21 (1490 KM²)

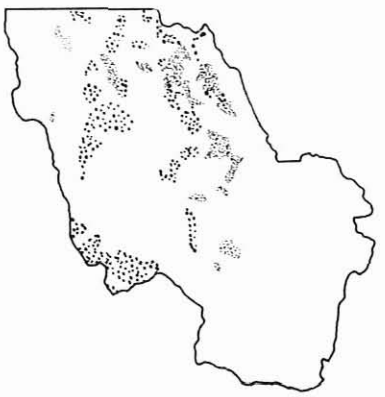
Field Criteria.—Gently undulating lowlands, poplar box grassy woodland, texture-contrast soils.

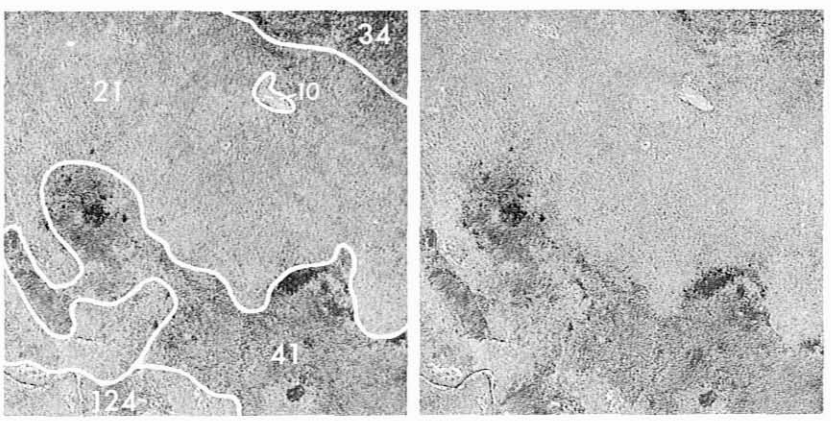
Climatic Zones.—6,7(8,10,11). Median rainfall: Nov.–Apr., 430 ± 125 mm; May–Oct., 130 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary sediments and volcanics.

Terrain.—Level to gently undulating.

Position on Slope.—Upper, middle and lower slopes, generally less than 3%, up to 5%.





Soil.—Deep texture-contrast soils: thick sandy surface horizons and mottled, neutral to alkaline subsoils, commonly with columnar or degraded columnar structure, Luxor (Dy3.22, 3.42, 3.21, 5.21) and Broadmeadow (Dy3.23, 3.43, 2.43, 2.23); minor Wyseby (Dr2.22, 2.32), Springwood (Dy3.22, 2.32, Db1.32) and Retro (Dy2.23, Db2.13).

Vegetation.—Poplar box grassy woodland: *E. populnea* gradually replaced by *E. brownii* in NW. (*E. melanophloia*, *E. crebra*/*E. drepanophylla*, *E. tessellaris*, *E. alba*), 14 ± 3 m; understorey absent or very sparse (*Casuarina luehmannii*, *Acacia* spp., *Cassia brewsteri*, *Diospyros* sp.), 5 ± 2 m; mesic mid-height grass grading into xeric mid-height grass in the west.

Land Capability.—$IVp_{3-4},e_{3-4},s_{3-4}$.

LAND UNIT 22 (2145 KM²)

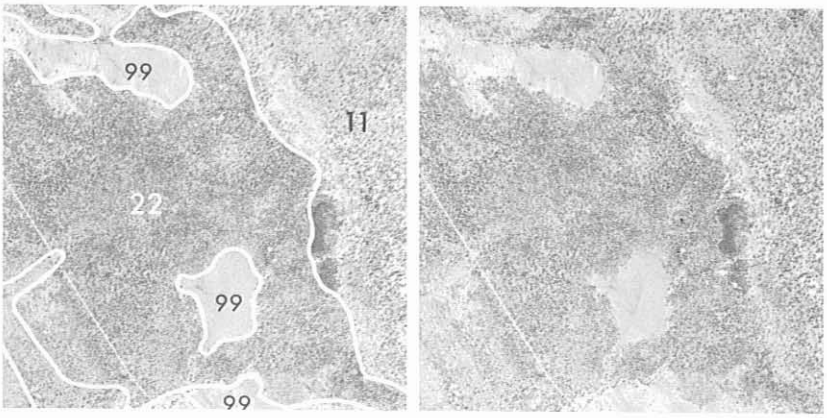
Field Criteria.—Gently undulating lowlands, poplar box–brigalow shrub woodland, texture-contrast soils.

Climatic Zones.—11(10,8,7,6). Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 130 ± 30 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone, and conglomerate; some pre-Tertiary sediments and volcanics.

Terrain.—Level to gently undulating.

Position on Slope.—Middle and lower slopes, generally less than 3%, up to 5%.



Soil.—Deep texture-contrast soils: thin to thick sandy hard-setting surface horizons and neutral to strongly alkaline subsoils, Taurus (Dr2.13, Dy2.23), Luxor (Dy3.22, Dr2.22) and Broadmeadow (Dr2.13, Db1.23); minor Retro (Dr2.13, Dr3.33, Db1.33).

Vegetation.—Poplar box–brigalow shrub woodland: *E. populnea*, 14 ± 3 m; moderately dense to dense understorey to *A. harpophylla*, *Eremophila mitchellii* (*Geijera parviflora*, *Albizia basaltica*, *Ventilago viminalis*), 6 ± 2 m, over moderately dense to dense shrub layer of *Carissa ovata*, *Heterodendrum diversifolium* (*Geijera parviflora* in south), 2 ± 1 m; sparse scrub grass, xeric and/or mesic mid-height grass. N.B. This unit is an ecotone between poplar box and brigalow communities.

Land Capability.—$IVp_{3-4},e_{3-4},s_{3-4}$.

Land Unit 23 (8965 km²)

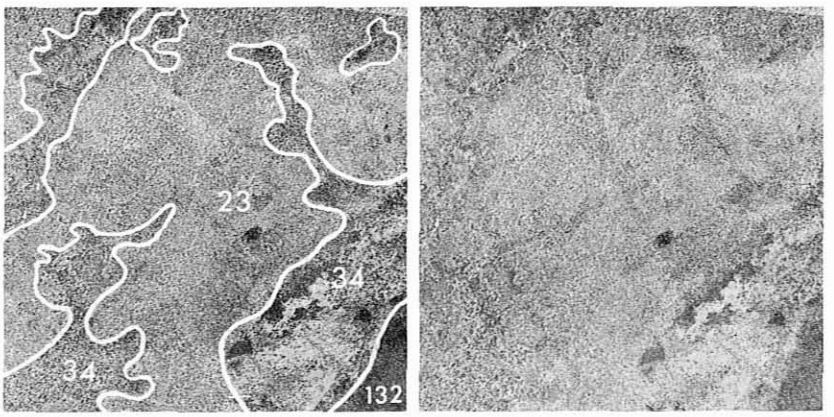
Field Criteria.—Gently undulating lowlands, poplar box shrub woodland, texture-contrast soils.

Climatic Zones.—6,7,8,10,11(5). Median rainfall: Nov.–Apr., 430 ± 125 mm; May–Oct., 130 ± 75 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary sediments and volcanics.

Terrain.—Level to gently undulating.

Position on Slope.—Upper, middle and lower slopes, mainly less than 3%, up to 5%.



Soil.—Deep texture-contrast soils: thick sandy surface horizons and mottled, acid to strongly alkaline subsoils, commonly with columnar or degraded columnar structure, Luxor (Dy3.22, 3.42, 3.41, 5.81, Dr2.22, Db2.22) and Broadmeadow (Dy2.23, 3.23, 3.43, 2.43, Db1.23); minor Springwood (Dy2.32, 3.21,2.32), Taurus (Dr2.23, Db1.33, Dy3.23, 2.43, 5.61), Wyseby (Dr2.12) and Retro (Db1.13).

Vegetation.—Poplar box shrub woodland: *E. populnea* gradually replaced by *E. brownii* in NW., 14 ± 3 m; moderately dense understorey, commonly with an upper tree layer of *Geijera parviflora*, *Ventilago viminalis* (*Casuarina luehmannii*, *Callitris columellaris* in some occurrences), 8 ± 3 m, and a lower tree layer of *Eremophila mitchellii* (*Albizia basaltica*, *Acacia* spp.), 5 ± 2 m, and shrub layer of *Carissa ovata* (*Erythroxylum australe*, *Capparis lasiantha*), 1 ± 0·5 m; xeric or mesic mid-height grass and scrub grass where understorey is dense.

Land Capability.—$IVp_{3-4},e_{3-4},s_{3-4}$.

Land Unit 24 (490 km²)

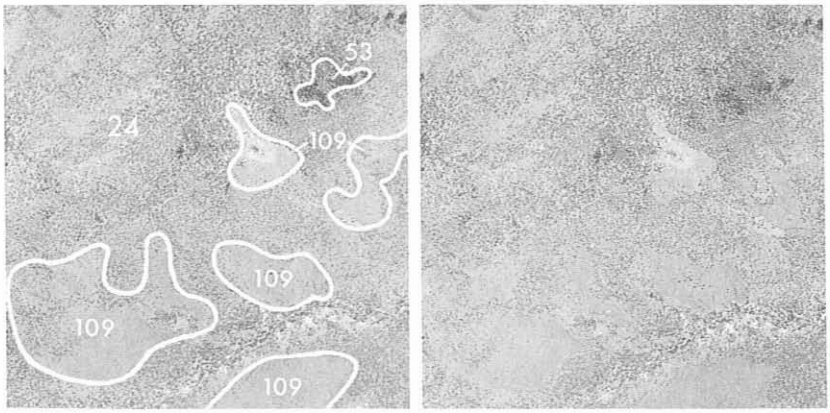
Field Criteria.—Gently undulating terrain, silver-leaved ironbark woodland, texture-contrast soils.

Climatic Zones.—8(10,6). Median rainfall: Nov.–Apr., 430 ± 75 mm; May–Oct., 130 ± 30 mm.

Lithology.—Lateritized sediments and thin gravelly deposits over Tertiary basalt.

Terrain.—Level to gently undulating.

Position on Slope.—Crestal, middle and lower slopes, mainly less than 3%, up to 10%, shallow gilgai in places.



Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons and acid to strongly alkaline subsoils, Taurus (Dr2.13, Db1.13), Wyseby (Dr2.12, Db1.12) and Springwood (Db1.32, Dy3.22); minor Luxor (Dy2.32, 3.21, 5.21), Broadmeadow (Dy3.43), Southernwood (Dd1.12) and Medway (Dy3.43); sparse surface strew of quartz gravel common.

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. crebra*, *E. orgadophila*, *E. papuana*), 12 ± 3 m; understorey absent or very sparse, sometimes a scattered shrub layer (*Carissa ovata*), 1 ± 0·5 m; mesic mid-height grass and/or blue grass.

Land Capability.—III–IVp_{3-4},e_{3-4}.

Land Unit 25 (2375 km²)

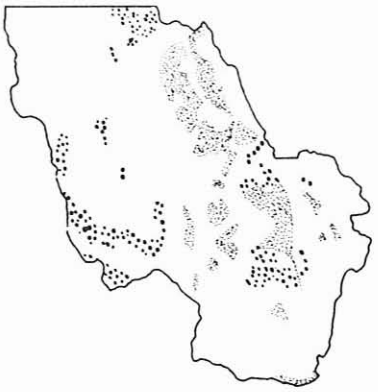
Field Criteria.—Undulating terrain, narrow-leaved ironbark woodland, texture-contrast soils.

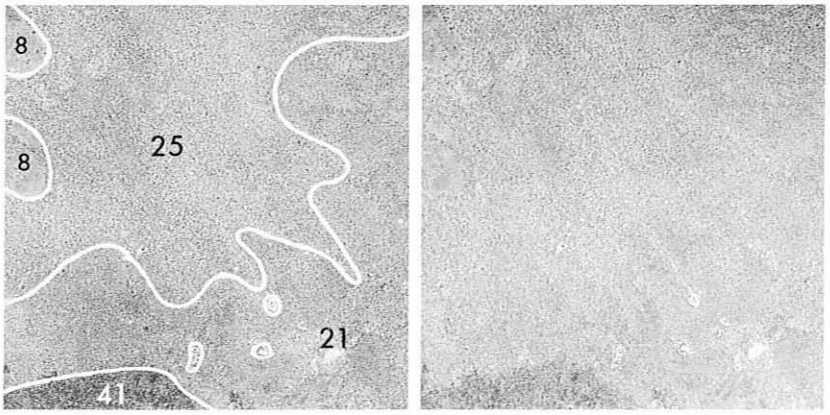
Climatic Zones.—5,6,8(7,9,10,11). Median rainfall: Nov.–Apr., 430 ± 125 mm; May–Oct., 130 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary sediments and volcanics.

Terrain.—Undulating.

Position on Slope.—Middle and lower slopes, mainly less than 3%, up to 5%.





Soil.—Deep texture-contrast soils: thick sandy surface horizons and acid to strongly alkaline subsoils, commonly with columnar structure, Luxor (Dy3.21, 3.41, 2.22, 2.42, 5.21, 5.41) and Broadmeadow (Dy3.23, 3.43); extensive Springwood (Dy3.22, 4.51, Db1.22) and Taurus (Dy3.23, 5.83); minor shallow soils on steeper slopes, Southernwood (Dr3.12, 2.32) and Medway (Dy3.43).

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra*/*E. drepanophylla* (*E. polycarpa*, *E. tessellaris*), 15 ± 4 m; understorey sometimes absent, but commonly sparse to moderately dense *Petalostigma pubescens*, *Alphitonia excelsa*, *Lysicarpus angustifolius* (*Casuarina luehmannii*, localized occurrences), 6 ± 2 m; mesic mid-height grass.

Land Capability.—$IVp_{3-4},e_{3-4},s_{3-4}$.

LAND UNIT 26 (605 KM²)

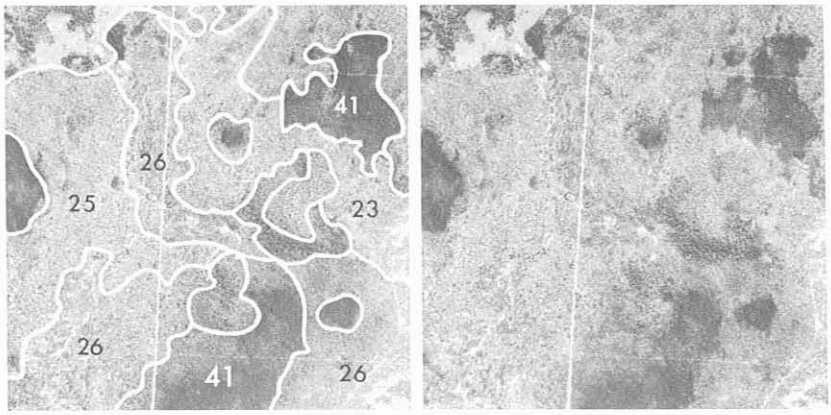
Field Criteria.—Gently undulating terrain, gum-topped box woodland, texture-contrast soils.

Climatic Zones.—4,5,6,8. Median rainfall: Nov.–Apr., 530 ± 75 mm; May–Oct., 200 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary rocks.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, mainly less than 1%, up to 3%.



Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons and mainly acid to neutral, occasionally strongly alkaline subsoils, Springwood (Dr2.32, 3.41, Dy3.42) and Wyseby (Dr2.31, Db1.11, Dy3.42); minor Retro (Dy4.33).

Vegetation.—Gum-topped box woodland: *E. moluccana* (*E. populnea*, *E. crebra*), 15 ± 4 m; understorey absent or sparse (*Eremophila mitchellii*, *Flindersia dissosperma*, *Eremocitrus glauca*), 5 ± 2 m; sparse mesic mid-height grass and forest grass where foliage cover dense. N.B. This community grades from woodland to open-forest.

Land Capability.—IVp_{3-4},e_{3-4}.

Land Unit 27 (230 km²)

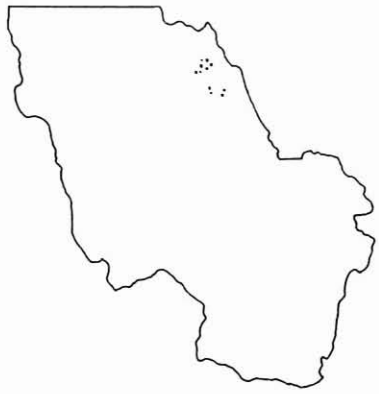
Field Criteria.—Gently undulating terrain, poplar gum woodland, texture-contrast soils.

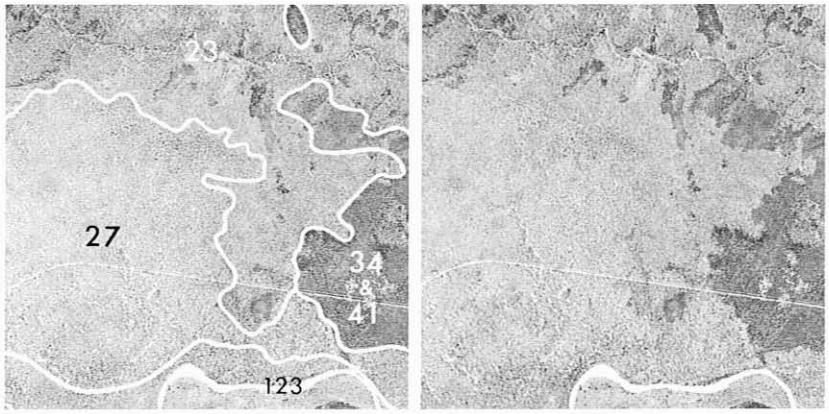
Climatic Zone.—6. Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 180 ± 50 mm.

Lithology.—Lateritized sediments; Tertiary sandstone, claystone and conglomerate.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, up to 3%.





Soil.—Deep texture-contrast soils: thick sandy surface horizons over neutral to alkaline mottled clayey subsoils, Luxor (Dy3.42, 5.42) and Broadmeadow (Dy3.23); concretionary ironstone common in subsurface horizons.

Vegetation.—Poplar gum grassy woodland: *E. alba* (*E. polycarpa*, *E. papuana*, *E. crebra* and sometimes *E. populnea*), 14 ± 3 m; understorey absent or very sparse; mesic mid-height grass.

Land Capability.—IVp_{3-4},e_{3-4}.

LAND UNIT 28 (390 KM²)

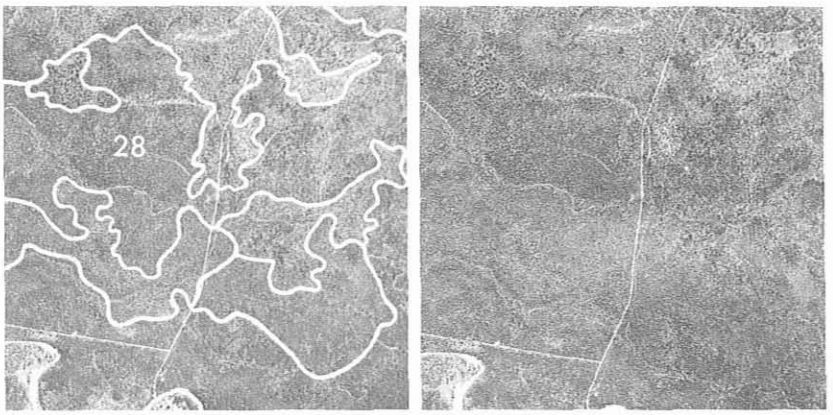
Field Criteria.—Gently undulating terrain, cypress pine forest, texture-contrast soils.

Climatic Zones.—8(5,6). Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 175 ± 25 mm.

Lithology.—Lateritized sediments; Tertiary sandstone, claystone and conglomerate.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, up to 3%.



Soil.—Deep texture-contrast soils: thick sandy surface horizons over acid to alkaline clayey subsoils, Luxor (Dy5.41, 4.61) and Broadmeadow (Dy3.43), commonly with columnar structure.

Vegetation.—Cypress pine open-forest: *Callitris columellaris* (*E. crebra*, *E. polycarpa*, *Angophora costata*), 15 ± 3 m, commonly associated with a lower tree layer of *Casuarina luehmannii*, 12 ± 3 m; understorey very sparse in undisturbed stands, but otherwise moderately dense, *Petalostigma pubescens*, *Lysicarpus angustifolius*, *Acacia* spp., 5 ± 3 m; sparse forest grass.

Land Capability.—$IVp_{3-4},e_{3-4},s_{3-4}$.

Land Unit 29 (260 km²)

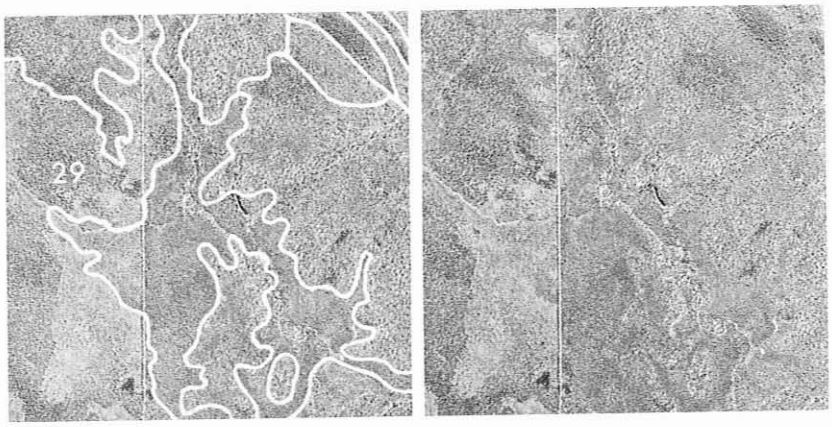
Field Criteria.—Gently undulating terrain, bull oak–blue gum forest, texture-contrast soils.

Climatic Zones.—8(5,6). Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 175 ± 25 mm.

Lithology.—Lateritized sediments; Tertiary sandstone, claystone and conglomerate.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, mainly less than 1%, up to 2%.



Soil.—Deep texture-contrast soils: sandy surface horizons over acid to strongly alkaline subsoils commonly with columnar structure, Luxor (Dy3.41) and Taurus (Dy3.43).

Vegetation.—Bull oak–blue gum open-forest: *Casuarina luehmannii*, 12 ± 3 m, with scattered emergent *E. tereticornis* (*E. tessellaris*, *Angophora costata*), 18 ± 4 m; sparse understorey (*Petalostigma pubescens*, *Grevillea striata*), 5 ± 2 m; deep litter and sparse forest grass.

Land Capability.—IVp_{3-4},s_{3-4}.

Land Unit 30 (200 km²)

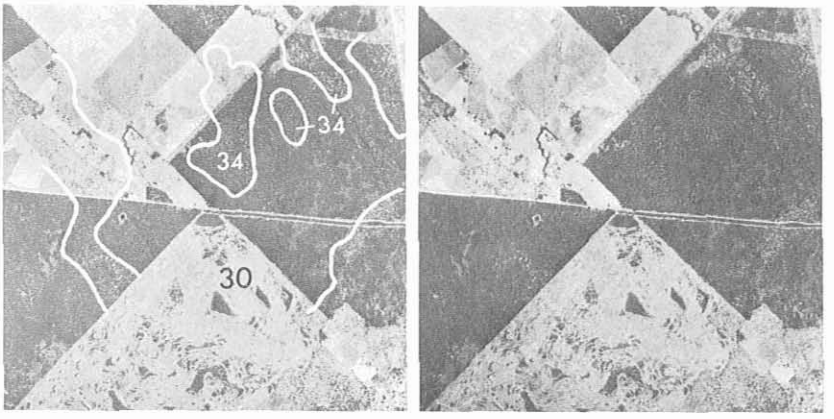
Field Criteria.—Gently undulating terrain, vine thicket, texture-contrast soils.

Climatic Zones.—5,6,8. Median rainfall. Nov.–Apr., 500 ± 75 mm; May–Oct., 175 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary sediments.

Terrain.—Level to gently undulating.

Position on Slope.—Crests and upper slopes, less than 2%.



Soil.—Deep texture-contrast soils: thick, slightly coherent, sandy surface horizons over acid to neutral mottled subsoils, Luxor (Dy3.21, 4.42, 4.82).

Vegetation.—Vine thicket: a complex, layered community with a more or less continuous canopy of slender, densely packed trees (*Flindersia australis*, *Alstonia constricta*, *Alphitonia excelsa*, *Geijera parviflora*, *Croton insularis* and many other species), 8 ± 3 m; a discontinuous emergent tree layer of *Brachychiton rupestre*, *Flindersia australis*, 15 ± 5 m; floristically rich shrub layer (*Exocarpos latifolius*, *Acalypha eremorum*, *Heterodendrum diversifolium*, *Carissa ovata*), 2 ± 1 m; sparse scrub grass. Lianes common.

Land Capability.—IVp$_{3-4}$.

Land Unit 31 (485 km²)

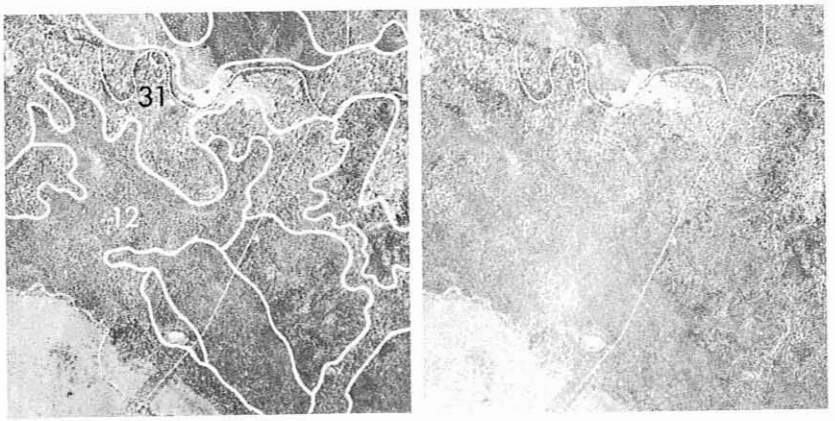
Field Criteria.—Gently undulating terrain, stringybark–apple forest, texture-contrast soils.

Climatic Zones.—8(5,6). Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 175 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate.

Terrain.—Level to gently undulating.

Position on Slope.—Middle and lower slopes, 0–3%.



Soil.—Deep texture-contrast soils: thick, soft, sandy surface horizons over acid, mottled, massive clayey subsoils, Luxor (Dy5.81).

Vegetation.—Stringybark–apple open-forest: *E. acmenioides–Angophora costata* (*E. polycarpa*), 18 ± 6 m; sparse understorey (*Lysicarpus angustifolius*, *Petalostigma pubescens*), 5 ± 3 m; sparse forest grass.

Land Capability.—IVp_{3-4}.

Land Unit 32 (80 km²)

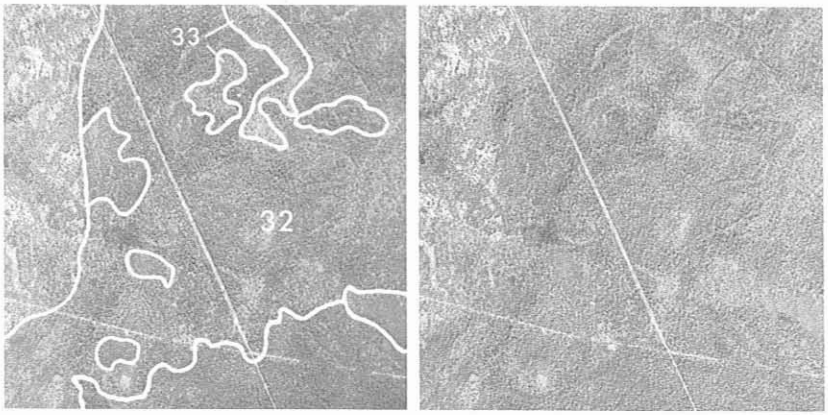
Field Criteria.—Gently undulating terrain, spotted gum–ironbark forest, texture-contrast soils.

Climatic Zone.—5. Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 225 ± 25 mm.

Lithology.—Lateritized granite and granodiorite.

Terrain.—Level to gently undulating.

Position on Slope.—Upper and middle slopes, up to 3%.



Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons over acid mottled subsoils, Springwood (Dr4.11) and Wyseby (Dy3.41, 3.81, Db3.31).

Vegetation.—Spotted gum–ironbark open-forest: *E. maculata–E. fibrosa* and/or *E. crebra*, 24 ± 6 m; sparse to moderately dense understorey of *A. glaucocarpa*, *A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma pubescens* (*Eremophila* sp., *Exocarpos* sp.), 6 ± 3 m. Both *E. exserta* and *Callitris columellaris* occur as small trees in the understorey in some areas; sparse forest grass.

Land Capability.—IVp_{3-4}.

LAND UNIT 33 (55 KM²)

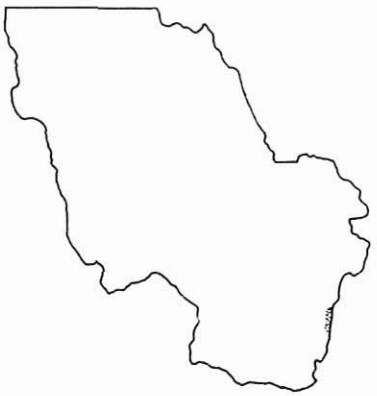
Field Criteria.—Gently undulating terrain, ironbark–spotted gum forest, skeletal soils.

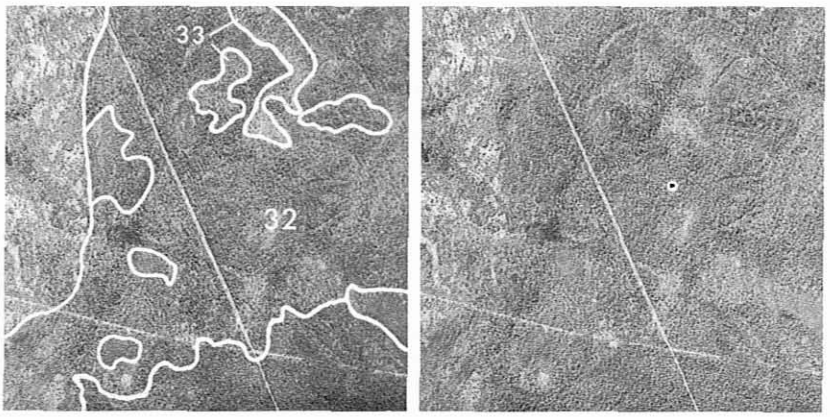
Climatic Zone.—5. Median rainfall: Nov.–Apr., 475 ± 25 mm; May–Oct., 225 ± 25 mm.

Lithology.—Lateritized granite and granodiorite.

Terrain.—Gently undulating.

Position on Slope.—Upper, middle and lower slopes, up to 5%.





Soil.—Skeletal soils: very shallow sandy or loamy soils, Shotover (Uc1.21) and Rugby (Um5.41).

Vegetation.—Ironbark–spotted gum open-forest: *E. crebra–E. maculata* (*E. polycarpa*, *E. tessellaris*), 24 ± 6 m; sparse to moderately dense understorey of *Acacia* spp., *Alphitonia excelsa*, *Petalostigma pubescens*, *Eremophila* sp., 6 ± 3 m; sparse forest grass.

Land Capability.—VId_6.

LAND UNIT 34 (10 285 KM²)

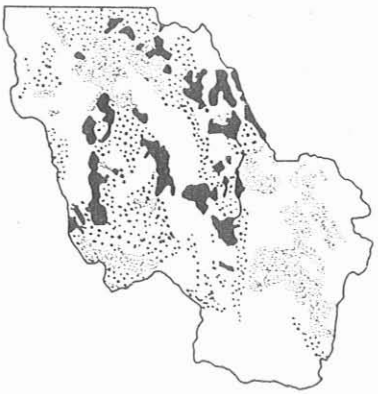
Field Criteria.—Gently undulating terrain, brigalow–blackbutt forest, texture-contrast soils.

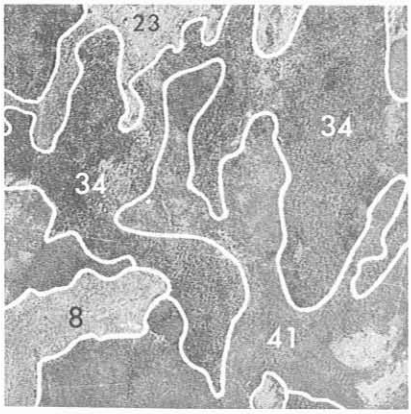
Climatic Zones.—5,6,7,8,10,11(9). Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 175 ± 75 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some basalt and pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Middle and lower slopes, generally less than 2%, up to 8% locally.





Soil.—Texture-contrast soils: deep soils with thin loamy or sandy surface horizons and strongly alkaline subsoils, commonly with columnar structure, Retro (Db1.13, 1.33, Dd1.13, 1.33) and Taurus (Db1.33, Dy2.23, Dr2.23); minor other texture-contrast soils, Springwood (Dy2.32, Dd1.32), Wyseby (Db1.32, Dr2.32), and dark brown and grey-brown soils, Cheshire (Gn3.13); gravel common in subsurface horizons.

Vegetation.—Brigalow–blackbutt open-forest: *A. harpophylla* (or *A. argyrodendron* in NW.), 12 ± 3 m, with *E. cambageana* scattered or in groups (occasionally *E. thozetiana*), 15 ± 4 m; moderately dense to dense understorey of *Eremophila mitchellii* (rarely *Terminalia oblongata*), 5 ± 3 m; moderately dense shrub layer of *Carissa ovata* (*Geijera parviflora* in south), 2 ± 1 m, scrub grass and/or mesic mid-height grass in open areas.

Land Capability.—$IVp_{3-4},s_{3-4},e_{3-4}$.

Land Unit 35 (195 km²)

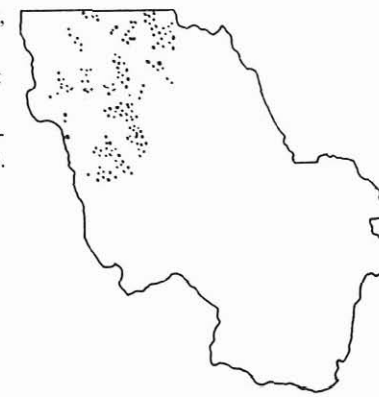
Field Criteria.—Gently undulating terrain, gidgee forest, texture-contrast soils.

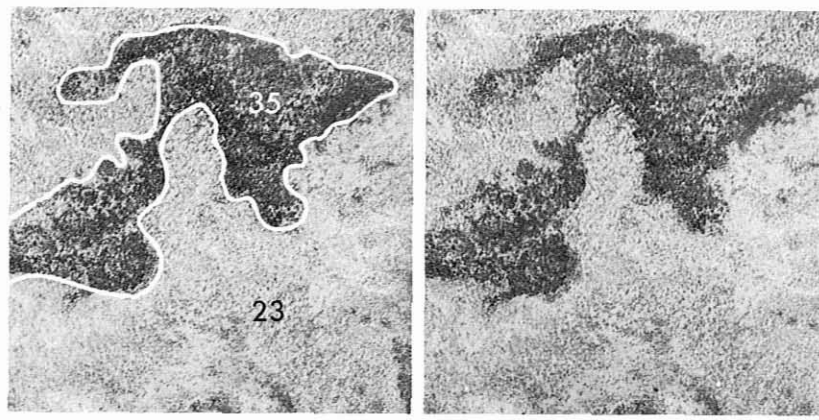
Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Middle and lower slopes, up to 2%.





Soil.—Texture-contrast soils: deep soils mainly with thin sandy or loamy surface horizons and strongly alkaline subsoils, Retro (Db1.13, 1.33, Dy3.43, Dr2.13) and Taurus (Dy2.23); minor Springwood (Dr2.11) and Wyseby (Db1.32).

Vegetation.—Gidgee open-forest: *A. cambagei* 12 ± 3 m; sparse to moderately dense upper tree layer of *Bauhinia carronii*, *Geijera parviflora*, *A. harpophylla* and/or *A. argyrodendron* in some occurrences, 8 ± 2 m; moderately dense lower tree layer of *Eremophila mitchellii* (*Terminalia oblongata*), 3 ± 2 m; moderately dense to dense shrub layer of *Carissa ovata* (*Capparis lasiantha*, *Myoporum deserti*, *Apophyllum anomalum*, *Heterodendrum diversifolium*), 1 ± 0·5 m; sparse scrub grass. On lower-rainfall sites this community grades into low open-forest and woodland.

Land Capability.—IVp_{3-4},s_{3-4}.

Land Unit 36 (400 km²)

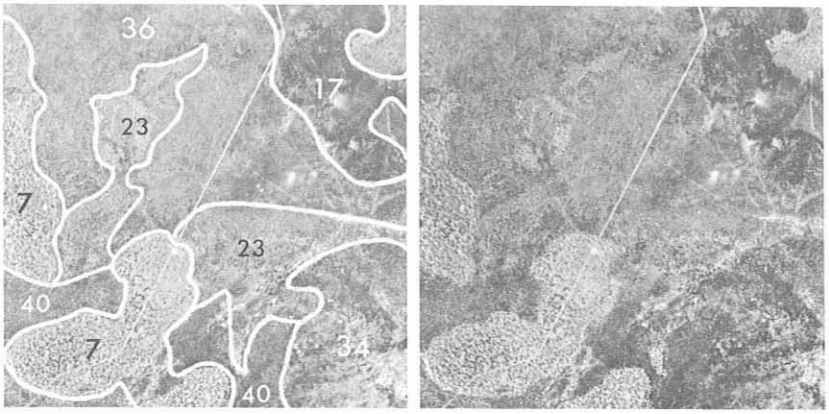
Field Criteria.—Gently undulating terrain, blackwood forest, texture-contrast soils.

Climatic Zones.—7,11. Median rainfall: Nov.–Apr., 425 ± 25 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary rocks.

Terrain.—Level to gently undulating.

Position on Slope.—Middle and lower slopes, generally less than 2%, up to 6%.

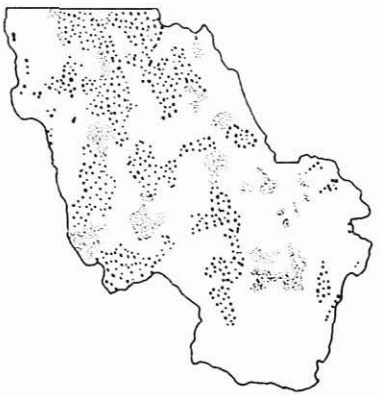


Soil.—Texture-contrast soils: deep, with thin sandy or loamy surface horizons and subsoils with strongly alkaline to neutral reaction, Retro (Db1.13, Dd1 33) and Taurus (Dy2.13, Dd1.33); minor Southernwood (Dr2.12), Springwood (Dr2.12) and Wyseby (Dy2.32).

Vegetation.—Blackwood open-forest: *A. argyrodendron*, 12 ± 3 m; sparse to moderately dense upper tree layer (*A. harpophylla*, *A. cambagei*, *Bauhinia carronii*, *Flindersia dissosperma*). 8 ± 3 m; moderately dense lower tree layer of *Eremophila mitchellii* (and/or *Terminalia oblongata*), 3 ± 1 m; moderately dense to dense shrub layer of *Carissa ovata* (*Myoporum deserti*, *Heterodendrum diversifolium*); sparse scrub grass.

Land Capability.—IVp_{3-4},s_{3-4}.

LAND UNIT 37 (2520 KM²)



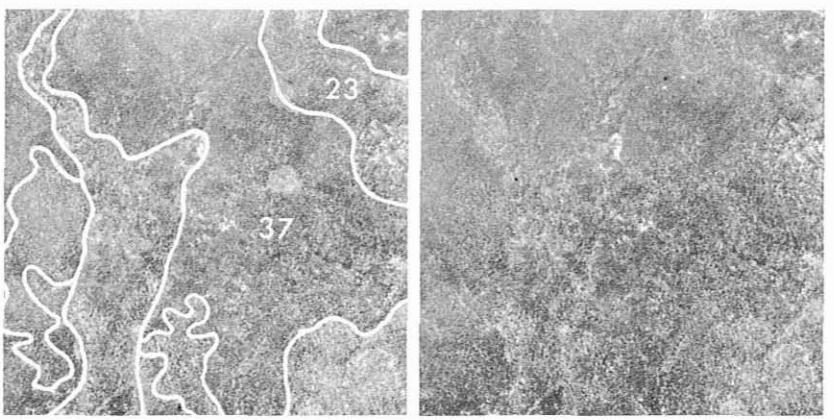
Field Criteria.—*Gently undulating terrain, brigalow forest,* texture-contrast soils.

Climatic Zones.—4,5,6,7,8,10,11(9). Median rainfall: Nov.–Apr., 475 ± 125 mm; May–Oct., 150 ± 50 mm.

Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; some pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Middle and lower slopes, mainly less than 2%, locally up to 8%.



Soil.—Texture-contrast soils: deep soils with thin loamy or sandy surface horizons and strongly alkaline subsoils, Retro (*Db1.13, 1.33, Dr.2.13, Dd1.13*) and Taurus (*Db1.33, Dy2.23, 3.43*); minor other texture-contrast soils, Wyseby (Db1.32, Dd1.32, Dr2.32) and Springwood (Dy3.12).

Vegetation.—Brigalow open-forest: *A. harpophylla*, 12 ± 4 m; sparse to moderately dense upper tree layer of *Bauhinia carronii, Casuarina cristata, Geijera parviflora, Atalaya hemiglauca* (*A. cambagei* and/or *A. argyrodendron* in some occurrences in north-west), 8 ± 3 m; moderately dense lower tree layer of *Eremophila mitchellii*, 3 ± 1 m; moderately dense to dense shrub layer of *Carissa ovata, Heterodendrum diversifolium* (*Geijera parviflora* in south, *Erythroxylum australe, Acalypha eremorum, Exocarpos latifolius* in more humid areas), 2 ± 1 m; sparse scrub grass, ferns and mosses. N.B. *Cadellia pentastylis* and *Brachychiton rupestre* emergents in south-east.

Land Capability.—IVp_{3-4},s_{3-4}.

LAND UNIT 38 (620 KM²)

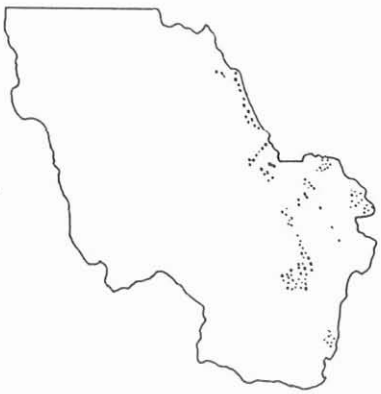
Field Criteria.—Gently undulating terrain, brigalow–blackbutt forest with vine-thicket understorey, texture-contrast soils.

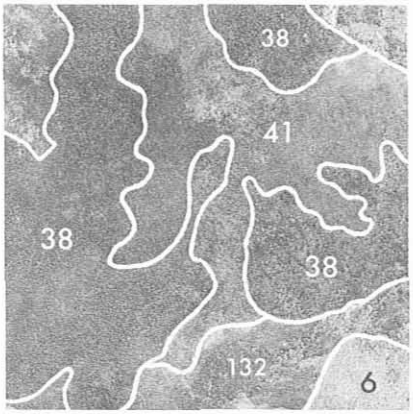
Climatic Zones.—4,5,6(8,9). Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 50 mm.

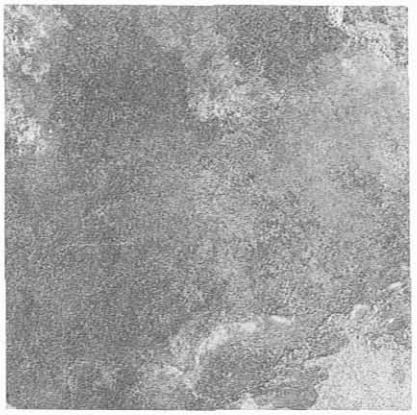
Lithology.—Lateritized sediments; mainly Tertiary sandstone, claystone and conglomerate; minor pre-Tertiary rocks.

Terrain.—Gently undulating.

Position on Slope.—Middle and lower slopes, mainly less than 2%, up to 5%.







Soil.—Texture-contrast soils: deep soils with thin sandy or loamy surface horizons and strongly alkaline subsoils commonly with columnar structure, Taurus (Db1.23, Dd1.13, Dy3.43) and Retro (Dd1.13, 1.33); minor Wyseby (Dy2.12) and Springwood (Dy3.42).

Vegetation.—Brigalow–blackbutt open-forest: *A. harpophylla*, 14 ± 3 m; scattered emergent *E. cambageana*, 18 ± 4 m, forming an upper canopy over a vine-thicket community, with a sparse to moderately dense upper layer of *Flindersia australis*, *Brachychiton rupestre*, *Bauhinia carronii*, *Geijera parviflora*, 8 ± 2 m; moderately dense to dense lower tree layer, *Eremophila mitchellii*, 3 ± 1 m; shrub layer sparse to moderately dense depending on foliage cover of upper layers, commonly with *Carissa ovata*, *Heterodendrum diversifolium* (*Eremocitrus glauca*, *Croton insularis*, *Denhamia obscura*), 2 ± 1 m; sparse scrub grass, ferns and mosses.

Land Capability.—IVp_{3-4},s_{3-4}.

Land Unit 39 (415 km²)

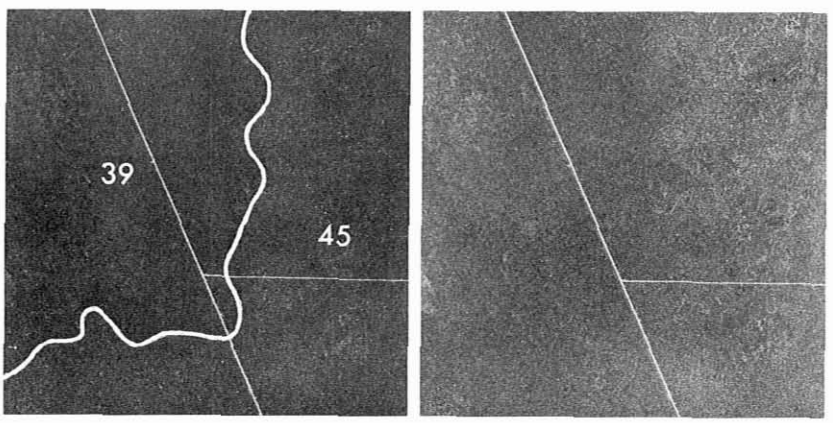
Field Criteria.—Lowland plains, gidgee forest, cracking clay soils.

Climatic Zones.—*11,7. Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 100 ± 25 mm.*

Lithology.—Lateritized sediments; Tertiary clay.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, *generally less than 2%*.



Soil.—Deep cracking clay soils: Rolleston (Ug5.24, 5.34, 5.15), weakly self-mulching with thin, platy surface crust; generally alkaline at or near the surface with acid mottled subsoils, occasionally acid throughout.

Vegetation.—Gidgee open-forest: *A. cambagei* (*A. harpophylla*), 12 ± 4 m; sparse upper tree layer (*Bauhinia carronii, Geijera parviflora, Ventilago viminalis*), 8 ± 3 m; moderately dense to dense lower tree layer of *Terminalia oblongata* (*Eremophila mitchellii*), 4 ± 2 m; moderately dense to dense shrub layer of *Carissa ovata, Heterodendrum diversifolium*, 1 ± 0·5 m; sparse scrub grass. N.B. In the north-west and on drier sites this community may be low open-forest.

Land Capability.—III–IVs_{3-4},k_{2-3}.

Land Unit 40 (90 km²)

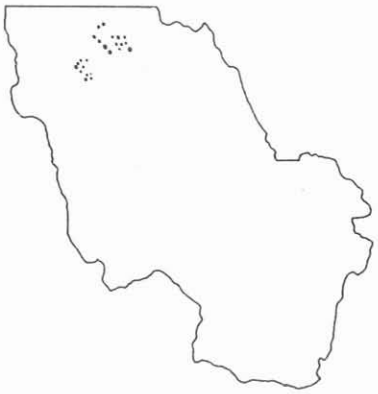
Field Criteria.—Lowland plains, blackwood forest, cracking clay soils.

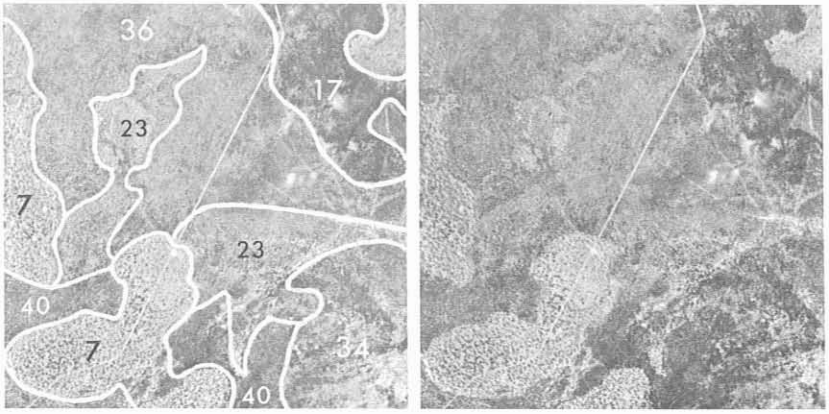
Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Lateritized sediments; Tertiary clay, minor pre-Tertiary volcanics and sediments.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, generally less than 2%.





Soil.—Deep cracking clay soils: Rolleston (Ug5.35), weakly self-mulching with thin, platy surface crust; generally alkaline at or near the surface over acid mottled subsoils.

Vegetation.—Blackwood open-forest: *A. argyrodendron* (often intimately associated with *A. cambagei* and/or *A. harpophylla*), 12 ± 4 m; sparse upper tree layer (*Bauhinia carronii*, *Geijera parviflora*, *Ventilago viminalis*), 8 ± 3 m; moderately dense to dense lower tree layer of *Terminalia oblongata* (*Eremophila mitchellii*), 5 ± 3 m; moderately dense to dense shrub layer of *Carissa ovata*, *Heterodendrum diversifolium*, 1 ± 0·5 m; sparse scrub grass. N.B. In the north-west and on drier sites this community may be low open-forest.

Land Capability.—$IIIs_{2-3},k_{2-3}$.

LAND UNIT 41 (9525 KM²)

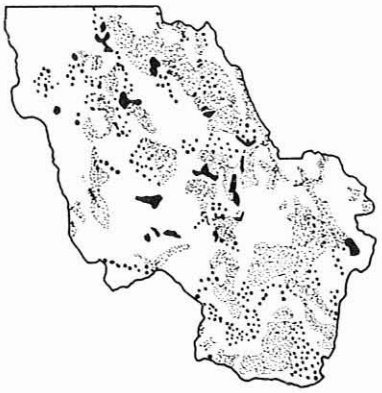
Field Criteria.—Lowland plains, brigalow forest, cracking clay soils.

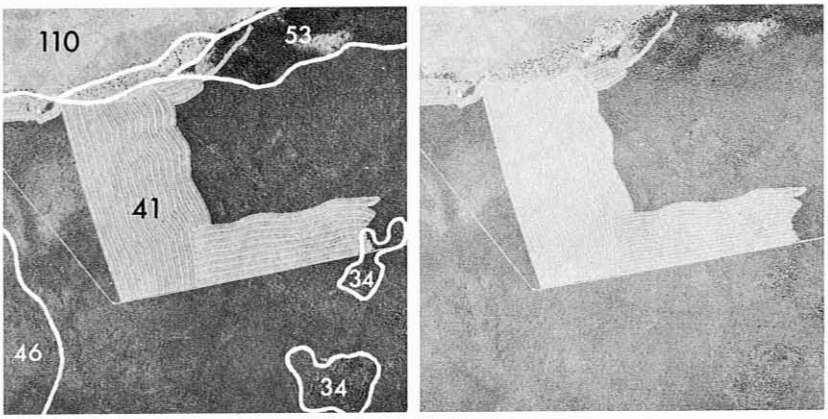
Climatic Zones.—4,5,6,7,8,9,10,11. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 175 ± 75 mm.

Lithology.—Lateritized sediments; Tertiary clay.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes, generally less than 2%.





Soil.—Deep cracking clay soils: Rolleston (Ug5.24, 5.15, 5.16, 5.38), weakly self-mulching with thin, platy surface crust; generally alkaline at or near the surface with acid mottled subsoils, occasionally acid throughout; minor gradational or uniform fine-textured soils, Cheshire (Gn3.23, Uf6.32) in mosaic with cracking clays; gravelly and stony phases occur, e.g. Willows land system.

Vegetation.—Brigalow open-forest: *A. harpophylla* (*Casuarina cristata*), 15 ± 5 m; sparse upper tree layer (*Bauhinia carronii*, *Geijera parviflora*, *Ventilago viminalis*, *Terminalia oblongata* in some northern occurrences, *Brachychiton rupestre*), 8 ± 3 m; moderately dense to dense lower tree layer of *Eremophila mitchellii* (*Terminalia oblongata*, *Croton* spp., *Atalaya hemiglauca*), 5 ± 3 m; moderately dense to dense shrub layer, *Carissa ovata*, *Heterodendrum diversifolium*, *Geijera parviflora* in south and east (*Denhamia obscura*, *Erythroxylum australe*, *Capparis lasiantha*, *Canthium* spp.), 2 ± 1 m; scrub grass, ferns and mosses.

Land Capability.—$IIIk_{2-3},s_{2-3}$.

Land Unit 42 (930 km²)

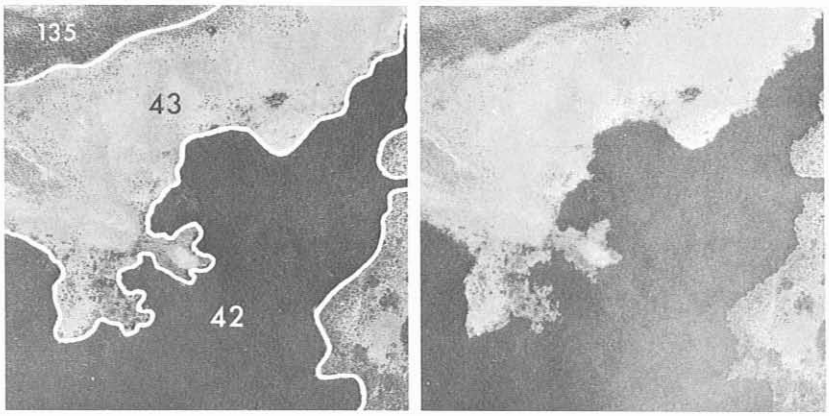
Field Criteria.—Plains, gidgee forest, self-mulching cracking clay soils.

Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Clay derived from deeply weathered basalt and/or possibly shales in the north-west.

Terrain.—Level to very gently undulating.

Position on Slope.—Gentle slopes, less than 1%.



Soil.—Very deep cracking clay soils: dark grey and brown self-mulching clays generally medium to strongly alkaline throughout, Natal (Ug5.24, 5.34); some alkaline/acid clay soils, Logan (Ug5.34, 5.16) with prominent red and grey mottling in subsoils.

Vegetation.—Gidgee open-forest: *A. cambagei* (*A. harpophylla*), 12 ± 4 m; sparse to moderately dense small tree layer of *Terminalia oblongata* (*Eremophila mitchellii*), 5 ± 3 m; moderately dense shrub layer, *Carissa ovata* (*Heterodendrum diversifolium*, *Ehretia membranifolia*), 1 ± 0·5 m; scrub grass. N.B. *Terminalia oblongata* commonly forms an open fringing community between land units 42 and 43.

Land Capability.—$IIIk_{2-3},s_{2-3}$.

Land Unit 43 (855 km²)

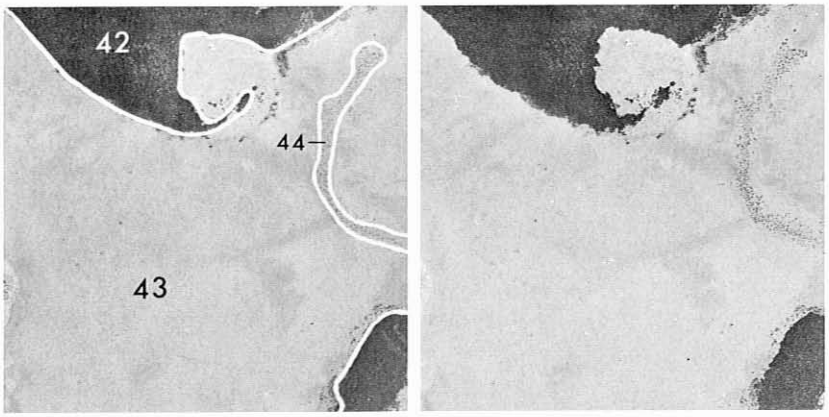
Field Criteria.—Plains, grassland, self-mulching cracking clay soils.

Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Clay derived from deeply weathered basalt and/or possibly shales in the north-west.

Terrain.—Level to very gently undulating.

Position on Slope.—Gentle slopes, less than 2%.



Soil.—Very deep cracking clay soils: dark grey self-mulching clays, generally alkaline to neutral reaction at or near the surface grading to medium or very strongly acid in red and grey mottled subsoils, commonly gypseous, Logan (Ug5.24, 5.16); extensive clay soils with strongly alkaline reaction throughout, Natal (Ug5.16, 5.24).

Vegetation.—Blue grass tussock grassland: tussocks of perennial grasses, *Dichanthium sericeum*, *Thellungia advena*, *Panicum decompositum*, *P. queenslandicum*, *Aristida leptopoda*, *Ophiuros exaltatus* (*Astrebla lappacea* and *A. pectinata* prominent in some occurrences), 1 ± 0·3 m; annual grasses such as *Iseilema* spp. and forbs (*Polymeria longifolia*, *Rhynchosia minima*, *Calotis cuneata*, *Crotalaria dissitiflora*) fill the interspaces after seasonal rains.

Land Capability.—$IIIk_{2-3},s_{2-3}$.

Land Unit 44 (410 km²)

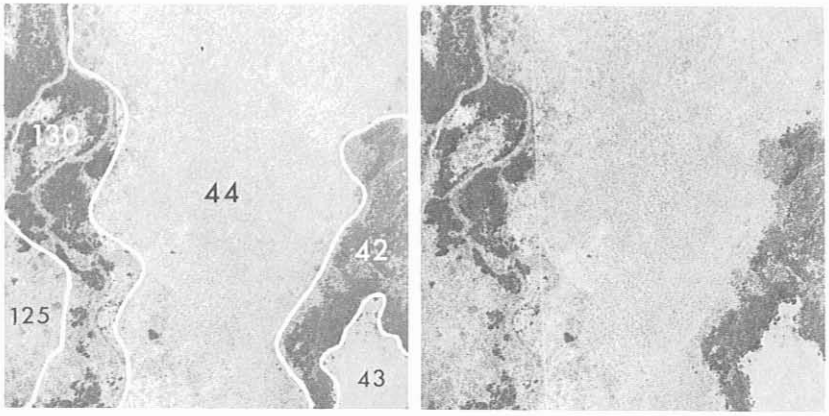
Field Criteria.—Lowland plains, coolibah woodland, cracking clay soils.

Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Clay derived from deeply weathered basalt.

Terrain.—Level to very gently undulating.

Position on Slope.—Lower slopes and bottomlands, less than 1%, subject to flooding or waterlogging.



Soil.—Very deep cracking clay soils: dark self-mulching clays with neutral to alkaline reaction at or near the surface and acid massive grey subsoils with prominent red mottles, Logan (Ug5.24, 5.34).

Vegetation.—Coolibah grassy open-woodland: *E. microtheca*, 11 ± 3 m; blue grass tussock grassland, 1 ± 0·3 m. N.B. Included in this unit are associated occurrences of grassy woodland dominated by *Acacia* sp. aff. *cana*, 20 ± 4 m.

Land Capability.—Vw_{4-5},k_{2-3}.

LAND UNIT 45 (1715 KM²)

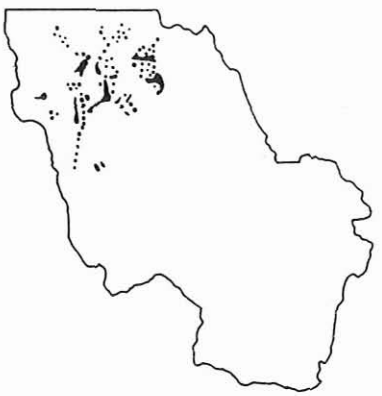
Field Criteria.—Lowland plains, gidgee forest, gilgaied cracking clay soils.

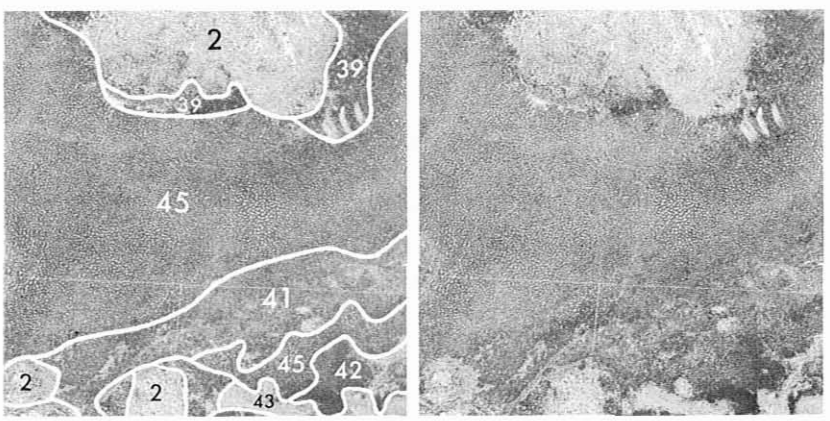
Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400± 100 mm; May–Oct., 100±25 mm.

Lithology.—Lateritized sediments; Tertiary clay.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes and bottomlands, less than 1%, gilgai microrelief 90–120 cm; subject to seasonal ponding and waterlogging.





Soil.—Gilgaied deep cracking clay soils: weakly self-mulching with thin platy surface crust, Pegunny (Ug5.24, 5.16); generally mildly to strongly alkaline at or near the surface and acid beneath, occasionally acid or alkaline throughout, prominent red and grey mottling common in subsoils.

Vegetation.—Gidgee open-forest: *A. cambagei*, 12±4 m; upper tree layer absent or sparse (*Ventilago viminalis*), 8±3 m; sparse to moderately dense lower tree layer of *Terminalia oblongata* (*Eremophila mitchellii*), 5±3 m; sparse to moderately dense shrub layer, *Carissa ovata* (*Ehretia membranifolia*, *Heterodendrum diversifolium*), 1±0·5 m; scrub grass. Seasonally ponded gilgai commonly with *Cyperus* and *Marsilea* spp.

Land Capability.—$IVg_{4}s_{3-4}$.

LAND UNIT 46 (7305 KM²)

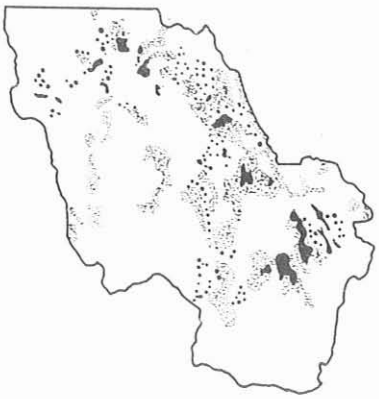
Field Criteria.—Lowland plains, brigalow forest, gilgaied cracking clay soils.

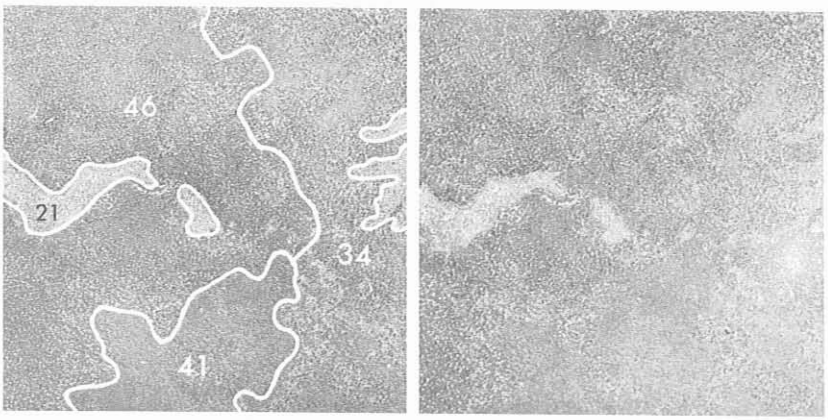
Climatic Zones.—4,5,6,7,8,10,11. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 150 ± 75 mm.

Lithology.—Lateritized sediments; Tertiary clay.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes and bottomlands, less than 1%, gilgai microrelief 90–120 cm; subject to seasonal ponding and waterlogging.





Soil.—Gilgaied deep cracking clay soils: weakly self-mulching with thin platy surface crust, Pegunny (Ug5.24, 5.16, 5.34), generally mildly to strongly alkaline at or near the surface and acid beneath, occasionally acid or alkaline throughout; prominent red and grey mottling common in subsoils. In places these soils form a mosaic with texture-contrast soils, Retro (Db1.33, Dr2.43), Taurus (Dr2.33) and Wyseby (Dy2.41).

Vegetation.—Brigalow open-forest: *A. harpophylla*, 14 ± 4 m, scattered emergent *E. thozetiana* (and/or *E. cambageana* in the east), 18 ± 4 m; upper tree layer absent or sparse (*Bauhinia carronii*, *Geijera parviflora*), 8 ± 3 m; sparse to moderately dense lower tree layer of *Eremophila mitchellii* and/or *Terminalia oblongata*, 5 ± 3 m; sparse to moderately dense shrub layer, *Carissa ovata* (*Heterodendrum diversifolium*), 1 ± 0·5 m; scrub grass. Seasonally ponded gilgai with *Cyperus* spp., *Marsilea* spp. N.B. With higher rainfall, in the extreme east this unit may have an *A. harpophylla–Casuarina cristata* canopy, 14 ± 4 m, over a vine-thicket understorey.

Land Capability.—III–IVg_{3-4},s_{3-4}.

Land Unit 47 (995 km²)

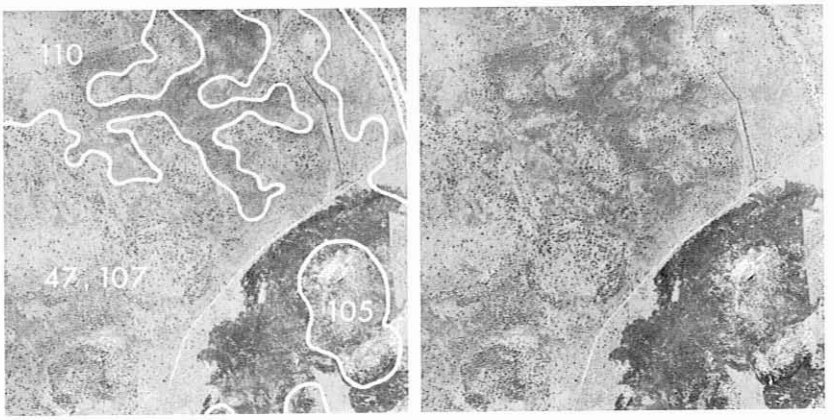
Field Criteria.—Undulating terrain, mountain coolibah woodland, reddish brown cracking clay soils.

Climatic Zones.—6,7,8,10. Median rainfall: Nov.–Apr., 425 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Weathered basalt.

Terrain.—Undulating to rolling.

Position on Slope.—Crests of low ridges and mesas and benched slopes, mainly less than 6%, up to 10% on margins.



Soil.—Deep cracking clay soils: dark brown or reddish brown, self-mulching clay soils, Glenora (Ug5.34, 5.37), commonly strongly alkaline throughout with carbonate accumulations in lower profiles.

Vegetation.—Mountain coolibah grassy open-woodland: *E. orgadophila* (*E. melanophloia*, *E. dichromophloia*), 12 ± 4 m; tussock grassland, commonly blue grass community, but mesic mid-height grass communities may also occur. N.B. Undescribed occurrences of this unit in Westwood land system near Bauhinia Downs in the Dawson–Fitzroy area.

Land Capability.—$IIIe_{2-3},k_{2-3}$.

LAND UNIT 48 (520 KM²)

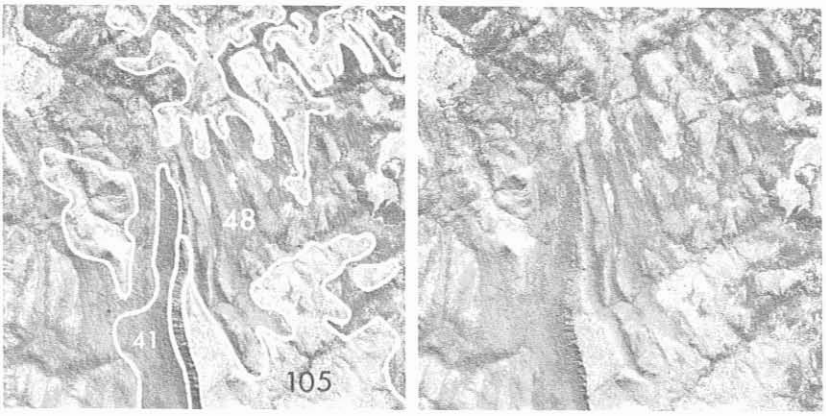
Field Criteria.—Hilly terrain on basalt slumps, vine thicket, shallow loams and clays.

Climatic Zones.—5,8,10(6,9). Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—Weathered basalt.

Terrain.—Hilly terrain commonly on slumped basalt sheets below scarps and steep slopes.

Position on Slope.—Crests, upper and middle slopes, up to 15%.



Soil.—Skeletal soils and shallow loams and clays: very shallow stony or gravelly soils, Rugby (Um1.43); locally shallow soils, Kinnoul (Uf6.21, 6.31), and shallow humic loams and clays on thick secondary carbonate accumulations, Gindie (Um6.21, Uf6.31), generally with large boulders on surface.

Vegetation.—Vine thicket: a complex layered community with a more or less continuous canopy of slender, densely packed trees; commonly dominated by *Macropteranthes leichhardtii* (*Geijera parviflora*, *Denhamia obscura*, *Croton insularis*, *Acacia fasciculifera* and numerous other species), 8 ± 2 m, usually with scattered emergents (*Brachychiton rupestre*, *B. australe*, *A. harpophylla*), 15 ± 3 m; shrub layer absent where canopy dense, but commonly sparse to moderately dense, floristically rich (*Apophyllum anomalum*, *Ehretia membranifolia*, *Capparis* sp., *Croton phebalioides*, *Erythroxylum australe*, *Heterodendrum diversifolium*, *Carissa ovata*, *Geijera parviflora*), 2 ± 1 m; deep litter, ferns, mosses and sparse scrub grass. Lianes common.

Land Capability.—VIt_6,d_{4-6},r_{4-6}.

Land Unit 49 (705 km²)

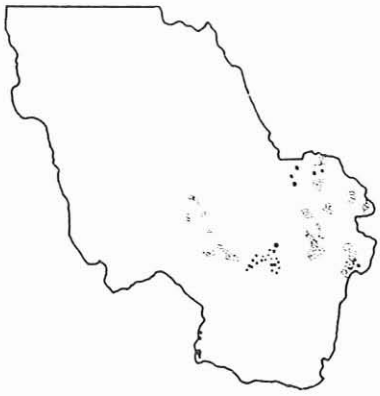
Field Criteria.—Undulating terrain, vine thicket, brown and grey-brown soils.

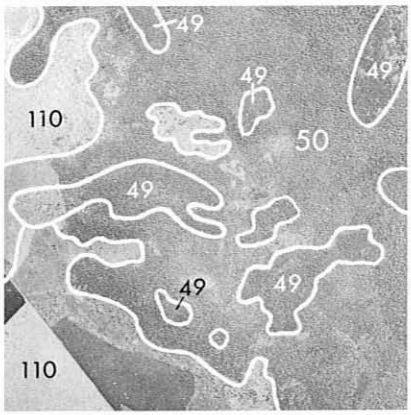
Climatic Zones.—4,5,8(9,6). Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 50 mm.

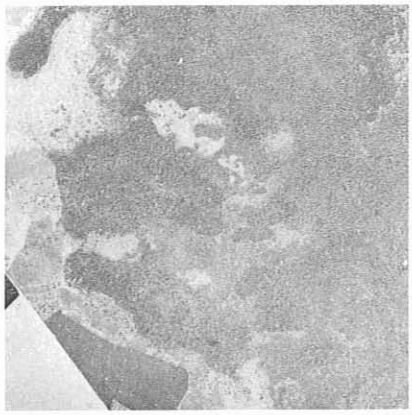
Lithology.—Weathered basalt or andesitic volcanic rocks.

Terrain.—Undulating.

Position on Slope.—Crests and upper slopes, mainly less than 2%, locally up to 5%.







Soil.—Dark brown and grey-brown soils: shallow, humic loams and clays underlain by secondary carbonate accumulations, Gindie (Um6.21, Uf6.33), and shallow to moderately deep, uniform or gradational fine-textured soils, Kinnoul (Uf6.22), Carraba (Uf6.32, Gn3.12) and Cheshire (Gn3.11, Uf6.33). Minor areas of gravelly or stony red earths, Gregory (Uf1.43), are included.

Vegetation.—Vine thicket: a complex layered community with a more or less continuous canopy of slender, densely packed trees (*Geijera parviflora*, *Macropteranthes leichhardtii*, *Owenia* sp., *Diospyros* sp., *Croton insularis*, *Denhamia obscura* common, but not constant), 8 ± 2 m, with scattered emergents (*Brachychiton rupestre*, *A. harpophylla*), 14 ± 3 m; moderately dense to dense, floristically rich shrub layer (*Apophyllum anomalum*, *Ehretia membranifolia*, *Zygophyllum* sp., *Capparis* sp., *Croton phebaliodes*, *Erythroxylum australe*, *Heterodendrum diversifolium*, *Carissa ovata*, *Geijera parviflora*), 3 ± 1 m; deep litter, ferns, mosses and sparse scrub grass. Lianes common.

Land Capability.—IVd_{3-4}.

Land Unit 50 (780 km²)

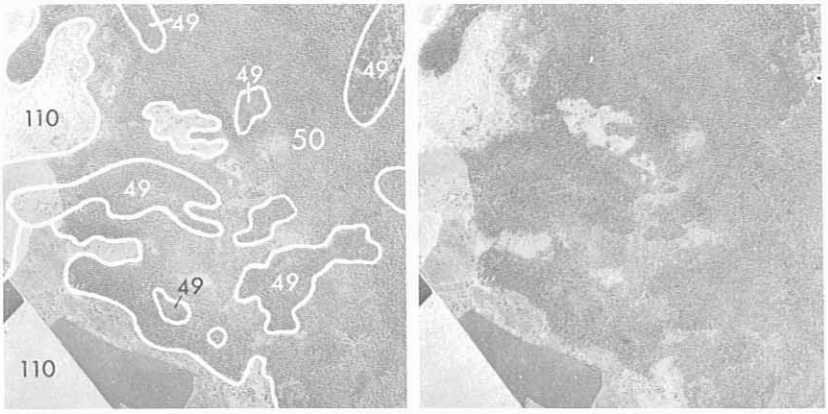
Field Criteria.—Undulating terrain, brigalow forest, reddish brown cracking clay soils.

Climatic Zones.—5,7,8,10,11(6,9). Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 150 ± 50 mm.

Lithology.—Weathered basalt.

Terrain.—Undulating.

Position on Slope.—Crests and gentle lower slopes, to 5%.



Soil.—Deep cracking clay soils: brown or reddish brown, self-mulching clay soils, Glenora (Ug5.34, 5.37, 5.15), moderately to strongly alkaline throughout and commonly with carbonate accumulations in lower profiles.

Vegetation.—Brigalow open-forest: *A. harpophylla*, 15 ± 4 m; moderately dense to dense understorey of vine-thicket species (*Bauhinia carronii*, *Macropteranthes leichhardtii* (in south), *Atalaya hemiglauca*, *Geijera parviflora*, *Denhamia obscura*), *Terminalia oblongata*, *Eremophila mitchellii*, 5 ± 3 m; dense to moderately dense shrub layer of *Carissa ovata*, *Apophyllum anomalum*, *Heterodendrum diversifolium*, 2 ± 1 m; litter, ferns, forbs and sparse scrub grass.

Land Capability.—II–IIIk$_{2-3}$,e$_{2-3}$.

LAND UNIT 51 (435 KM²)

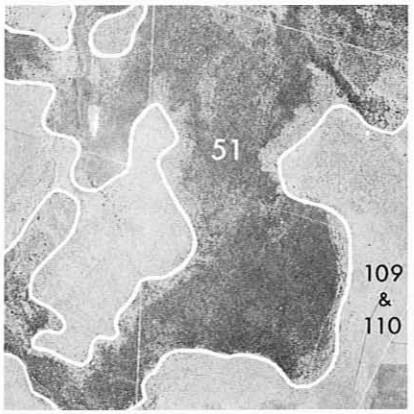
Field Criteria.—Undulating terrain, gidgee forest, reddish brown cracking clay soils.

Climatic Zone.—7. Median rainfall: Nov.–Apr., 400 ± 25 mm; May–Oct., 125 ± 15 mm.

Lithology.—Weathered basalt.

Terrain.—Undulating.

Position on Slope.—Middle and lower slopes, to 4%.



Soil.—Deep cracking clay soils: dark brown or reddish brown, self-mulching clay soils, Glenora (Ug5.32, 5.34, 5.37), generally strongly alkaline and calcareous throughout; minor non-cracking clay soils, Cheshire (Uf6.31).

Vegetation.—Gidgee open-forest: *A. cambagei*, 12 ± 3 m; sparse to moderately dense understorey, commonly with *Terminalia oblongata* and/or *Eremophila mitchellii* and sometimes vine-thicket species on wetter sites, 5 ± 3 m; sparse to moderately dense shrub layer, *Carissa ovata*, 1 ± 0·5 m; sparse scrub grass. N.B. *Terminalia oblongata* commonly forms an ecotone between this and adjacent communities.

Land Capability.—$IIIk_{2-3},e_{2-3}$.

LAND UNIT 52 (595 KM²)

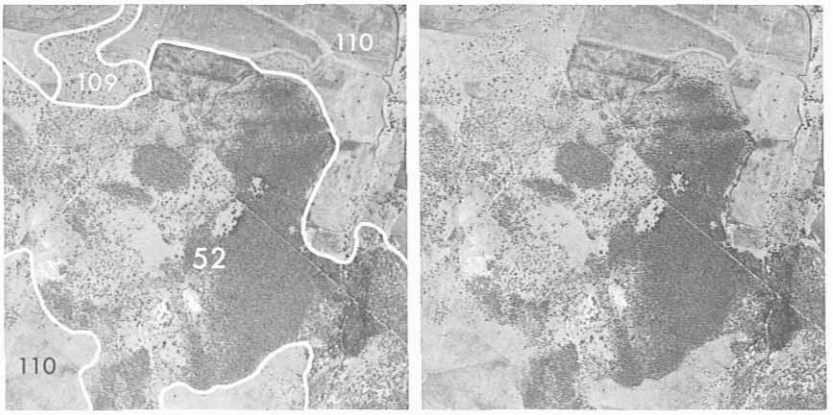
Field Criteria.—Gently undulating terrain, brigalow–yellowwood forest, cracking clay soils.

Climatic Zones.—5,6,7,8,10. Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 150 ± 50 mm.

Lithology.—Weathered basalt.

Terrain.—Gently undulating.

Position on Slope.—Lower slopes, up to 2%.



Soil.—Deep cracking clay soils: dark clay soils with weakly self-mulching, occasionally massive surface soils, Rolleston (Ug5.16, 5.4), strongly alkaline at or near the surface with acid mottled subsoils.

Vegetation.—Brigalow open-forest: *A. harpophylla*, 14 ± 3 m; sparse to moderately dense understorey commonly with *Terminalia oblongata* and/or *Eremophila mitchellii* and sometimes vine-thicket species on higher-rainfall sites, 5 ± 3 m; sparse to moderately dense shrub layer, *Carissa ovata*, 1 ± 0·5 m; sparse scrub grass. N.B. *Terminalia oblongata* commonly forms an ecotone between this and adjacent communities.

Land Capability.—II–IIIk_{2-3},s_{2-3}.

LAND UNIT 53 (360 KM²)

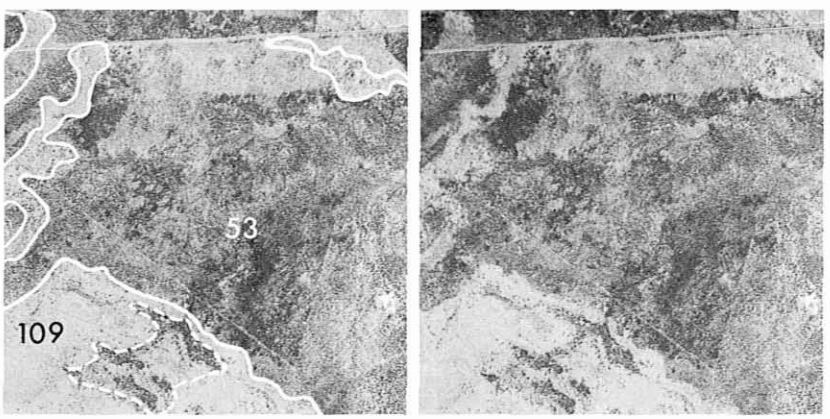
Field Criteria.—Gently undulating terrain, brigalow–belah forest, cracking clay soils.

Climatic Zones.—7,8,10. Median rainfall: Nov.–Apr., 425 ± 25 mm; May–Oct., 125 ± 25 mm.

Lithology.—Weathered basalt.

Terrain.—Gently undulating.

Position on Slope.—Lower slopes, to 2%.



Soil.—Deep cracking clay soils: dark self-mulching clay soils, May Downs (Ug5.16, 5.14, 5.24), generally strongly alkaline throughout with carbonate accumulations at depth.

Vegetation.—Brigalow–belah open-forest: *A. harpophylla* and/or *Casuarina cristata*, 14 ± 3 m; sparse to moderately dense understorey, commonly with *Terminalia oblongata*, *Eremophila mitchellii*, *Geijera parviflora* (*Bauhinia hookeri*, *B. carronii*), 5 ± 3 m; moderately dense to dense shrub layer of *Geijera parviflora* (in south), *Carissa ovata*, *Heterodendrum diversifolium*, 2 ± 1 m; litter, ferns, forbs and sparse scrub grass.

Land Capability.—II–IIIk$_{2-3}$.

LAND UNIT 54 (3680 KM²)

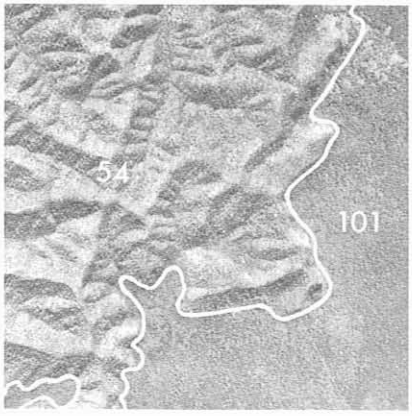
Field Criteria.—Steep rocky hills, narrow-leaved ironbark woodland, skeletal soils.

Climatic Zones.—5,6,7,8,9,10,11. Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 150 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Mountainous to hilly.

Position on Slope.—Rocky crests and steep slopes,* 10–100%.



Soil.—Skeletal soils: very shallow sandy soils, Shotover (Uc1.2, 4.1), generally gravelly or stony with extensive rock outcrop; minor areas of uniform sandy soils, Petrona and Highmount (Uc1.23, 4.11), and texture-contrast soils, Luxor (Dy5.41), on crests and benches.

Vegetation.—Narrow-leaved ironbark woodland: *E. drepanophylla*/*E. crebra*/*E. decorticans* (*E. polycarpa*, *E. watsoniana*, *E. peltata*), 12 ± 3 m; sparse to moderately dense understorey (*Callitris columellaris*, *Casuarina luehmannii*, *A. cunninghamii*, *Lysicarpus angustifolius*), 8 ± 3 m, over a sparse to moderately dense shrub layer (*Acacia* spp., *Boronia* spp., *Grewia retusifolia*, *Ricinocarpos pinifolius*), 2 ± 1 m; xeric mid-height grass and/or spinifex. N.B. On moister sites this community grades into open-forest.

Land Capability.—VII–VIIIt_{7-8},r_{7-8}.

* These landforms can be subdivided into component elements but in view of the uniform nature of the soils and vegetation this is not considered to be warranted.

Land Unit 55 (6225 km²)

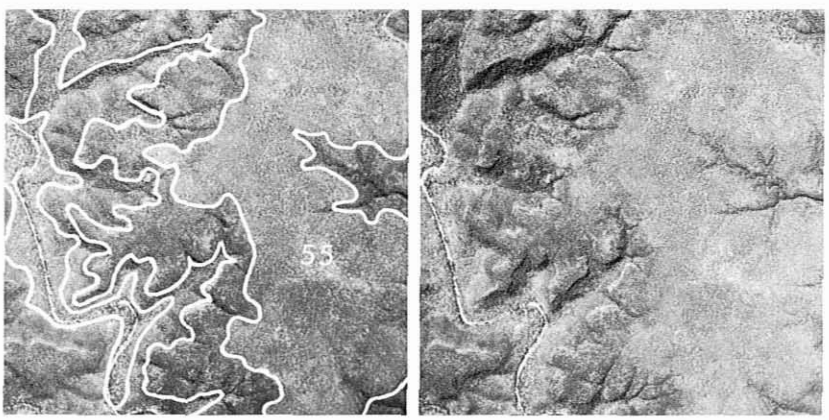
Field Criteria.—Steep rocky hills, sandstone forest, skeletal soils.

Climatic Zones.—5,6,7,8,9,10,11. Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct. 150 ± 40 mm.

Lithology.—Quartz sandstone.

Terrain.—Mountainous to hilly.

Position on Slope.—Crests, benches and upper slopes, mainly less than 5%, attaining 10–20% in places.



Soil.—Skeletal soils: very shallow sandy soils, Shotover (Uc1.2, 4.1), generally gravelly or stony with extensive outcrop; minor areas of uniform sandy soils, Petrona and Highmount (Uc1.2, 4.1).

Vegetation.—Sandstone open-forest/woodland: *E. watsoniana–E. crebra/E. decorticans/E. polycarpa* (*E. cloeziana, E. tenuipes, E. peltata, Angophora costata*), 18 ± 6 m; sparse lower tree layer of *Casuarina inophloia, Lysicarpus angustifolius, Alphitonia excelsa* (*Callitris columellaris*), 8 ± 3 m, over a moderately dense to dense and floristically rich shrub layer with *Xanthorrhoea* sp., *Acacia* spp., *Boronia* spp., *Grevillea* spp., *Dampiera* sp., *Olearia* sp., *Hovea* sp., *Dodonaea* spp. and others, 2 ± 1 m, and numerous forbs (*Cryptandra amara, Mirbelia pungens, Patersonia* sp., *Helichrysum* spp.), sparse xeric mid-height grass and spinifex grading to forest grass in humid eastern locations.

Land Capability.—VII–VIIIr_{7-8},d_7.

Land Unit 56 (3130 km²)

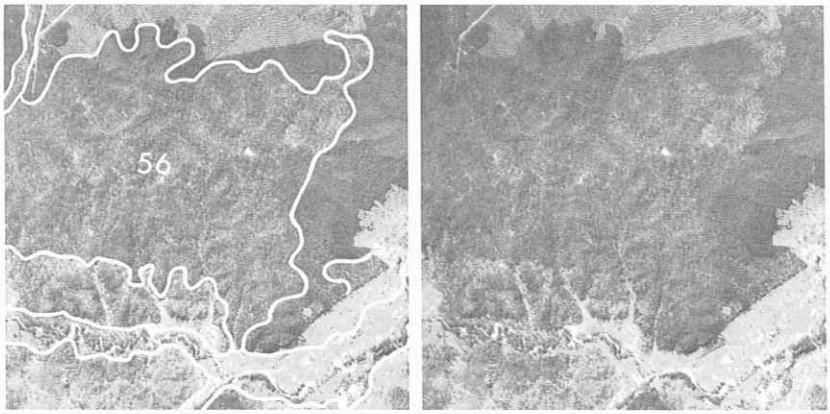
Field Criteria.—Hilly terrain, ironbark–spotted gum forest, texture-contrast soils.

Climatic Zones.—9,8(6,5). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Mountainous to hilly.

Position on Slope.—Crests and gentle upper slopes, mainly less than 5%, up to 20%.



Soil.—Texture-contrast soils: shallow to moderately deep soils commonly with thin sandy or loamy surface horizons over acid to alkaline, mottled or whole-coloured subsoils, Southernwood (Dr3.32), Medway (Dr2.33, Dy2.33), Wyseby (Dr2.31) and Taurus (Dy3.43); some soils with thick sandy surface horizons and alkaline mottled subsoils, Broadmeadow (Dy5.83); minor uniform sandy soils, moderately deep to deep, Petrona and Highmount (Uc1.2).

Vegetation.—Ironbark–spotted gum open-forest: *E. crebra*/*E. drepanophylla*–*E. maculata*/*E. citriodora* (*E. fibrosa*, *E. polycarpa*), 22 ± 6 m; sparse to moderately dense lower tree layer, *Callitris columellaris*, *Casuarina luehmannii*, 12 ± 5 m; sparse to moderately dense understorey, *A. glaucocarpa*, *A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma pubescens*, *Xanthorrhoea* sp., 5 ± 3 m; forest grass. N.B. In elevated areas such as the Blackdown Tableland, with a more favourable water balance, this community grades into tall open-forest (*E. acmenioides*, *E. phaeotricha*, *E. saligna*, *Syncarpia glomulifera* noted by Forestry Department), 35 ± 6 m.

Land Capability.—IV–VIt_6,r_{4-6},d_4.

LAND UNIT 57 (380 KM²)

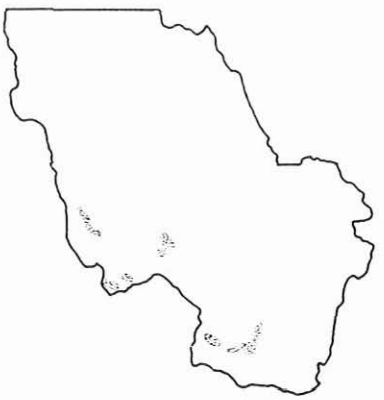
Field Criteria.—Gently undulating terrain, cypress pine forest, uniform sandy soils.

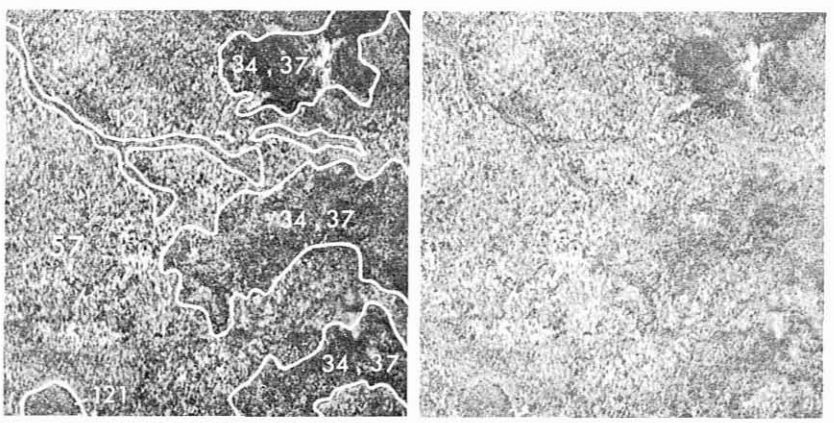
Climatic Zones.—9,10. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Level to gently undulating.

Position on Slope.—Upper to lower slopes, mainly less than 5%, up to 10%.





Soil.—Uniform sandy soils: moderately deep to deep, Petrona and Highmount (Uc1.2, 4.1), gravelly or stony in places.

Vegetation.—Cypress pine open-forest: *Callitris columellaris* (*Casuarina luehmannii*, *E. melanophloia*, *Angophora costata*), 15 ± 5 m; sparse to moderately dense understorey of *A. cunninghamii* (*Alphitonia excelsa*, *Petalostigma pubescens*), 5 ± 3 m; sparse xeric mid-height grass or arid scrub grass. N.B. This community commonly grades into associated eucalypt woodland, e.g. land unit 58.

Land Capability.—IV–VIe_4,m_4,r_{4-6}.

Land Unit 58 (940 km²)

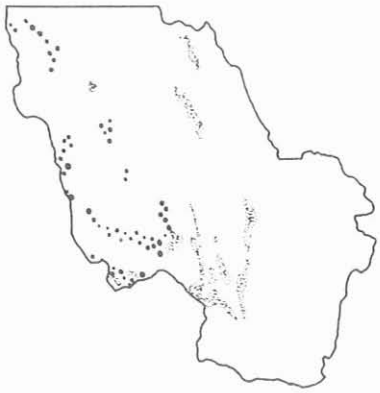
Field Criteria.—Undulating terrain, narrow-leaved ironbark woodland, uniform sandy soils.

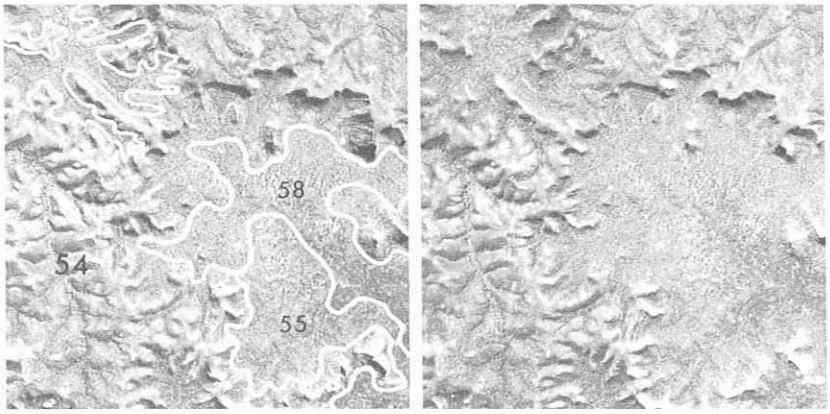
Climatic Zones.—6,8(7,10,11). Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 150 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Undulating.

Position on Slope.—Lower colluvial slopes, up to 5%.





Soil.—Uniform sandy soils: moderately deep to deep, Petrona and Highmount (Uc1.23, 4.11), stony and extensive outcrops in places.

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra*/*E. drepanophylla* and/or *E. decorticans*, 12 ± 3 m; sparse to moderately dense lower tree layer of *Casuarina luehmannii* and/or *Callitris columellaris*, *A. cunninghamii*, 7 ± 3 m; shrubs sparse or absent; xeric mid-height grass and/or spinifex.

Land Capability.—IV–VIr_{4-6},m_4,e_4.

Land Unit 59 (485 km²)

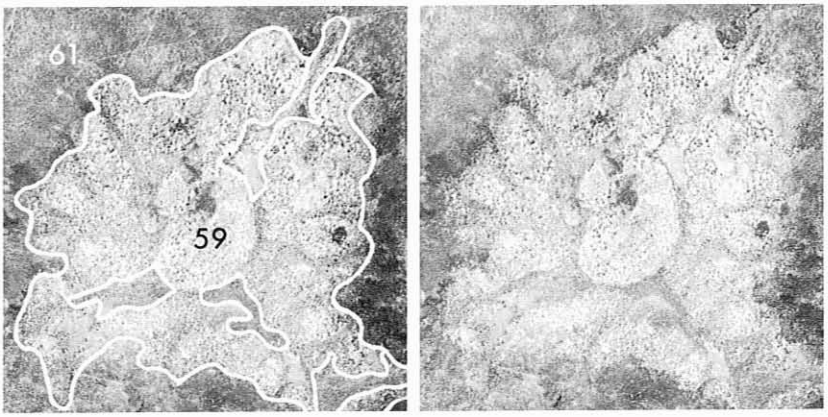
Field Criteria.—Undulating terrain, tumble-down gum woodland, uniform sandy soils.

Climatic Zones.—9(8,10). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Undulating.

Position on Slope.—Lower slopes, mainly 2–3%, up to 5%.



Soil.—Uniform sandy soils: moderately deep to deep, Petrona and Highmount (Uc1.21, 4.11, 5.11); minor deep texture-contrast soils with thick sandy surface horizons and acid mottled subsoils, Luxor (Dy3.42, Dg4.81).

Vegetation.—Tumble-down gum grassy woodland: *E. dealbata* (*E. polycarpa*), 12 ± 3 m; understorey absent or sparse (*Acacia* spp., *Petalostigma pubescens*), 5 ± 3 m; mesic mid-height grass.

Land Capability.—IVm$_4$,p$_{3-4}$.

LAND UNIT 60 (1610 KM²)

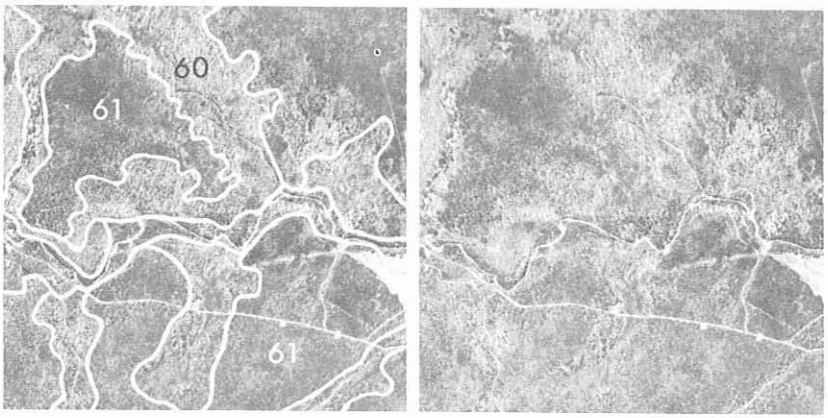
Field Criteria.—Undulating terrain, apple forest, texture-contrast soils.

Climatic Zones.—9,8(5). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct , 200 ± 50 mm.

Lithology.—Quartz sandstone.

Terrain.—Undulating.

Position on Slope.—Upper slopes, mainly 1–5%, up to 10%.



Soil.—Deep texture-contrast soils: thick sandy surface horizons and mottled or whole-coloured acid subsoils, Luxor (Dy5.81, 4.41); minor uniform sandy soils, moderately deep to deep, Petrona and Highmount (Uc2,1.21, 1.22).

Vegetation.—Apple open-forest: *Angophora costata–E. dealbata–E. polycarpa–E. crebra*, 15 ± 3 m; smaller tree layer of *Casuarina luehmannii*, *Callitris columellaris*, 10 ± 3 m; moderately dense understorey of *A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma pubescens*, *Dodonaea* sp., *Exocarpos* sp.; sparse forest grass.

Land Capability.—IVp_{3-4},m_{3-4}.

Land Unit 61 (495 km²)

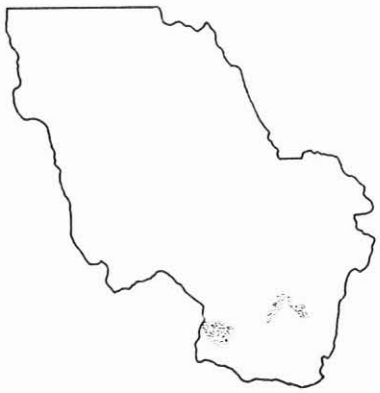
Field Criteria.—Undulating terrain, cypress pine–bull oak forest, texture-contrast soils.

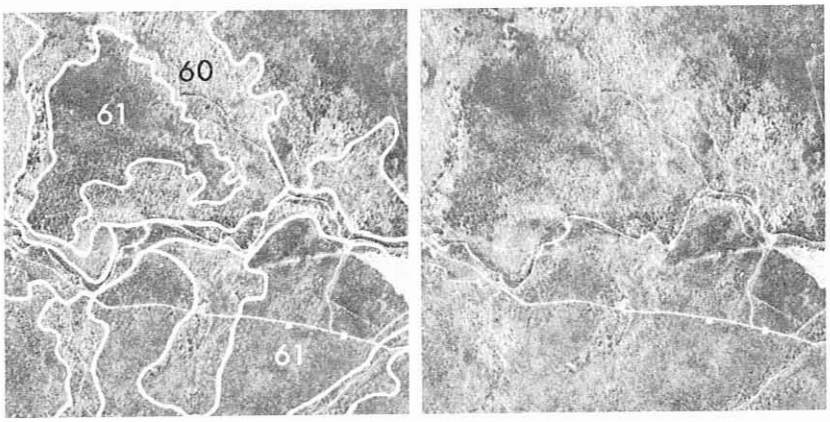
Climatic Zone.—9. Median rainfall: Nov.–Apr., 425 ± 50 mm; May–Oct., 190 ± 25 mm.

Lithology.—Quartz sandstone.

Terrain.—Undulating.

Position on Slope.—Upper to lower slopes, up to 5%.





Soil.—Deep texture-contrast soils: thick sandy surface horizons and acid subsoils, Luxor (Dy4.41, 4.61, 5.41); minor shallow skeletal soils, Shotover (Uc1.21); gravelly in some occurrences.

Vegetation.—Cypress pine–bull oak open-forest: *Callitris columellaris–Casuarina luehmannii* (*E. crebra*, *E. polycarpa*, *E. tereticornis*), 15 ± 4 m; sparse understorey, except where disturbed (*A. cunninghamii*, *Petalostigma pubescens*, *Lysicarpus angustifolius*, *Hakea lorea*), 5 ± 3 m; sparse forest grass.

Land Capability.—IV–VId_{4-6},r_{4-6},p_{3-4}.

LAND UNIT 62 (1630 KM²)

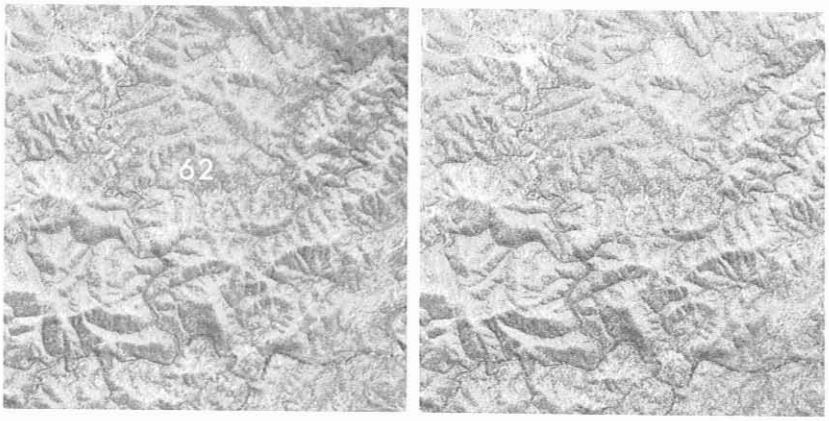
Field Criteria.—Dissected hilly terrain, narrow-leaved ironbark woodland, skeletal soils.

Climatic Zones.—10,11,7. Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Metamorphics; greywacke, mica-schist, slate and phyllite with abundant quartz veins.

Terrain.—Closely dissected hilly terrain.

Position on Slope.—Hill slopes,* 10–50%.



Soil.—Skeletal soils: very shallow gravelly or stony, uniform coarse-textured soils, Shotover (Uc1.2); extensive outcrop with quartz veins; minor shallow texture-contrast soils, Southernwood (Dr2.12).

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra*/*E. drepanophylla*, 14 ± 4 m; commonly with a moderately dense to dense smaller tree layer of *A. rhodoxylon* (*A. sparsiflora*, *Flindersia dissosperma*), 8 ± 3 m; sparse shrub layer (*Erythroxylum australe*), 2 ± 1 m; xeric and/or mesic mid-height grass.

Land Capability.—$VIIt_{6-7}d_{6-7}$.

* These slopes can be subdivided into component slope segments but in view of the uniformity of soils and vegetation this landscape is dealt with in its entirety.

Land Unit 63 (140 km²)

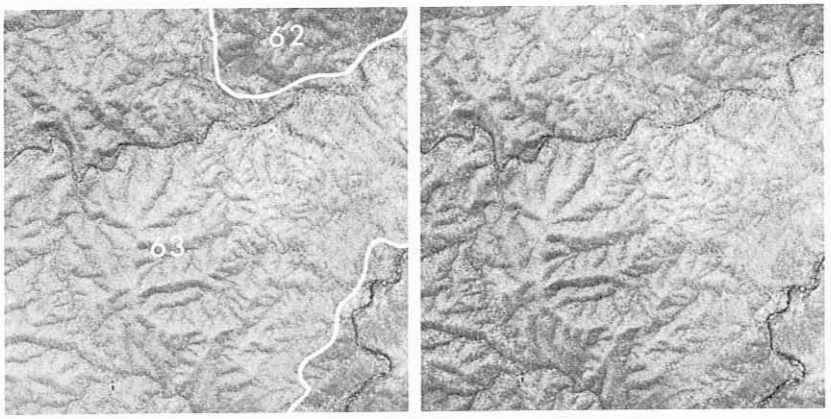
Field Criteria.—Dissected hilly terrain, silver-leaved ironbark woodland, texture-contrast soils.

Climatic Zones.—10,11,7. Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Metamorphics; greywacke, mica-schist, slate and phyllite with abundant quartz veins.

Terrain.—Closely dissected hilly terrain.

Position on Slope.—Crests, middle and lower slopes, 10–30%.



Soil.—Moderately deep texture-contrast soils: thin sandy or loamy surface horizons over neutral to strongly alkaline, red or brown subsoils, Springwood (Dr2.12), Wyseby (Db1.12) and Taurus (Dr2.13), gravelly or stony in places.

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia* (*E. orgadophila*, *E. populnea*), 12 ± 3 m; sparse to moderately dense understorey, *Eremophila mitchellii*, 5 ± 3 m; sparse to moderately dense shrub layer of *Carissa ovata* (*Erythroxylum australe*, *Capparis lasiantha*), 1 ± 0·5 m; xeric mid-height grass.

Land Capability.—VIt_6,r_{4-6},e_4.

Land Unit 64 (2915 km²)

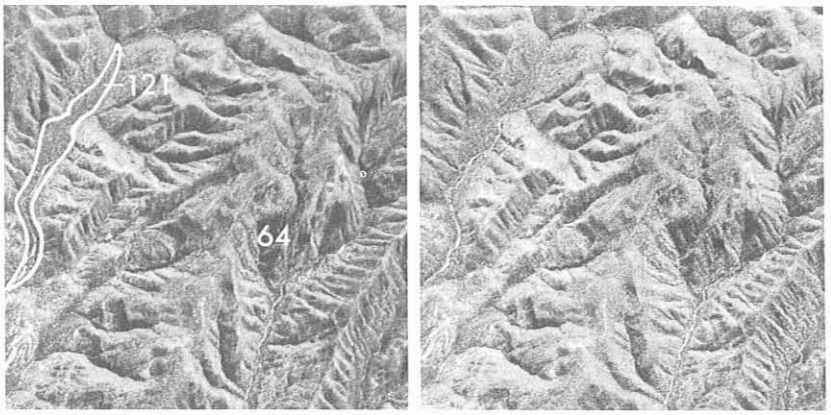
Field Criteria.—Hilly terrain, narrow-leaved ironbark woodland, skeletal soils.

Climatic Zones.—10(11,8,7,6,5,4). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 150 ± 75 mm.

Lithology.—Mixed sediments; sandstone and shale.

Terrain.—Mountainous to hilly.

Position on Slope.—Crests, middle and lower slopes, bluffs, benches and strike ridges, slopes 10–100%; gully and sheet erosion in places.



Soil.—Skeletal soils: very shallow sandy or loamy soils, Shotover (Uc1.2) or Rugby (Um1); extensive outcrop, stone- and cobble-strewn surfaces; minor shallow texture-contrast soils, Southernwood (Db1.12) and Medway (Dy2.23).

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra*/*E. drepanophylla* (*E. citriodora*/*E. maculata*), 14 ± 4 m; understorey sparse to moderately dense *A. cunninghamii*, *Acacia* spp., *Alphitonia excelsa*, *Petalostigma pubescens*, *Casuarina luehmannii*, 6 ± 3 m; mesic and/or xeric mid-height grass.

Land Capability.—VII–VIIIt_{7-8},r_{7-8},d_{6-7}.

Land Unit 65 (1690 km²)

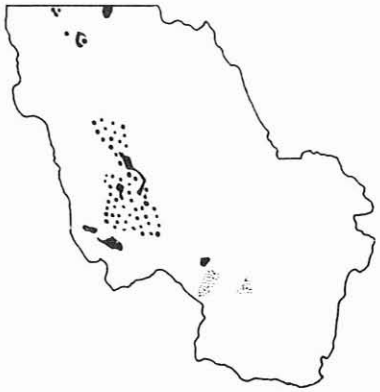
Field Criteria.—Hilly terrain, narrow-leaved ironbark woodland, shallow texture-contrast soils.

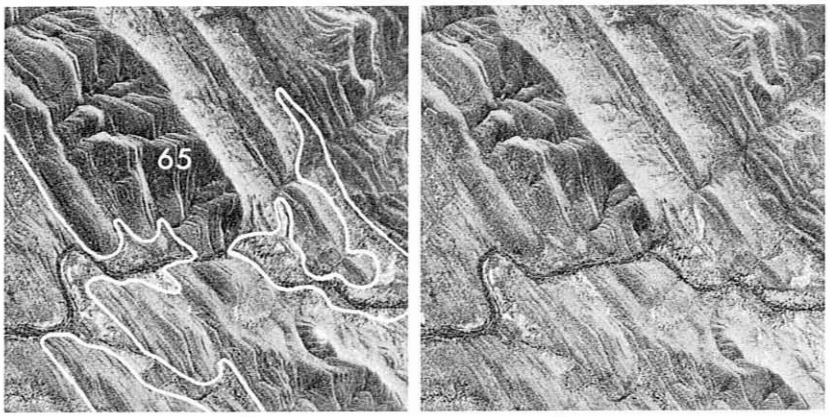
Climatic Zones.—10,11,7,8. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 125 ± 50 mm.

Lithology.—Mixed sediments; sandstone, shale and mudstone; generally folded and steeply dipping.

Terrain.—Hilly.

Position on Slope.—Slopes on strike ridges, cuestas, low mesas and hills, 5–40%.





Soil.—Shallow texture-contrast soils: Southernwood (Dr2.12, Db1.12) and Medway (Db1.13, Dy2.43, Dd1.13); minor deep to moderately deep soils, Luxor (Db1.22), Broadmeadow (Dy2.23, Dr2.43) and Springwood (Dr3.22, Dy2.22); commonly in narrow strike-controlled belts.

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra*/*E. drepanophylla*, 14 ± 4 m; moderately dense understorey of *A. cunninghamii*, *Petalostigma pubescens*, *Casuarina luehmannii*, 5 ± 3 m; xeric and/or mesic mid-height grass.

Land Capability.—VIt_6,d_{4-6},p_{3-4}.

Land Unit 66 (1600 km²)

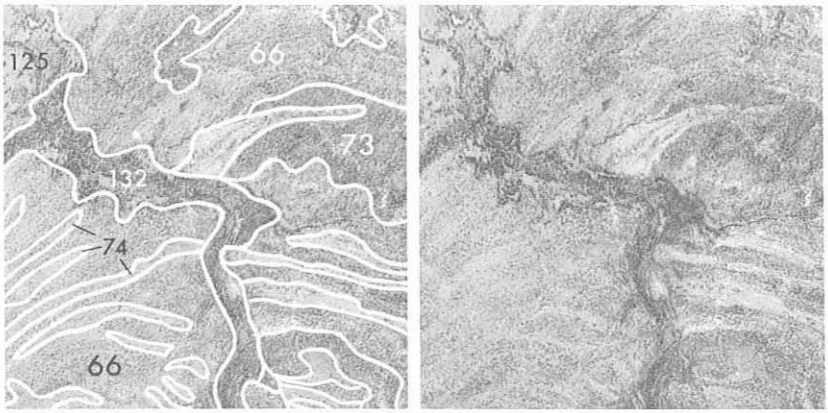
Field Criteria.—Hilly terrain, silver-leaved ironbark woodland, shallow texture-contrast soils.

Climatic Zones.—10,11(7). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 125 ± 50 mm.

Lithology.—Mixed sediments; sandstone, shale and mudstone; generally folded, steeply dipping, strike-controlled strata.

Terrain.—Hilly.

Position on Slope.—Slopes of low hills, strike ridges and cuestas, 5–40%.



Soil.—Shallow texture-contrast soils: Southernwood (Db1.12, Dr2.12) and Medway (Dd1.33, Dy2.43, 2.32); minor moderately deep to deep soils, Luxor (Db1.22, Dy2.32), Broadmeadow (Dy3.23, 2.23). Springwood (Dy3.22) and Taurus (Dr2.13, Db1.13); generally complex distribution in narrow belts following the strike of underlying folded parent rocks.

Vegetation.—Silver-leaved ironbark grassy woodland, *E. melanophloia* (*E. orgadophila*), 11 ± 3 m, commonly aligned in linear bands, alternating with land units 73 and 74; understorey absent or sparse (*Albizia basaltica*, *Eremophila mitchellii*, *Carissa ovata*); xeric and/or mesic mid-height grass.

Land Capability.—VI–VIIt_{6-7},p_{3-4}.

LAND UNIT 67 (485 KM²)

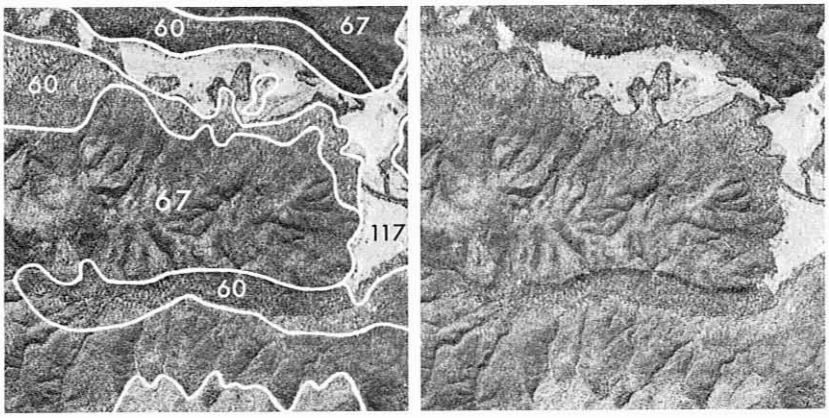
Field Criteria.—Hilly to undulating terrain, ironbark–spotted gum forest, shallow texture-contrast soils.

Climatic Zones.—9(8). Median rainfall: Nov.–Apr., 450 ± 25 mm; May–Oct., 200 ± 25 mm.

Lithology.—Mixed sediments; shale and sandstone.

Terrain.—Hilly to undulating.

Position on Slope.—Slopes up to 60%.



Soil.—Shallow texture-contrast soils: Southernwood (Dr2.11, 2.12); minor deep to moderately deep soils, Springwood (Dy2.12) and Wyseby (Dr2.11), and shallow acid loams, Ingelara (Um4.2); extensive outcrop in places.

Vegetation.—Narrow-leaved ironbark and spotted gum open-forest: *E. crebra–E. maculata/E. citriodora*, 22 ± 4 m; moderately dense understorey of *A. cunninghamii*, *A. glaucocarpa*, *Alphitonia excelsa*, *Petalostigma pubescens*, *Persoonia falcata*, *Xanthorrhoea* sp., 5 ± 3 m; forest grass.

Land Capability.—VI–VIIt_{6-7},d_{6-7},r_{6-7}.

Land Unit 68 (4410 km²)

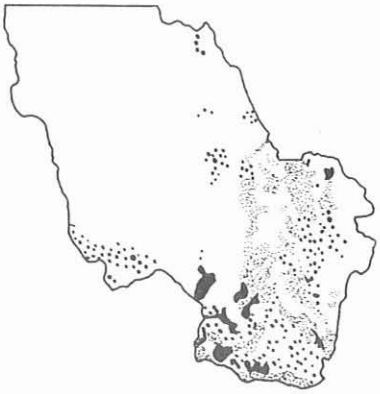
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, shallow texture-contrast soils.

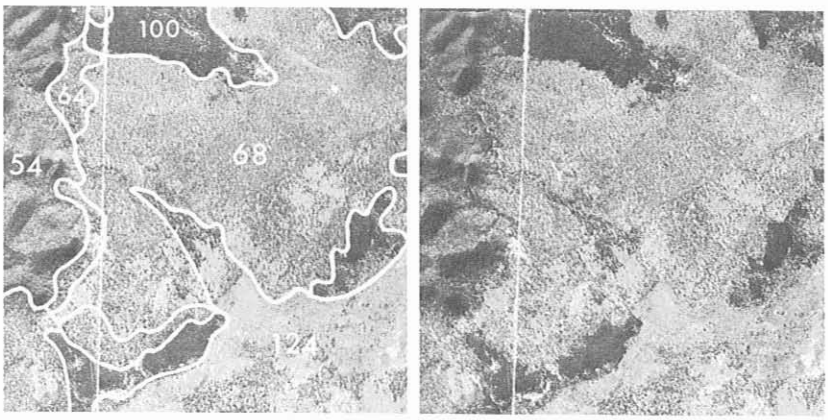
Climatic Zones.—9,8,5,4(6,10). Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 200 ± 50 mm.

Lithology.—Mixed sediments; mainly sandstone and shale; some siltstone, claystone, limestone and conglomerate; locally with volcanic and metamorphic rocks; gently dipping.

Terrain.—Undulating to rolling.

Position on Slope.—Lower slopes, mainly less than 5%, locally up to 15%.





Soil.—Shallow texture-contrast soils: mainly Southernwood (Dr2.12, 2.22, Dy2.12, 2.22, 3.42), extensive Medway (Dr2.13, Db1.43, Dy2.13); minor deep soils, Luxor (Dy2.32, 3.22, 3.42), Taurus (Dd1.43), Springwood (Db2.22) and Wyseby (Dr2.31); very gravelly in places.

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. orgadophila*, *E. papuana*, *E. crebra*), 12 ± 3 m, understorey absent or very sparse shrubs; mesic mid-height grass.

Land Capability.—VId_{4-6},r_{4-6},t_6.

Land Unit 69 (360 km²)

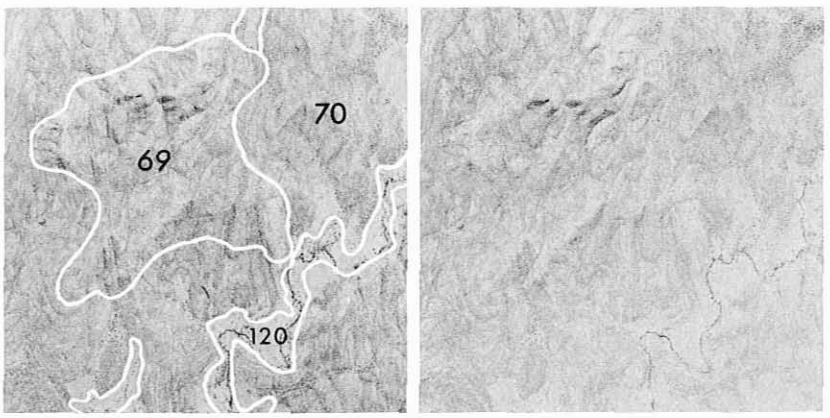
Field Criteria.—Hilly terrain, rosewood–narrow-leaved ironbark forest, skeletal soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—Mixed sediments; siltstone, claystone, shale, sandstone and limestone.

Terrain.—Hilly.

Position on Slope.—Upper slopes, mainly less than 20%, locally up to 60%.



Soil.—Skeletal soils: very shallow sandy soils, Shotover (Uc1.21), with extensive outcrop; generally in poorly defined linear belts following the strike of underlying rocks.

Vegetation.—Rosewood–narrow-leaved ironbark open-forest: *A. rhodoxylon–E. crebra* (*E. moluccana*), 14 ± 4 m; moderately dense understorey (*Alphitonia excelsa*, *Grevillea striata*, *Hakea lorea*, *Acacia cunninghamii*, *Acacia* sp., *Cassia brewsteri*, *Petalostigma pubescens*, *Alstonia constricta* and *Heterodendrum diversifolium*), 5 ± 3 m; forest grass. N.B. In many places this community has been extensively modified by selective logging and/or ring-barking to woodland or open-woodland formation.

Land Capability.—$VIIt_{6-7},d_{6-7}$.

LAND UNIT 70 (505 KM²)

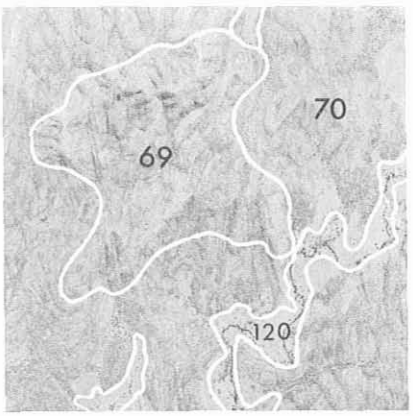
Field Criteria.—Undulating terrain, rosewood–silver-leaved ironbark forest, texture-contrast soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—Mixed sediments, siltstone, claystone, shale, sandstone and limestone; moderately to steeply dipping strata.

Terrain.—Undulating to rolling.

Position on Slope.—Middle and lower slopes, convex to concave, 2–10%.



Soil.—Shallow to moderately deep texture-contrast soils: shallow soils, Medway (Dy2.23), and moderately deep soils, Taurus (Dy2.23), Retro (Dy2.43, Dd1.23) and Luxor (Dy3.42); commonly in poorly defined narrow belts following the strike of underlying strata.

Vegetation.—Rosewood–silver-leaved ironbark open-forest: *A. rhodoxylon*, *E. melanophloia* (*E. moluccana*, *E. crebra*), 12 ± 3 m; understorey absent or sparse (*Alphitonia excelsa*), 5 ± 3 m; scattered shrubs (*Grewia retusa*, *Carissa ovata*), 1 ± 0·5 m; forest grass. N.B. In many places this community has been very extensively modified by selective logging, ring-barking or clearing to woodland or open-woodland formation. In these more open areas mesic mid-height grass tends to replace forest grass.

Land Capability.—$VId_{4-6}p_{3-4}$.

LAND UNIT 71 (830 KM²)

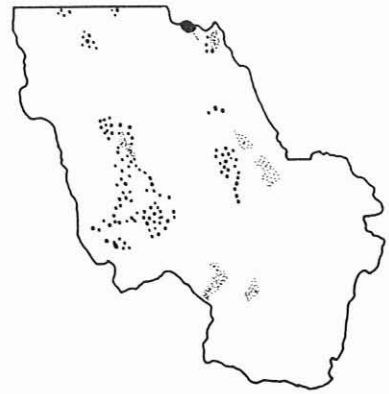
Field Criteria.—Undulating terrain, box woodland, texture-contrast soils.

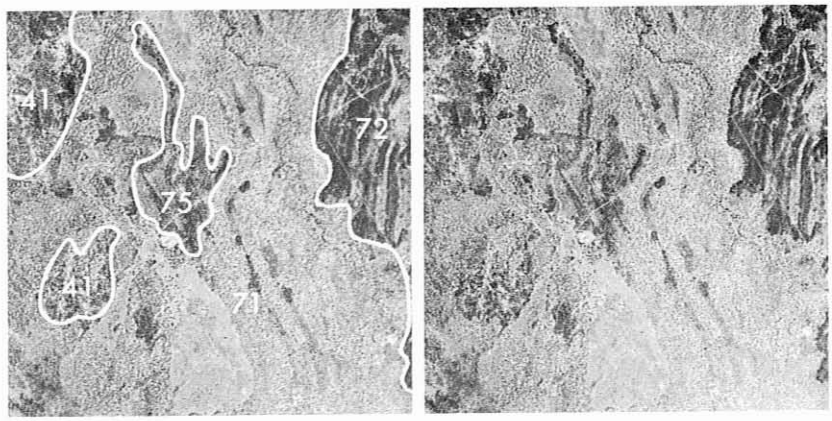
Climatic Zones.—6,7,8,10,11. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 125 ± 50 mm.

Lithology.—Mixed sediments; sandstone, shale and mudstone; generally folded steeply dipping strata.

Terrain.—Undulating terrain with low strike ridges.

Position on Slope.—Lower slopes and depressions, generally less than 6%, up to 12% locally.





Soil.—Texture-contrast soils: shallow to moderately deep soils, Southernwood (Dr2.12, Dy2.42), Medway (Dr2.13, Db1.13) and Taurus (Dr2.13, Db1.33, Dy3.43, Dd1.23); minor Springwood (Dr2.32, Db2.22), Wyseby (Dr2.31, Db1.11) and Luxor (Dy3.22); generally occurring in narrow belts following the strike of underlying strata.

Vegetation.—Box woodland: *E. populnea*/*E. brownii* commonly aligned in linear bands along strike belts, 12 ± 3 m; moderately dense to dense understorey of *Eremophila mitchellii* (*Geijera parviflora*), 5 ± 3 m; moderately dense to dense shrub layer of *Carissa ovata* (*Canthium oleifolium*), 1 ± 0·5 m; xeric and/or mesic mid-height grass.

Land Capability.—VIt_6,d_{4-6}.

LAND UNIT 72 (1075 KM²)

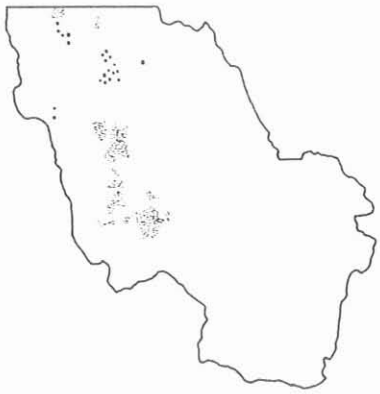
Field Criteria.—Undulating terrain, brigalow forest, texture-contrast soils.

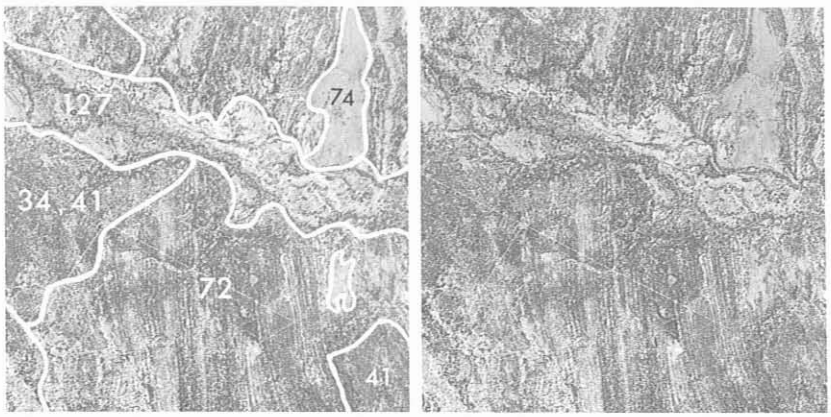
Climatic Zones.—6,7,10,11. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Mixed sediments; sandstone, shale and mudstone; generally folded, steeply dipping strata; slightly affected by deep weathering.

Terrain.—Undulating.

Position on Slope.—Upper, middle and lower slopes, up to 6%.





Soil.—Texture-contrast soils: shallow to moderately deep soils with thin sandy or loamy surface horizons and strongly alkaline subsoils, Medway (Db1.13, Dy2.33, Dd1.33), Retro (Db1.13, Dd1.33, Dr3.33) and Taurus (Dd1.33, Dy2.13); minor Springwood (Dr2.11); generally in narrow belts following strike of underlying strata.

Vegetation.—Brigalow open-forest: *A. harpophylla* (*A. argyrodendron* in north), 12 ± 3 m, in linear groves aligned along strike, commonly forming a complex pattern of alternating belts with land unit 73; sparse to moderately dense upper tree layer of *Bauhinia carronii*, *Geijera parviflora*, *Flindersia dissosperma*, *Owenia acidula*, 6 ± 3 m; moderately dense lower tree layer of *Eremophila mitchellii*, 3 ± 1 m; moderately dense to dense shrub layer of *Geijera parviflora*, *Canthium oleifolium*, *Carissa ovata*, 2 ± 1 m; sparse scrub grass, ferns and mosses.

Land Capability.—$VId_{4-6},p_{3-4},e_{3-4}$.

Land Unit 73 (1690 km²)

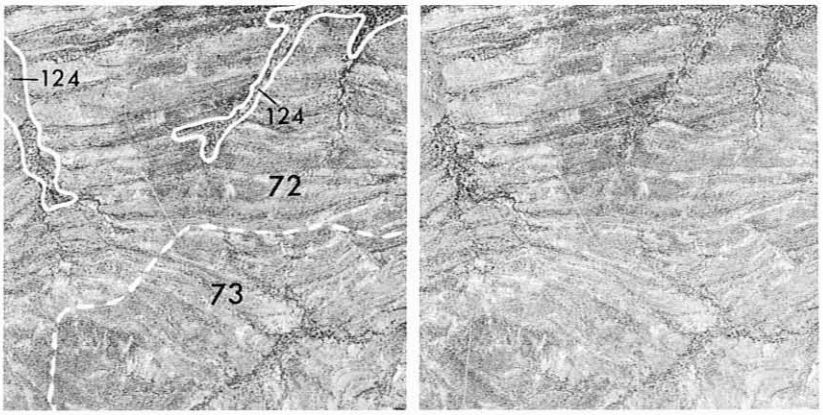
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, shallow texture-contrast soils.

Climatic Zones.—11,10(7,6,5,4). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 150 ± 75 mm.

Lithology.—Mixed sediments; sandstone, siltstone, claystone and shale: generally folded steeply dipping strata.

Terrain.—Undulating to rolling.

Position on Slope.—Crestal, upper, middle and lower slopes, mainly less than 5%.



Soil.—Shallow texture-contrast soils: Southernwood (Dr2.12, Db1.12) and Medway (Dr2.13, Dy2.13, 3.23, 2.43, Dd1.13); extensive deep soils in places, Luxor (Dy3.22, 2.32), Broadmeadow (Dr2.43, Dy3.23) and Taurus (Dr2.13); minor Springwood (Dy2.23) and Retro (Dy2.13); commonly with gravel or stones on surface and in upper horizons; generally in narrow belts following the strike of underlying strata.

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia* and/or *E. orgadophila* (*E. dichromophloia*, *E. papuana*), 11 ± 3 m, in linear groves aligned along strike, commonly forming a complex pattern of alternating belts with land unit 72; sparse to moderately dense understorey of *Eremophila mitchellii* (*Albizia basaltica*, *Ventilago viminalis*), 5 ± 3 m; sparse to moderately dense shrub layer of *Carissa ovata* (*Canthium oleifolium*); mesic mid-height grass grading to xeric mid-height grass in the west.

Land Capability.—$VId_{4-6},p_{3-4},e_{3-4}$.

LAND UNIT 74 (290 KM²)

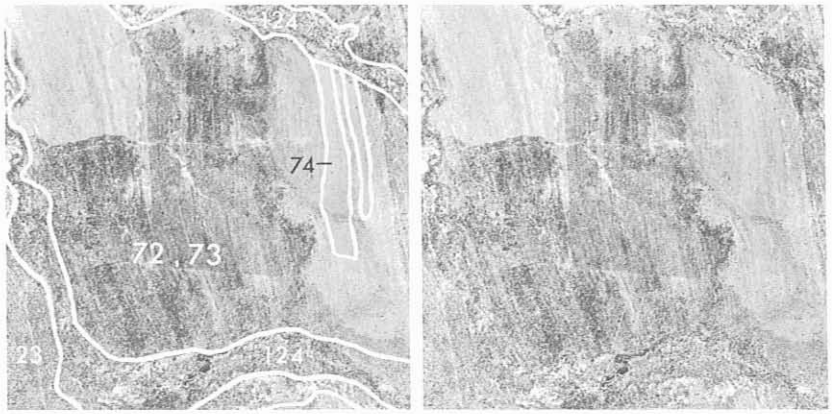
Field Criteria.—Undulating terrain, grassland, cracking clay soils.

Climatic Zones.—11,10(7,6). Median seasonal rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 125 ± 50 mm.

Lithology.—Mixed sediments; sandstone, siltstone, claystone and shale; generally folded, steeply dipping strata.

Terrain.—Undulating to rolling.

Position on Slope.—Upper, middle and lower slopes, mainly less than 6%, up to 14% locally.



Soil.—Shallow to moderately deep cracking clay soils: self-mulching, generally mildly to strongly alkaline throughout with small amounts of carbonate concretions, Bruce (Ug5.12, 5.37) and Teviot (Ug5.14, 5.22); commonly in narrow belts following the strike of underlying strata.

Vegetation.—Tussock grassland: perennial tussocks of mesic mid-height grasses (e.g. *Themeda australis*, *Heteropogon contortus*) and blue grass (*Dichanthium sericeum*) in the east, grading to xeric mid-height grasses (*Bothriochloa ewartiana*, *B. decipiens*, *Aristida* spp.) in the west; aligned in linear patterns along strike belts in association with land units 73 and/or 72.

Land Capability.—VId_{4-6},e_3.

Land Unit 75 (1225 km²)

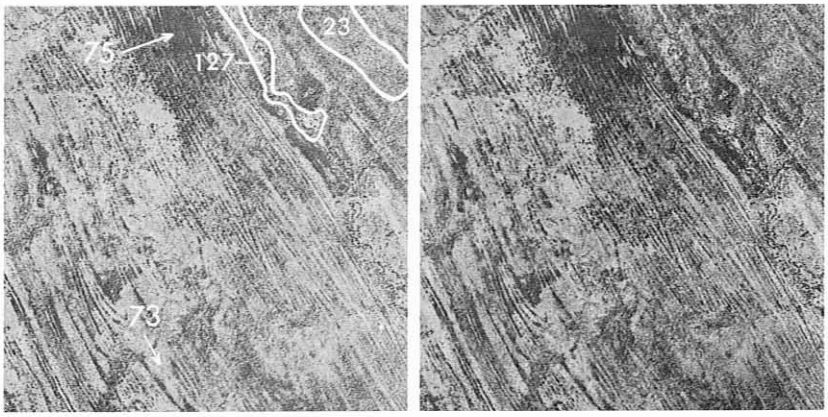
Field Criteria.—Undulating terrain, brigalow forest, cracking clay soils.

Climatic Zones.—6,5(4,7,10,11). Median rainfall: Nov.–Apr., 524 ± 75 mm; May–Oct., 150 ± 75 mm.

Lithology.—Mixed sediments; sandstone, siltstone, claystone and shale; generally folded, steeply dipping strata; slightly affected by deep weathering.

Terrain.—Undulating.

Position on Slope.—Upper, middle and lower slopes, mainly less than 3%, up to 6% locally.



Soil.—Moderately deep to deep cracking clay soils: Teviot (Ug5.12, 5.22, 5.32), generally strongly alkaline throughout and calcareous in lower profiles; commonly in well-defined to poorly defined belts following the strike of underlying strata.

Vegetation.—Brigalow open-forest: *A. harpophylla* (*A. argyrodendron* in north), 12 ± 3 m, commonly in groves aligned along strike belts; sparse to moderately dense upper tree layer of *Bauhinia carronii*, *Terminalia oblongata*, *Geijera parviflora*, *Casuarina cristata*, 8 ± 3 m; moderately dense lower tree layer of *Eremophila mitchellii*, 5 ± 3 m; moderately dense shrub layer of *Carissa ovata*, 1 ± 0·5 m; sparse scrub grass, ferns and mosses.

Land Capability.—III–IVe_{2-3},d_3.

Land Unit 76 (620 km²)

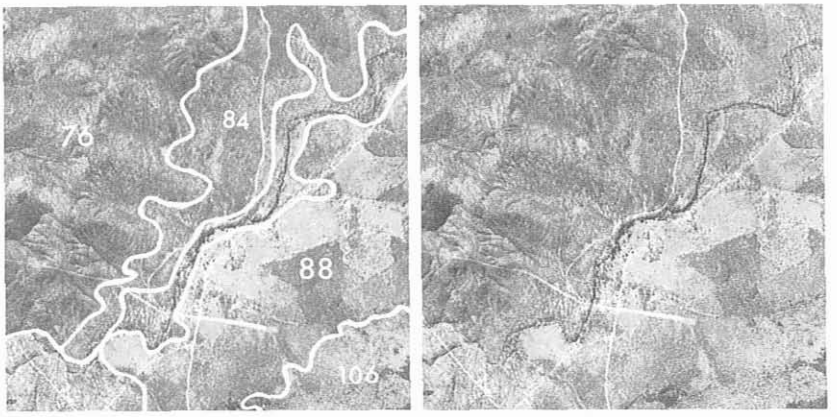
Field Criteria.—Hilly terrain, ironbark–bloodwood forest, shallow texture-contrast soils.

Climatic Zones.—4,5(6). Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—Granite and granodiorite.

Terrain.—Hilly.

Position on Slope.—Hill slopes, mainly 11–25%, locally up to 60%.



Soil.—Shallow texture-contrast soils: gritty loamy surface horizons over gritty, clayey subsoils with neutral reaction, Southernwood (Dr2.12, Dy3.22, 3.62); minor skeletal soils, Shotover (Uc1.2), and shallow sandy soils, Petrona (Uc1.21).

Vegetation.—Narrow leaved ironbark–bloodwood open-forest: *E. crebra–E. dichromophloia*, 16 ± 4 m; understorey absent or sparse (*Alphitonia excelsa*, *Acacia* spp. and *Xanthorrhoea* sp. locally), 5 ± 3 m; mesic mid-height grass. N.B. This community has been modified extensively through selective logging for fence-posts and through ring-barking and much is now woodland or open-woodland.

Land Capability.—VI–VIIt_{6-7},d_{4-7}.

Land Unit 77 (30 km²)

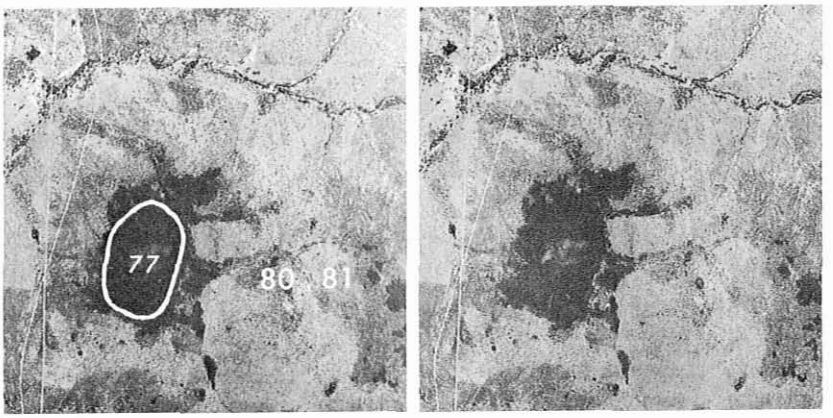
Field Criteria.—Hilly terrain, vine thicket, skeletal soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—*Granite and granodiorite.*

Terrain.—Hilly.

Position on Slope.—Upper slopes, 11–25%.



Soil.—Skeletal soils: very shallow to moderately shallow coarse sandy soils, Shotover and Petrona (Uc1.21); extensive outcrop.

Vegetation.—Vine thicket: a complex layered community with a more or less continuous canopy of slender, densely packed trees (*Flindersia australis*, *Alphitonia excelsa*, *Alstonia constricta* and many other species), 6 ± 2 m; a discontinuous emergent tree layer of *Ficus* spp., *Brachychiton australe*, *B. rupestre*, 12 ± 4 m; a dense shrub layer (*Abutilon* sp., *Citriobatus spinescens*, *Capparis lasiantha*, *Carissa ovata* and many other species), 2 ± 1 m; over deep litter, sparse scrub grasses, ferns and mosses. Lianes common.

Land Capability.—VI–VIId_{6-7},t_6.

LAND UNIT 78 (505 KM²)

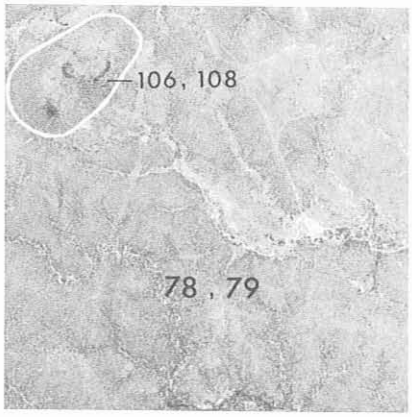
Field Criteria.—Rolling terrain, silver-leaved ironbark woodland, texture-contrast soils.

Climatic Zones.—10,7. Median rainfall: Nov.–Apr., 425 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Granite.

Terrain.—Rolling.

Position on Slope.—Upper and middle slopes, mainly 6–14%, up to 20%.



Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons over mainly red, neutral to strongly alkaline subsoils, Wyseby (Dr2.12) and Taurus (Dr2.13); minor shallow or thick sandy surface soils on some upper slopes, Southernwood (Dr2.12) and Broadmeadow (Dy2.43).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. papuana*), 11 ± 2 m; understorey absent or very sparse; mesic mid-height grass.

Land Capability.—$VIt_6,p_{3-4},e_{3-4},d_{4-6}$.

LAND UNIT 79 (840 KM²)

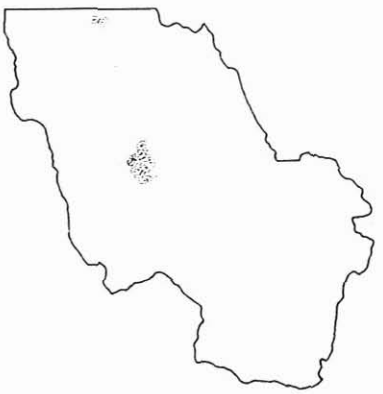
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, texture-contrast soils.

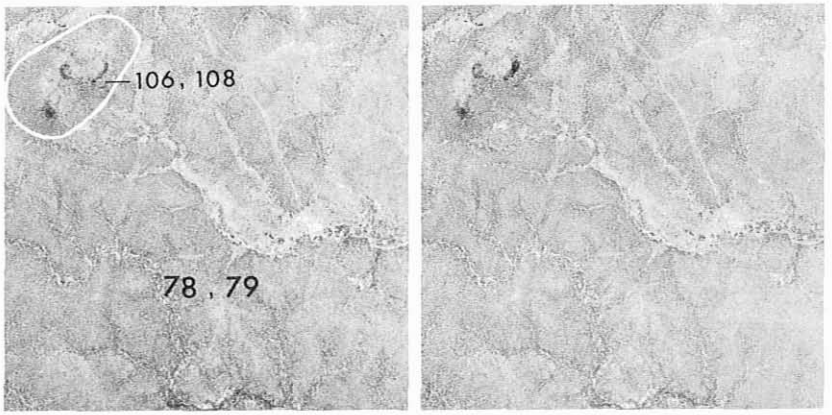
Climatic Zones.—10,7. Median rainfall: Nov.–Apr., 425 ± 50 mm; May–Oct., 125 ± 25 mm.

Lithology.—Granite.

Terrain.—Undulating.

Position on Slope.—Crests of broad interfluves and lower slopes, 2–7%, up to 10% locally.





Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons over mainly red, neutral to strongly alkaline subsoils, Wyseby (Dr2.12) and Taurus (Dr2.13); minor shallow or sandy soils, Southernwood (Dr2.12) and Broadmeadow (Dy2.43).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. papuana*), 11 ± 2 m; understorey absent or very sparse; mesic mid-height grass. N.B. In many cases this community has been thinned by ring-barking and is now open-woodland.

Land Capability.—IVe_{3-4},p_{3-4}.

Land Unit 80 (455 km²)

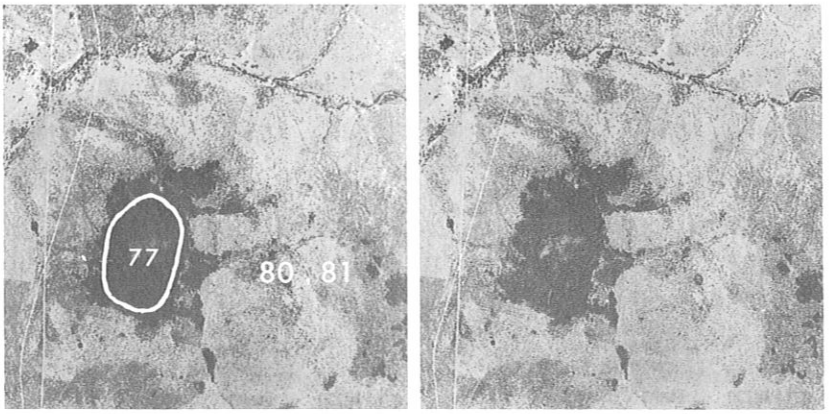
Field Criteria.—Undulating terrain, ironbark–bloodwood woodland, texture-contrast soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 75 mm; May–Oct., 200 ± 25 mm.

Lithology.—Granite and granodiorite.

Terrain.—Undulating.

Position on Slope.—Lower slopes, mainly less than 5%.



Soil.—Moderately deep texture-contrast soils: thick sandy surface horizons over massive clayey subsoils with neutral to acid reaction, Luxor (Dy3.42, 4.51).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. crebra*, *E. dichromophloia*), 13 ± 3 m; understorey absent or sparse; mesic mid-height grass. N.B. This community has been modified extensively through ring-barking and in many cases has been completely cleared.

Land Capability.—IVp$_{3-4}$.

Land Unit 81 (150 km²)

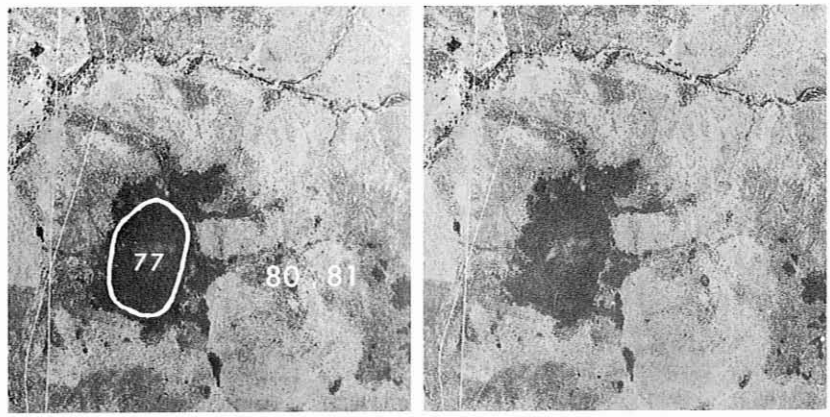
Field Criteria.—Undulating terrain, blue gum–ironbark forest, uniform sandy soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 75 mm; May–Oct., 200 ± 25 mm.

Lithology.—Granite and granodiorite.

Terrain.—Undulating.

Position on Slope.—Lower slopes, up to 5%.



Soil.—Moderately deep to deep sandy soils: Petrona (Uc2.21) and Highmount (Uc6.12).

Vegetation.—Blue gum–ironbark open-forest: *E. tereticornis–E. crebra* (*E. tessellaris*, *E. polycarpa*, *E. populnea*, *E. papuana* in north), 18 ± 4 m; understorey absent or sparse; mesic mid-height grass. N.B. This community has been modified extensively through ring-barking and selective logging and in many cases has been completely cleared.

Land Capability.—IVm_{3-4},d_{3-4}.

Land Unit 82 (120 km²)

Field Criteria.—Undulating terrain, gum-topped box woodland, texture-contrast soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 500 ± 75 mm; May–Oct., 200 ± 25 mm.

Lithology.—Granite and granodiorite.

Terrain.—Undulating.

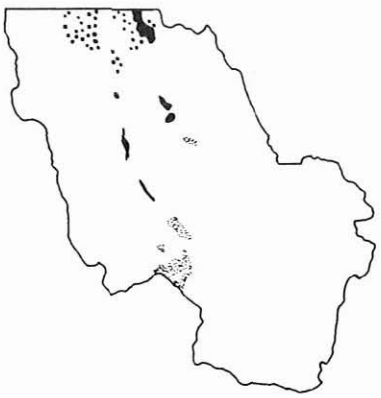
Position on Slope.—Lower slopes, mainly 3–5%.

Soil.—Moderately deep texture-contrast soils: thin sandy or loamy surface horizons over acid to strongly alkaline clayey subsoils, Retro (Dy3.43) and Springwood (Dy2.41).

Vegetation.—Gum-topped box open-forest/woodland: *E. moluccana* (*E. populnea*, *E. melanophloia*), 18 ± 5 m; understorey sparse to moderately dense (*Flindersia dissosperma*, *Eremophila mitchellii*, *Petalostigma pubescens*, *Eremocitrus* sp.), 5 ± 3 m; mesic mid-height grass.

Land Capability.—IVp_{3-4}.

Land Unit 83 (820 km²)



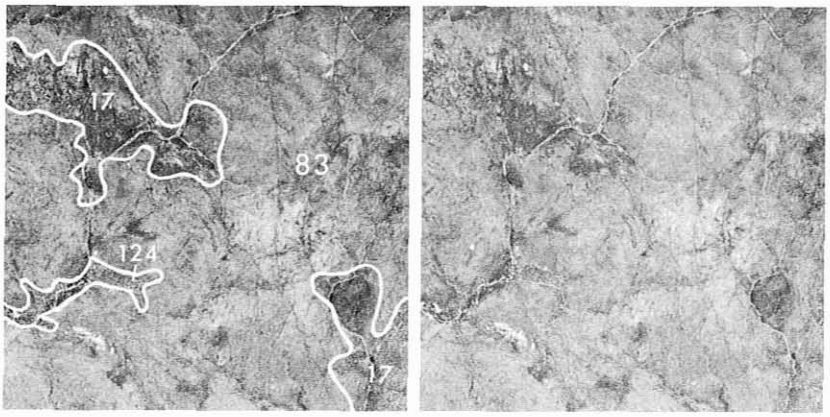
Field Criteria.—Rocky hills, ironbark woodland, skeletal soils.

Climatic Zones.—7,8,10(11,6). Median rainfall: Nov.–Apr., 425 ± 50 mm; May–Oct., 125 ± 75 mm.

Lithology.—Volcanic rocks; mainly rhyolite, andesite, tuff, agglomerate and trachyte.

Terrain.—Hilly.

Position on Slope.—Slopes on rocky hills and strike ridges, mainly 11–25%, up to 80% locally.



Soil.—Skeletal soils: very shallow sandy soils, generally gravelly or stony, Shotover (Uc1.2); minor shallow to moderately deep soils, Petrona (Uc1.2); extensive outcrop.

Vegetation.—Narrow-leaved or silver-leaved ironbark grassy woodland: *E. drepanophylla* or *E. melanophloia*, 11 ± 2 m; understorey absent or sparse (*Albizia basaltica*, *Eremophila mitchellii*, *Macrozamia moorei*), 3 ± 1 m; xeric mid-height grass and/or spinifex on drier sites. N.B. Very small occurrences of depauperate vine thicket have been included within this unit, e.g. Peak Range area.

Land Capability.—VII–VIIIt_{6-8},d_{6-7},r_{6-8}.

LAND UNIT 84 (3130 KM²)

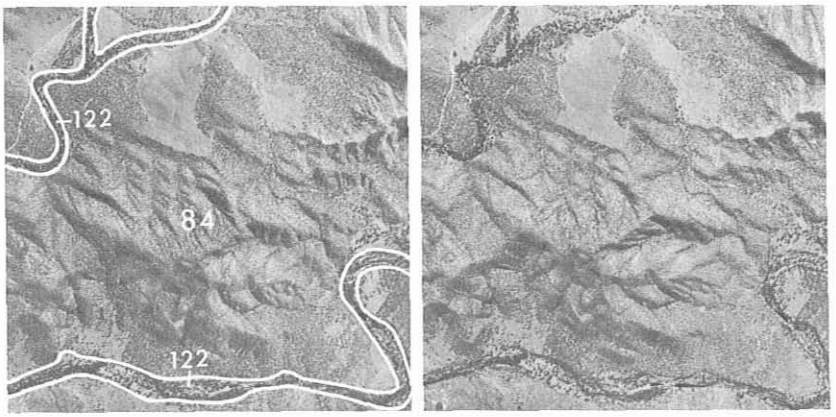
Field Criteria.—Steep rocky hills, ironbark forest, skeletal soils.

Climatic Zones.—4,5(1). Median rainfall: Nov.–Apr., 550 ± 75 mm; May–Oct., 225 ± 50 mm.

Lithology.—Volcanic rocks; rhyolite, andesite, tuff, agglomerate, trachyte and dacite with interbedded sediments in places.

Terrain.—Hilly to mountainous.

Position on Slope.—Slopes on hills, mountains and strike ridges, mainly 11–25%, up to 80% locally.



Soil.—Skeletal soils: mainly very shallow uniform sandy or loamy soils, generally gravelly or stony, Shotover (Uc1.2) and Rugby (Um1.2, 1.4); minor shallow texture-contrast soils, Southernwood (Dr2.12, Dy3.62) and Medway (Dd1.13).

Vegetation.—Narrow-leaved ironbark open-forest: *E. crebra*/*E. drepanophylla*, 15 ± 3 m; sparse to moderately dense understorey (*Alphitonia excelsa*, *Petalostigma pubescens*, *Acacia* spp., and locally *Xanthorrhoea* sp. and *Macrozamia* sp.), 5 ± 3 m; mesic mid-height grass and forest grass. N.B. Ring-barking and selective logging have reduced many occurrences of this community to grassy woodland or open-woodland formation.

Land Capability.—VII–VIIIt_{6-8},d_{6-7}.

LAND UNIT 85 (220 KM²)

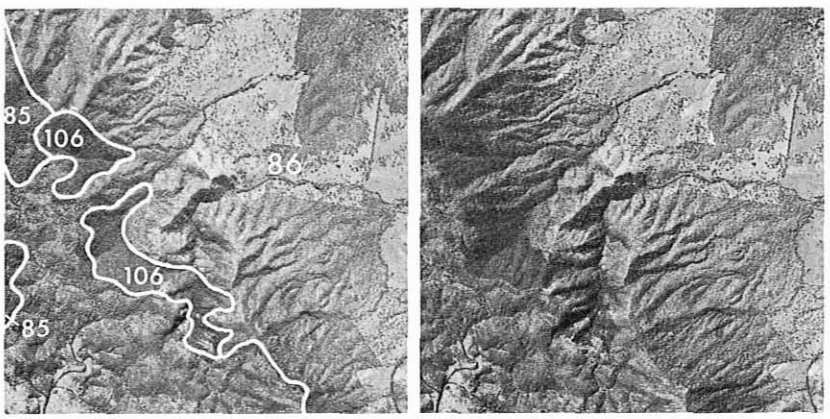
Field Criteria.—Hilly terrain, mixed eucalypt forest, red and yellow earths.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 575 ± 50 mm; May–Oct., 225 ± 50 mm.

Lithology.—Volcanic rocks; mainly rhyolite and andesite with interbedded sediments; slightly affected by deep weathering.

Terrain.—Hilly to mountainous.

Position on Slope.—Crests and upper slopes, mainly less than 5%, up to 20% locally.



Soil.—Humic loamy red and yellow massive earths: humic red earths (Gn2.11, 2.21), moderately deep to deep, with thick humic surface horizons and acid red or yellow subsoils overlying pale-coloured, soft weathered rock;* stony or gravelly in places; some outcrop.

Vegetation.—Tall eucalypt open-forest: a group of related eucalypt communities confined to moister, elevated sites on or near coastal ranges and tablelands (*E. crebra–E. tenuipes*, also *E. acmenioides–E. phaeotricha*, *E. andrewsii*, *E. saligna* recorded by Queensland Forestry Department on Kroombit Tops), 30 ± 10 m; sparse to moderately dense lower tree layer (*Casuarina torulosa*, *Acacia* spp.), 12 ± 3 m; moderately dense ground layer of *Xanthorrhoea* sp., *Macrozamia* sp., 1 ± 0·5 m; over *Pteridium esculentum*, *Imperata cylindrica* and forest grass.

Land Capability.—VIt_6,r_{4-6}.

* Not described in Gelobera land system in the Dawson–Fitzroy area.

Land Unit 86 (175 km²)

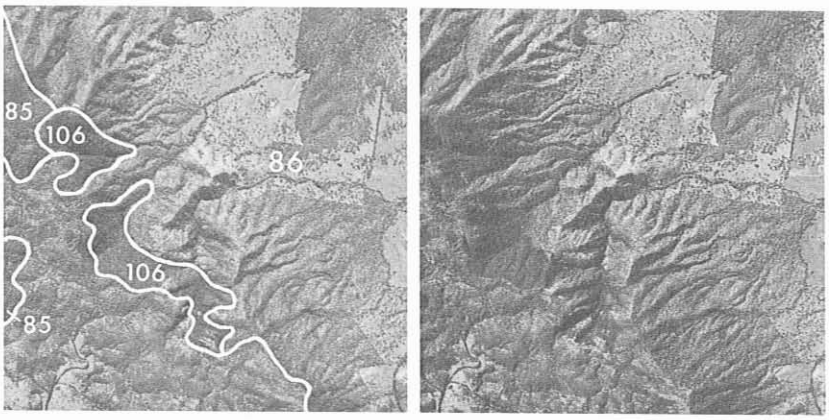
Field Criteria.—Hilly terrain, ironbark–spotted gum forest, shallow texture-contrast soils.

Climatic Zones.—4,5. Median rainfall: Nov.–Apr., 575 ± 50 mm; May–Oct., 225 ± 50 mm.

Lithology.—Volcanic rocks; mainly rhyolite and andesite with interbedded sediments.

Terrain.—Hilly to mountainous.

Position on Slope.—Spurs and foot slopes, mainly less than 10%, up to 25% locally.



Soil.—Shallow texture-contrast soils: Southernwood (Dr3.41).

Vegetation.—Ironbark–spotted gum open-forest: *E. crebra–E. maculata*, 22 ± 4 m; moderately dense understorey (*A. glaucocarpa*, *A. cunninghamii*, *Alphitonia excelsa*, *Petalostigma pubescens*, *Eremophila* sp.), 6 ± 3 m; forest grass.

Land Capability.—VIt_6,d_{4-6}.

LAND UNIT 87 (640 KM²)

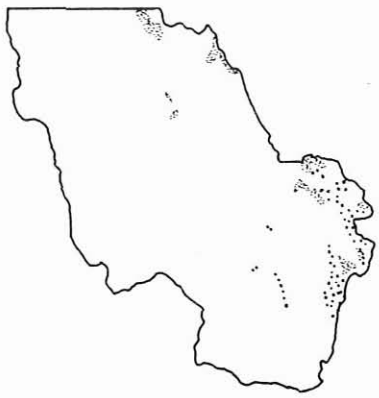
Field Criteria.—Undulating terrain, poplar box woodland, texture-contrast soils.

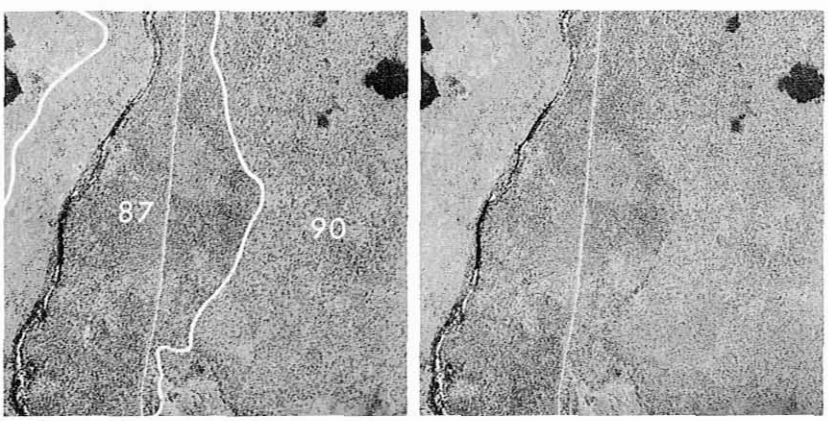
Climatic Zones.—4,5,6,7. Median rainfall: Nov.–Apr., 500 ± 75 mm; May–Oct., 175 ± 75 mm.

Lithology.—Volcanic rocks; mainly rhyolite, andesite, tuff, agglomerate, trachyte and dacite with interbedded sediments in places.

Terrain.—Undulating.

Position on Slope.—Lower colluvial slopes, concave, mainly 2–3%, up to 5% locally.





Soil.—Deep texture-contrast soils: thin and thick surface horizons and mainly strongly alkaline subsoils, Retro (Dy2.43), Taurus (Dy3.43, Db1.13) and Broadmeadow (Dy3.43, Db1.23); minor Wyseby (Dr2.12).

Vegetation.—Poplar box grassy woodland: *E. populnea* (*E. tessellaris*, *E. papuana* and *E. alba* in north-east), 12 ± 3 m; understorey absent or sparse (*Eremophila mitchellii*), 3 ± 1 m; sparse shrub layer (*Carissa ovata*), 1 ± 0·5 m; mesic mid-height grass.

Land Capability.—IVp_{3-4}.

LAND UNIT 88 (2375 KM²)

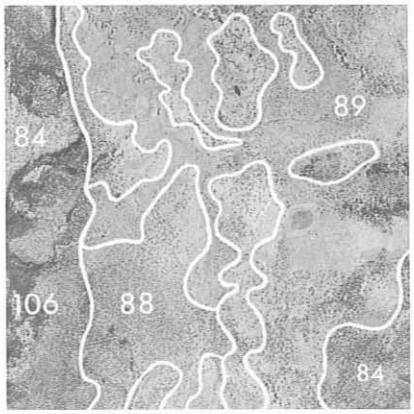
Field Criteria.—Undulating terrain, ironbark–bloodwood woodland, shallow texture-contrast soils.

Climatic Zones.—4,5,6. Median rainfall: Nov.–Apr., 525 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Volcanic rocks; andesite, agglomerate, tuffs and interbedded sediments.

Terrain.—Undulating to rolling.

Position on Slope.—Upper, middle and lower slopes, mainly less than 5%, up to 15% locally.



Soil.—Shallow texture-contrast soils: Southernwood (Dr2.12, Dy2.12, 3.12) and Medway (Dr2.13); minor deeper soils, Retro (Dy2.23) and Wyseby (Dy2.12).

Vegetation.—Narrow-leaved ironbark woodland: *E. crebra* (*E. melanophloia*, *E. dichromophloia*, *E. papuana* in north), 11 ± 3 m; understorey sparse to moderately dense (*Albizia basaltica*, *Owenia acidula*, *Acacia* spp.), 5 ± 3 m; mesic mid-height grass. N.B. This community has been extensively modified by ring-barking and clearing.

Land Capability.—$IVp_{3-4},d_{3-4},e_{3-4}$.

Land Unit 89 (1090 km²)

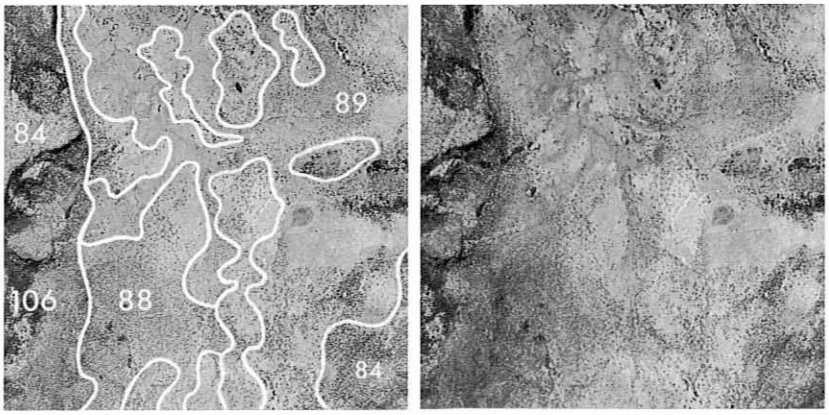
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, cracking clay soils.

Climatic Zones.—4,5,6. Median rainfall: Nov.–Apr., 525 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Volcanic rocks; andesite, tuff and agglomerate.

Terrain.—Undulating to rolling.

Position on Slope.—Upper and middle slopes, mainly 2–3%, up to 7% locally.



Soil.—Shallow to moderately deep cracking clay soils: Bruce and Arcturus (Ug5.12, 5.22, 5.37); minor very shallow loams or clays, Rugby (Um1.4, Uf6.32).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. crebra*, *E. dichromophloia*), 11 ± 3 m; understorey sparse or absent; mesic mid-height grass.

Land Capability.—III–IVd_{3-4}.

Land Unit 90 (460 km²)

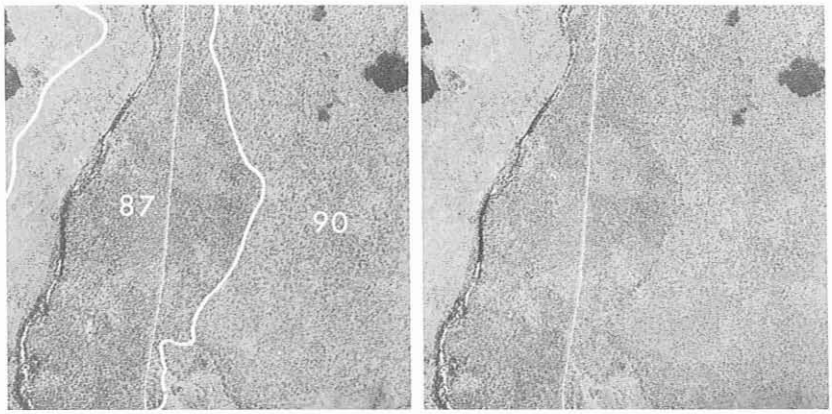
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, cracking clay soils.

Climatic Zones.—4,5,6. Median rainfall: Nov.–Apr., 525 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Volcanic rocks; andesite, tuff and agglomerate.

Terrain.—Undulating to rolling.

Position on Slope.—Lower slopes, mainly less than 3%.



Soil.—Moderately deep to deep cracking clay soils: Arcturus (Ug5.12) and May Downs (Ug5.12, 5.13, 5.15, 5.16, 5.4).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. crebra*, *E. polycarpa* and *E. orgadophila* in north-east), 12 ± 3 m; understorey absent or very sparse; mesic mid-height grass.

Land Capability.—II–IIIe_{2-3},k_{2-3}.

Land Unit 91 (705 km²)

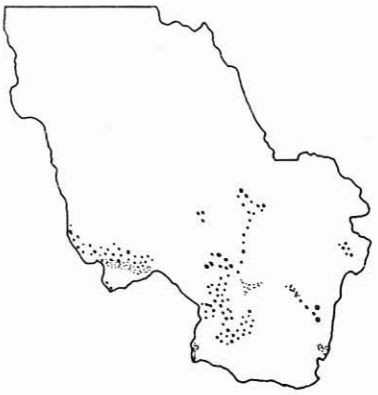
Field Criteria.—Hilly terrain, vine thicket, texture-contrast and brown and grey-brown soils.

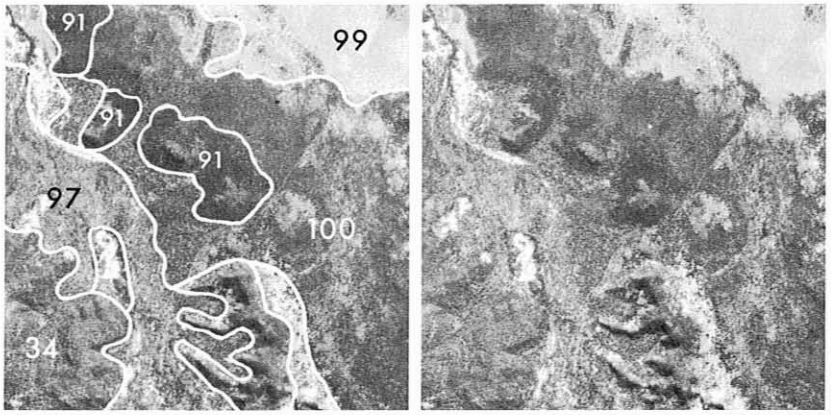
Climatic Zones.—5,8,9,10. Median seasonal rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Argillaceous sediments; shales, mudstones, lithic sandstones; slightly affected by deep weathering.

Terrain.—Hilly.

Position on Slope.—Steep upper and middle slopes, 15–40%.





Soil.—Texture-contrast and dark brown and grey-brown soils: shallow to moderately deep, Wyseby (Dr2.11), Retro (Db2.13), Kinnoul (Uf6.33, 6.31, 6.21, 6.11), Carraba (Gn3.11) and Cheshire (Gn3.24, Uf6.32).

Vegetation.—Vine thicket (tree-wilga, bottle-tree, and occasional brigalow emergents): a complex layered community with a more or less continuous canopy of slender, densely packed trees (*Macropteranthes leichhardtii* common and locally dominant, *Geijera parviflora*, *Denhamia obscura*, *Croton insularis*, *Bauhinia carronii* and many other species), 6 ± 2 m; a discontinuous emergent tree layer (*Geijera parviflora*, *Brachychiton rupestre* and occasionally *A. harpophylla*), 11 ± 3 m; shrub layer moderately dense to dense, depending on density of canopy layer (*Macropteranthes leichhardtii*, *Croton phebalioides*, *Ehretia membranifolia*, *Erythroxylum australe*, *Heterodendrum diversifolium*, *Carissa ovata* and many other species), 2 ± 1 m; over deep litter, sparse scrub grass, ferns and mosses. Lianes common.

Land Capability.—VI–VIIt_{6-7}.

Land Unit 92 (595 km²)

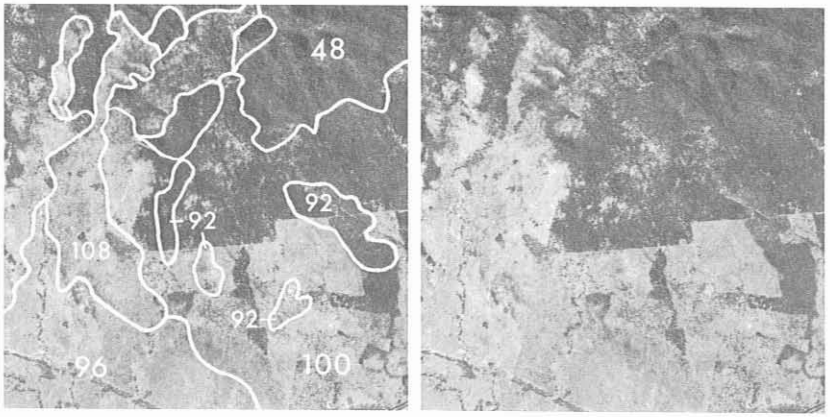
Field Criteria.—Undulating terrain, vine thicket–mountain coolibah, brown and grey-brown soils.

Climatic Zone.—9. Median rainfall: Nov.–Apr., 400 ± 50 mm; May–Oct., 175 ± 25 mm.

Lithology.—Argillaceous sediments; shales, mudstones, lithic sandstones; slightly affected by deep weathering.

Terrain.—Undulating.

Position on Slope.—Crests and upper slopes, mainly less than 5%, flanked by steep slopes up to 25%; gravel or cobble-strewn surfaces.



Soil.—Dark brown and grey-brown soils: shallow to moderately deep, Kinnoul (Gn3.43, Uf6.31, 6.21, 6.11) and Carraba (Gn3.4, Um2.12); minor shallow acid loams, Ingelara (Um2.12).

Vegetation.—Vine thicket (mountain coolibah, bottle-tree emergents): a complex layered community with a more or less continuous canopy of slender densely packed trees (*Geijera parviflora*, *Alphitonia excelsa*, *Alstonia constricta*, *Atalaya hemiglauca*, *Macropteranthes leichhardtii*, *Croton insularis* and many other species), 6 ± 2 m; a discontinuous emergent tree layer (*E. orgadophila*, *Brachychiton rupestre* and less commonly other species, such as *A. harpophylla*, *A. fasciculifera*, *Casuarina cristata*, *Flindersia australis*), 11 ± 3 m; shrub layer moderately dense to dense, depending on the density of the canopy layer (*Croton phebalioides*, *Geijera parviflora*, *Acalypha eremorum*, *Heterodendrum diversifolium*, *Carissa ovata* and many other species), 2 ± 1 m; over deep litter, sparse scrub grass, ferns and mosses. Lianes common.

Land Capability.—IV–VIt_{6},d_{3-4}.

Land Unit 93 (1855 km²)

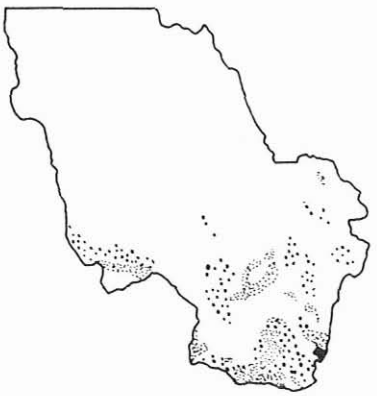
Field Criteria.—Undulating terrain, vine thicket–brigalow, brown and grey-brown soils.

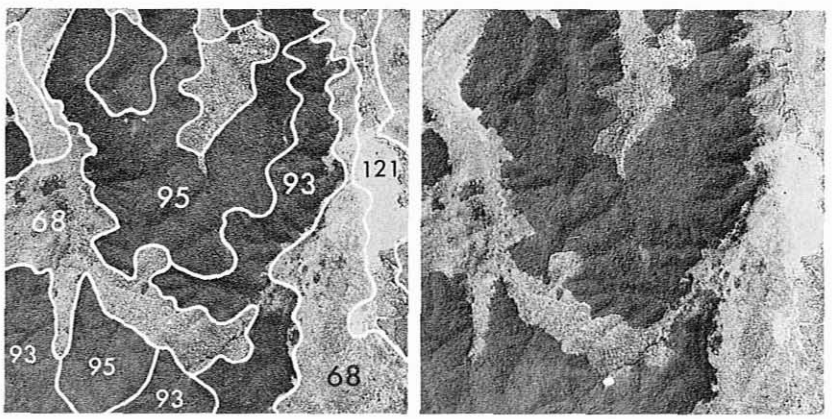
Climatic Zones.—4,5,8,9,10(6). Median rainfall: Nov.–Apr. 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Argillaceous sediments; shales, mudstones, lithic sandstones; slightly affected by deep weathering.

Terrain.—Undulating to rolling.

Position on Slope.—Upper, middle and lower slopes, 5–15%; moderately dissected.





Soil.—Dark brown and grey-brown soils: shallow to moderately deep, clay loams and light to medium clays, Kinnoul (Uf6.31, 6.21, 6.11) and Cheshire (Gn3.93, 3.23, Uf6.33); minor shallow acid loams and clays, Ingelara (Um5.2, Uf6.31); severely sheet eroded in places.

Vegetation.—Vine thicket (brigalow, bottle-tree emergents): a complex layered community with a more or less continuous canopy of slender, densely packed trees (*Geijera parviflora*, *Denhamia obscura*, *Macropteranthes leichhardtii*, *Croton insularis*, *Alstonia constricta* and many other species), 8 ± 3 m; a discontinuous emergent tree layer (*A. harpophylla*, *Brachychiton rupestre*, *B. australe*), 14 ± 3 m; shrub layer moderately dense to dense, depending on the density of the canopy layer (*Geijera parviflora*, *Croton phebalioides*, *Heterodendrum diversifolium*, *Carissa ovata* and many other species), 2 ± 1 m; over deep litter, sparse scrub grass, ferns and mosses. Lianes common.

Land Capability.—IVe_{3-4},d_{3-4}.

Land Unit 94 (500 km²)

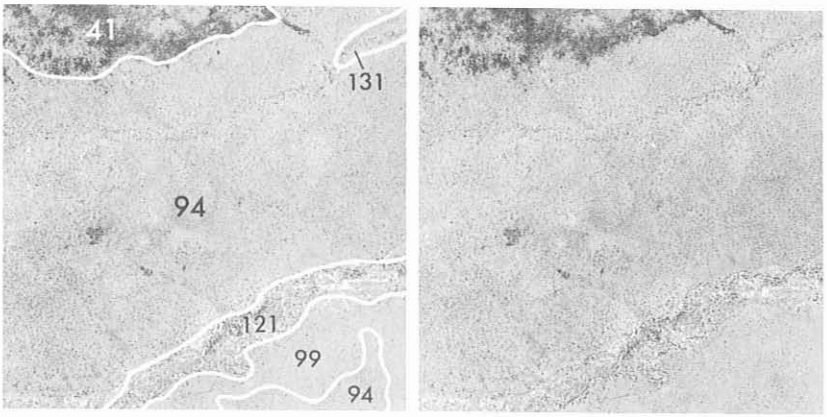
Field Criteria.—Undulating terrain, silver-leaved ironbark–mountain coolibah woodland, cracking clay soils.

Climatic Zones.—6,7,10(11). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 125 ± 25 mm.

Lithology.—Argillaceous sediments; shales, mudstones and lithic sandstones.

Terrain.—Undulating.

Position on Slope.—Crests and upper slopes, mainly 2–5%, up to 8% locally.



Soil.—Shallow to moderately deep self-mulching cracking clay soils: Bruce (Ug5.12) and Teviot (Ug5.12, 5.14); minor shallow clay soils on calcareous materials, Gindie (Uf6.12).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* and/or *E. orgadophila* (*E. dichromophloia*, *E. populnea*, *E. papuana* and *E. terminalis* in extreme north-west), 11 ± 3 m; understorey absent or very sparse; blue grass and/or mesic mid-height grass.

Land Capability.—IVe_{3-4},d_{3-4}.

LAND UNIT 95 (505 KM²)

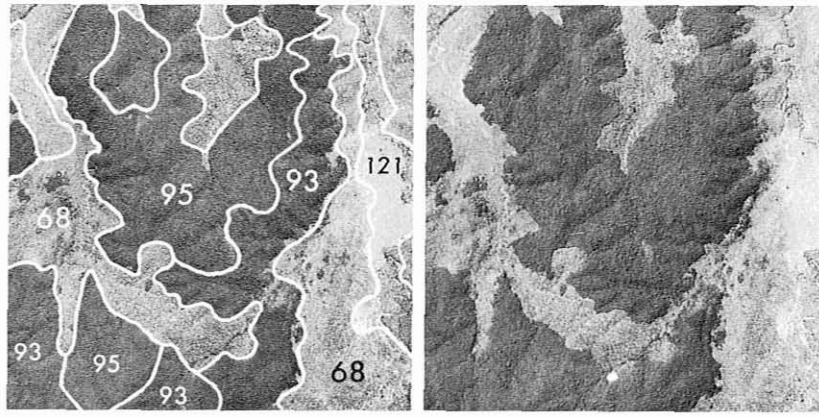
Field Criteria.—Undulating terrain, vine thicket, brown and grey-brown soils.

Climatic Zones.—4,5,6,8. Median rainfall: Nov.–Apr., 525 ± 75 mm; May–Oct., 200 ± 50 mm.

Lithology.—Argillaceous sediments; shales, mudstones, *lithic sandstones*; slightly affected by deep weathering.

Terrain.—Undulating.

Position on Slope.—Crests, upper, middle and lower slopes, mainly less than 5%.



Soil.—Dark brown and grey-brown soils: shallow to moderately deep, uniform or gradational loams to medium clays, Ingelara (Gn3.12, Uf6.31).

Vegetation.—Vine thicket (bottle-tree and occasional brigalow emergents): a complex layered community with a more or less continuous canopy of slender, densely packed trees (*Excoecaria dallachayana*, *Alstonia constricta*, *Macropteranthes leichhardtii*, *Croton insularis*, *Owenia acidula*, *Homalium almifolium*, *Backhousia sciadophora*, *Alphitonia excelsa*, *Denhamia obscura* and many other species), 8 ± 3 m; a discontinuous emergent tree layer, commonly *Brachychiton rupestre* and more rarely *B. australe*, 14 ± 3 m; shrub layer moderately dense to dense depending on the density of the canopy layer (*Acalypha eremorum*, *Exocarpos latifolius*, *Croton phebalioides*, *Erythroxylum australe*, *Citriobatus spinescens*, *C. parviflora*, *Carissa ovata*), 2 ± 1 m; over deep litter, sparse scrub grass, ferns and mosses. Lianes common.

Land Capability.—IVd_{3-4}.

Land Unit 96 (1265 km²)

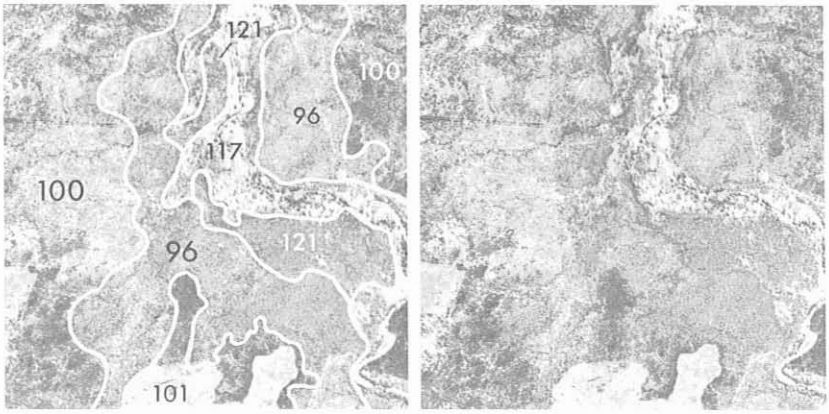
Field Criteria.—Gently undulating terrain, poplar box woodland, texture-contrast soils.

Climatic Zones.—5,8,9(4,6,10). Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 200 ± 50 mm.

Lithology.—Argillaceous sediments; shales, mudstones and lithic sandstones.

Terrain.—Level to undulating.

Position on Slope.—Lower slopes, concave, mainly 2–3%, up to 5%.



Soil.—Deep texture-contrast soils: thin loamy or sandy surface horizons and strongly alkaline subsoils, Retro (Dy2.43, 3.43, Dd1.13, Db2.23) and Taurus (Dy2.43, Db1.13); minor Broadmeadow (Dy5.83) and Luxor (Dy3.32).

Vegetation.—Poplar box woodland: *E. populnea*, 12 ± 3 m; understorey sparse to moderately dense (*Eremophila mitchellii*), 3 ± 1 m; mesic mid-height grass. N.B. Extensive clearing and ring-barking have modified this community to grassy woodland or open grassy woodland. On favoured sites this woodland formation grades to open-forest.

Land Capability.—IVp$_{3-4}$.

Land Unit 97 (560 km²)

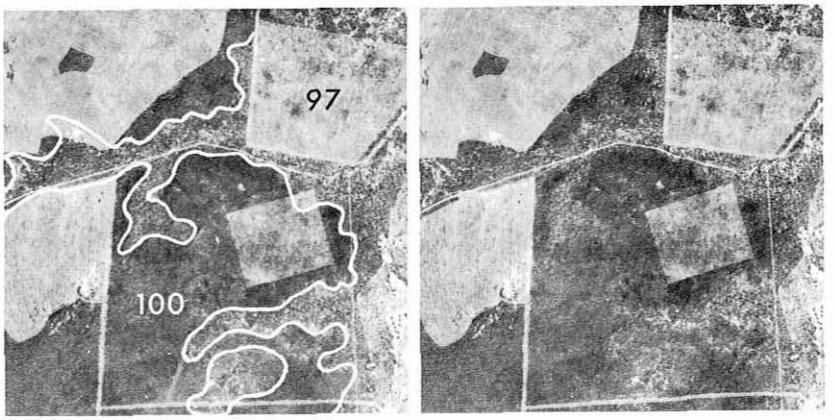
Field Criteria.—Gently undulating terrain, poplar box woodland, texture-contrast soils.

Climatic Zones.—9,8,5,4. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 200 ± 59 mm.

Lithology.—Argillaceous sediments; shales, mudstones and lithic sandstones.

Terrain.—Level to gently undulating.

Position on Slope.—Lower slopes marginal to drainage floors, 0–2%.



Soil.—Deep texture-contrast soils: thin loamy surface horizons and strongly alkaline subsoils, Retro (Db1.13, Dy2.23, 3.23); minor Taurus (Dy2.43).

Vegetation.—Poplar box–brigalow open-forest: *E. populnea–A. harpophylla*, 12 ± 3 m; moderately dense understorey (*Geijera parviflora*, *Eremophila mitchellii*), 3 ± 1 m; sparse to moderately dense shrub layer (*Carissa ovata*, *Heterodendrum diversifolium*, *Capparis lasiantha*), 1 ± 0·5 m; scrub grass and/or mesic mid-height grass.

Land Capability.—III–IVp_{3-4}.

Land Unit 98 (125 km²)

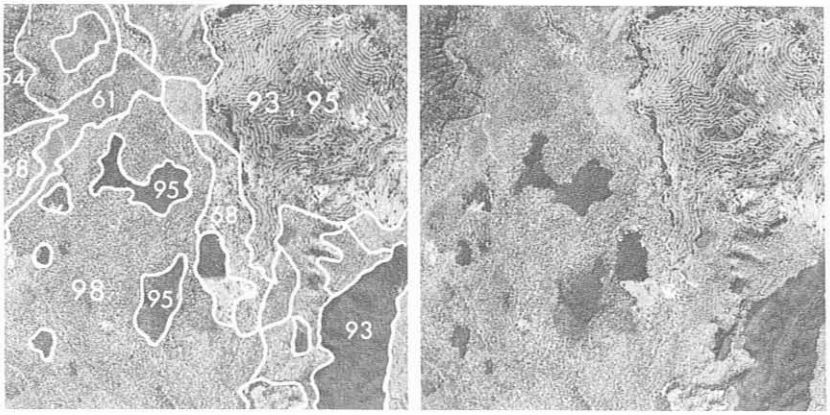
Field Criteria.—Undulating terrain, gum-topped box forest, texture-contrast soils.

Climatic Zones.—4,5,8,9. Median rainfall: Nov.–Apr., 525 ± 75 mm; May–Oct., 200 ± 50 mm.

Lithology. —Argillaceous sediments; shale, siltstone, claystone and lithic sandstone.

Terrain.—Undulating.

Position on Slope.—Lower slopes, less than 5%.



Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons and neutral to strongly alkaline subsoils, Wyseby (Dy3.42) and Taurus (Dy2.43).

Vegetation.—Gum-topped box open-forest: *E. moluccana* (*E. crebra*), 14 ± 3 m; sparse to moderately dense understorey (*Flindersia dissosperma*, *Eremophila mitchellii*, *Petalostigma pubescens*, *Alphitonia excelsa*, *Eremocitrus glauca*), 6 ± 3 m; shrub layer absent or sparse; forest grass or mesic mid-height grass where community is more open and grading to woodland.

Land Capability.—IVp_{3-4}.

Land Unit 99 (935 km²)

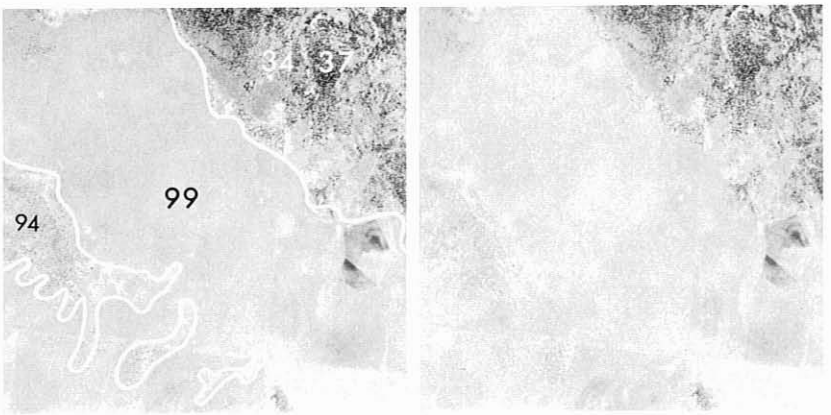
Field Criteria.—Undulating terrain, grassland, cracking clay soils.

Climatic Zones.—6,10. Median rainfall: Nov.–Apr., 450 ± 75 mm; May–Oct., 150 ± 25 mm.

Lithology.—Argillaceous sediments; shale and lithic sandstone.

Terrain.—Undulating.

Position on Slope.—Upper, middle and lower slopes, 0–5%.



Soil.—Cracking clay soils: moderately deep to deep, Teviot (Ug5.15, 5.14, 5.22), commonly with linear gilgai microrelief; minor dark brown and grey-brown soils, Cheshire (Gn3.93).

Vegetation.—Tussock grassland: perennial drought-evading tussocks of blue grass community (*Dichanthium sericeum*, *Thellungia advena*, *Panicum decompositum*) or occasionally mesic mid-height grass community (*Bothriochloa* spp., *Themeda australis*, *Heteropogon contortus*, *Aristida latifolia*, *Enneapogon* sp., *Cymbopogon refractus*); commonly with scattered trees (*E. melanophloia*, *E. dichromophloia* and/or *E. orgadophila*), 11 ± 3 m.

Land Capability.—II–IIIk_{2-3},e_{2-3}.

Land Unit 100 (5490 km²)

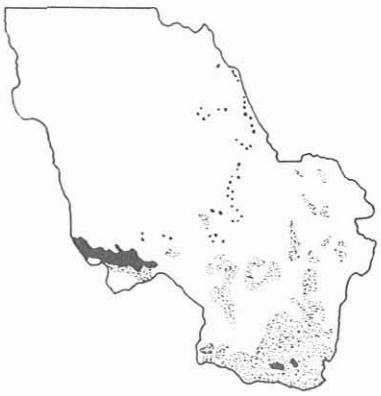
Field Criteria.—Gently undulating terrain, brigalow–belah forest, cracking clay soils.

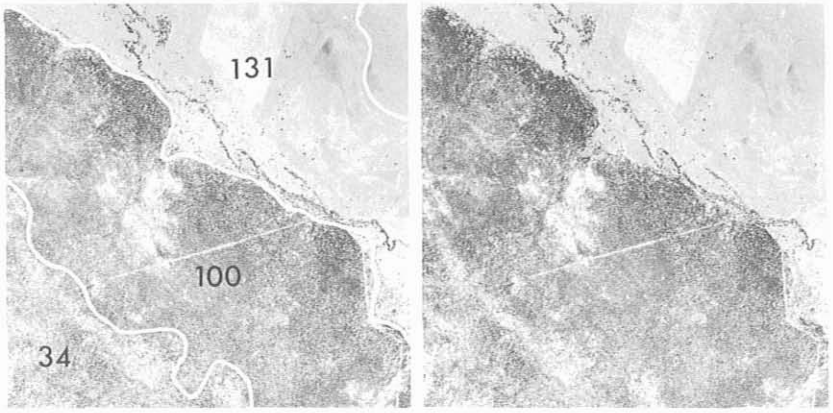
Climatic Zones.—4,5,6,8,9,10. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 175 ± 50 mm.

Lithology.—Argillaceous sediments; shale, mudstone, lithic sandstone; slightly affected by deep weathering.

Terrain.—Level to undulating.

Position on Slope.—Lower slopes, mainly 1–3%, up to 5%.





Soil.—Cracking clay soils: moderately deep to deep, Teviot (Ug5.12, 5.14, 5.15, 5.16, 5.22, 5.24, 5.32, 5.37); extensive dark brown and grey-brown soils, Cheshire (Uf6.21, 6.31); minor texture-contrast soils, Retro (Dr.2.13).

Vegetation.—Brigalow open-forest: *A. harpophylla* (*Casuarina cristata*), 14 ± 4 m, sparse to moderately dense upper tree layer (*Bauhinia carronii*, *Geijera parviflora*, *Brachychiton rupestre* and other species), 8 ± 3 m; moderately dense lower tree/tall shrub layer of *Geijera parviflora*, *Eremophila mitchellii* (*Atalaya hemiglauca*, *Croton phebalioides*, *Canthium odoratum*, *Eremocitrus glauca*, *Opuntia tomentosa* and other species), 3 ± 1 m; moderately dense to dense lower shrub layer of *Carissa ovata*, *Heterodendrum diversifolium* (*Denhamia obscura*, *Erythroxylum australe*, *Capparis lasiantha*, *Spartothamnella juncea*, *Apophyllum anomalum* and many other species), 1 ± 0·5 m; sparse scrub grass, forbs common (*Enchylaena tomentosa*, *Rhagodia hastata*, *Salsola kali*, *Chenopodium* spp., *Bassia tetracuspis*), ferns (*Cheilanthes distans*) and sedges (*Cyperus* spp.).

Land Capability.—II–IIIk_{2-3},e_{2-3}.

LAND UNIT 101 (3065 KM²)

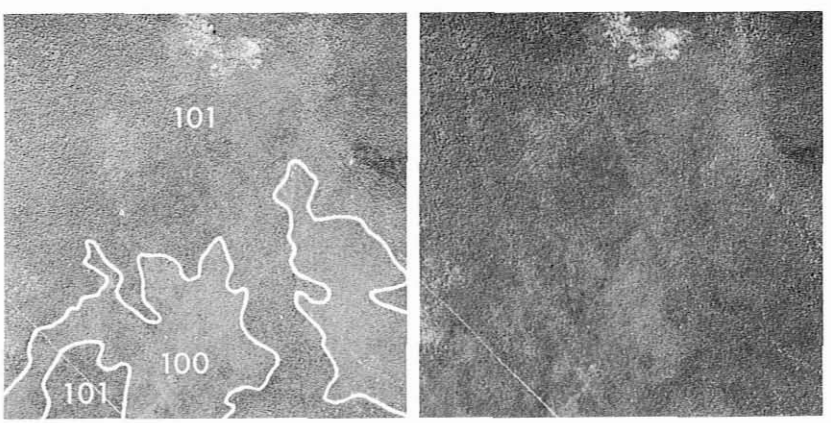
Field Criteria.—Gently undulating terrain, brigalow forest–vine thicket, cracking clay and brown and grey-brown soils.

Climatic Zones.—9,8,5,4. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 200 ± 50 mm.

Lithology.—Argillaceous sediments; shale, lithic sandstone; slightly affected by deep weathering.

Terrain.—Level to undulating.

Position on Slope.—Upper, middle and lower slopes, mainly 1–3%, up to 5% locally.



Soil.—Cracking clay and dark brown and grey-brown soils: moderately deep to deep, Teviot (Ug5.12, 5.14, 5.16, 5.33) and Cheshire (Gn3.93, 3.13, Uf6.21, 6.31); minor Carraba (Gn3.11, 3.22, 3.41).

Vegetation.—Brigalow open-forest/vine thicket: *A. harpophylla* (*Cadellia pentastylis*, *Bauhinia carronii*, *Brachychiton rupestre*, *Casuarina cristata*), 14 ± 4 m; moderately dense to dense softwood thicket understorey (*Geijera parviflora*, *Macropteranthes leichhardtii*, *Denhamia obscura*, *Croton insularis*, *C. phebalioides*, *Ehretia membranifolia*, *Eremophila mitchellii*, *Atalaya hemiglauca* and many other species), 6 ± 3 m; shrub layer sparse to moderately dense depending on density of the canopy layers (*Carissa ovata*, *Heterodendrum diversifolium*, *Myoporum deserti*, *Capparis lasiantha* and many other species), 2 ± 1 m; sparse scrub grass, forbs, ferns and sedges.

Land Capability.—*II–IIIk*$_{2-3}$,*e*$_{2-3}$.

LAND UNIT 102 (495 KM²)

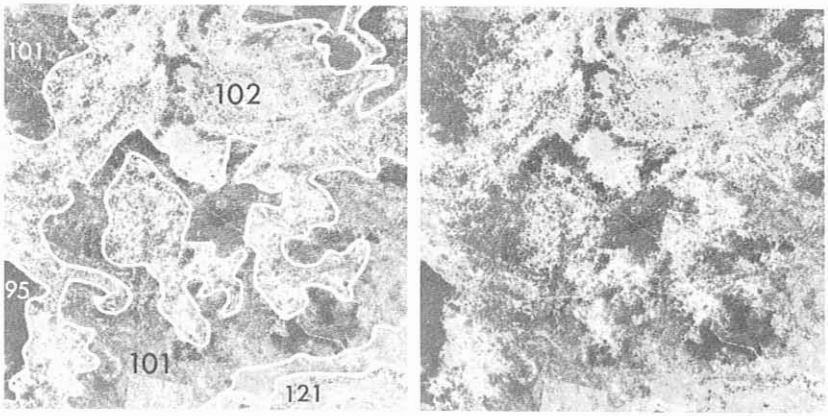
Field Criteria.—Gently undulating terrain, grassland with scattered clumps of brigalow or bauhinia, cracking clay soils.

Climatic Zones.—5,8,9. Median rainfall: Nov.–Apr., 450 ± 75 mm; May–Oct., 200 ± 50 mm.

Lithology.—Argillaceous sediments; shale and lithic sandstone.

Terrain.—Level to gently undulating.

Position on Slope.—Upper, middle and lower slopes, 0–3%.

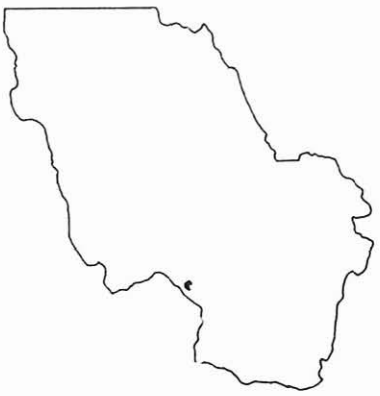


Soil.—Cracking clay soils: moderately deep to deep, Teviot (Ug5.13, 5.22, 5.32).

Vegetation.—Tussock grassland ('patchy plain' community): perennial tussocks of blue grass community (*Dichanthium sericeum*, *Thellungia advena*, *Aristida* spp., *Sporobolus caroli*, *Eriochloa* spp., *Cymbopogon refractus*, *Chloris divaricata*, *Astrebla lappacea*); characteristic rounded clumps of trees at widely spaced intervals. Individual clumps are virtually monospecific *Bauhinia hookeri*, *B. carronii* or *A. harpophylla*, 8 ± 3 m.

Land Capability.—$IIIk_{2-3}$.

Land Unit 103 (120 km²)



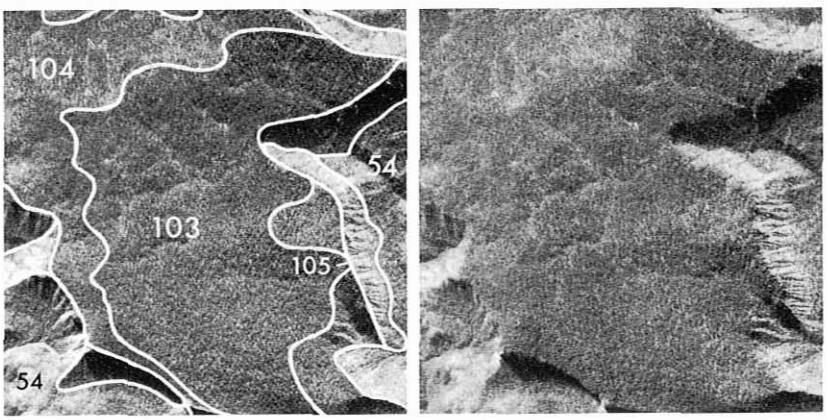
Field Criteria.—Elevated basalt plateaux, tall stringybark–blue gum forest, humic red earths.

Climatic Zone.—8. Median rainfall: Nov.–Apr., 500 mm; May–Oct., 225 mm.

Lithology.—Basalt; slightly to moderately affected by deep weathering.

Terrain.—Level to gently undulating terrain on elevated, dissected tablelands, 900–1000 m altitude (Consuelo Tableland).

Position on Slope.—Slopes mainly 1–5%, up to 10% locally.



Soil.—Humic massive earths; moderately deep to deep, dark reddish brown clay loams grading to friable red light to medium clays, with neutral to acid reaction (Gn2.12, 2.11).

Vegetation.—Tall stringybark–blue gum open-forest: *E. eugenioides–E.* sp. aff. *saligna*, 45 ± 5 m; sparse smaller tree layer, principally *Casuarina torulosa*, 12 ± 4 m; sparse to moderately dense lower layer, principally *Macrozamia moorei*, 3 ± 1 m; dense ground cover of *Themeda australis*, *Imperata cylindrica* and *Hardenbergia* sp. N.B. This previously undescribed land unit occurs in Black Alley land system in the Isaac–Comet area. Conservation of this landscape is recommended in view of poor access, high elevation and scenic attributes.

Land Capability.—III–IVe$_{3-4}$.

LAND UNIT 104 (280 KM²)

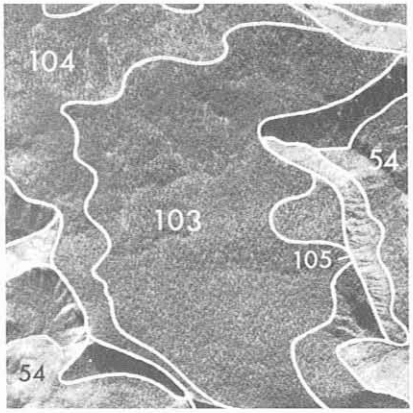
Field Criteria.—Stripped margins of basalt plateaux, mixed eucalypt woodland, shallow loams and clays.

Climatic Zones.—8,10(9,7,6,5). Median rainfall: Nov.–Apr., 524 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Undulating stripped margins of elevated tablelands, bounded by steep rocky scarps and benches.

Position on Slope.—Slopes up to 10%.



Soil.—Skeletal soils: very shallow loams and clays, Rugby (Um1.4, Uf1.41, 6.32); generally stony with extensive outcrop.

Vegetation.—Mixed eucalypt open-forest/woodland: *E. orgadophila*, *E. melanophloia*, *E. crebra*, *E. punctata*, *E. melliodora*, 12 ± 3 m; sparse understorey with lower tree layer of *Macrozamia moorei*, 3 ± 1 m; mesic mid-height grass (often dominated by *Themeda australis*).

Land Capability.—VId_{4-6},r_{4-6}.

Land Unit 105 (1560 km²)

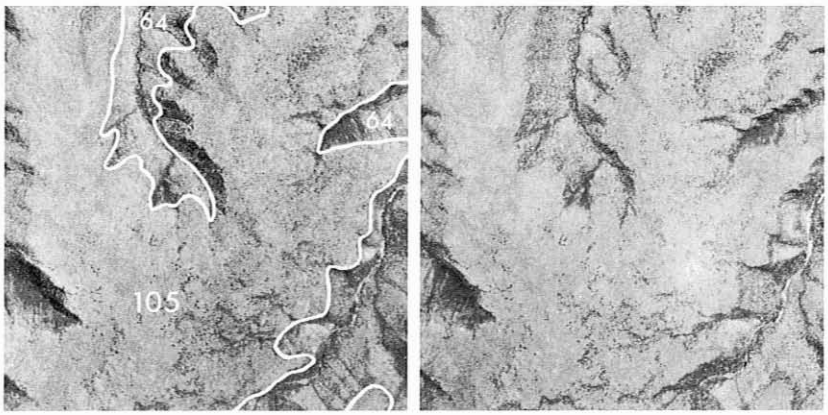
Field Criteria.—Steep rocky hills, ironbark woodland, skeletal soils.

Climatic Zones.—8,10(6,5,7). Median rainfall: Nov.–Apr., 450 ± 50 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Mountainous.

Position on Slope.—Crests and steep slopes on cliffs, benches and plugs, mainly less than 40%, up to 100%.



Soil.—Skeletal soils: very shallow loams, Rugby (Um1.4), generally stony with extensive outcrop.

Vegetation.—Ironbark woodland/open-forest: *E. melanophloia* and/or *E. drepanophylla*/*E. crebra* with scattered *E. dichromophloia*, 12 ± 3 m; sporadic *Macrozamia moorei* in south; mesic mid-height grass (often dominated by *Themeda australis*).

Land Capability.—VII–VIIIt_{7-8},r_{7-8},d_{6-7}.

LAND UNIT 106 (1090 KM²)

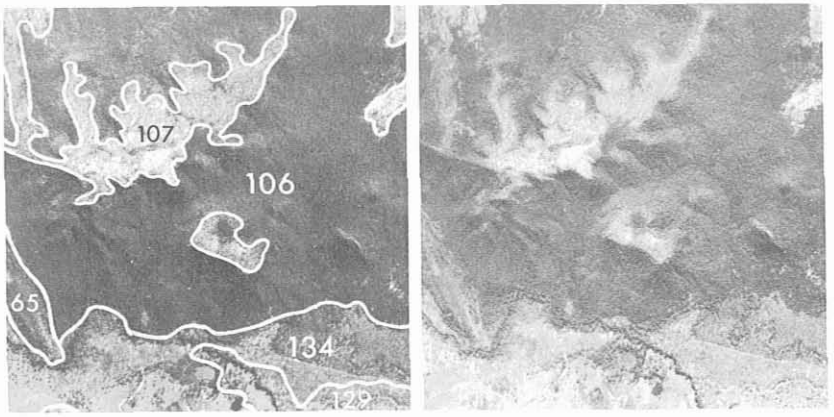
Field Criteria.—Hilly terrain, vine thicket, skeletal soils.

Climatic Zones.—1,2,3,4,5. Median rainfall: Nov.–Apr., 600 ± 75 mm; May–Oct., 225 ± 50 mm.

Lithology.—Basalt or andesitic volcanic rocks; slightly affected by deep weathering.

Terrain.—Mountainous to hilly.

Position on Slope.—Upper, middle and lower slopes, mainly 5–15%, up to 80% locally.



Soil.—Skeletal soils: mainly very shallow loams and clays, Rugby (Um1.4, Uf1.4); extensive shallow dark brown and grey-brown soils, Kinnoul (Uf6.31) and Ingelara (Um5.41, 6.21); minor deeper soils, Carraba (Uf6.32) and Cheshire (Um5.5).

Vegetation.—Vine thicket/forest: communities restricted to the humid eastern margins of the region and grouped here for convenience. Micro-environmental influences lead to marked changes in the structural and floristic composition over short distances. All are complex layered communities with a more or less continuous canopy of slender, densely packed trees (*Flindersia australis*, *Backhousia sciadophora*, *Excoecaria dallachayana*, *Bielschiemedia* spp., *Tieghemopanax elegans*, *Melia azederach*, *Ficus* spp., *Strychnos arborea*, *Mallotus claoxyloides*, *Homalium almifolium*, *Ellatostachys bidwillii*, *Bridelia leichhardtii*, *Barklya syringifolia*, *Macropteranthes leichhardtii*, *Alstonia constricta* and many other species), 12 ± 3 m; a discontinuous emergent tree layer (emergent species variable, often localized and including *Brachychiton australe*, *B. rupestre*, *Flindersia australis*, *Ficus* spp., *Araucaria cunninghamii* and even eucalypts such as *E. crebra*, *E. moluccana* and *E. tereticornis* and acacias such as *A. rhodoxylon*), 16 ± 5 m; shrub layer moderately dense to dense depending on canopy layer (*Croton* spp., *Abutilon* spp., *Capparis* spp., *Acalypha eremorum*, *Codonocarpus attenuatus* and many other species), 2 ± 1 m; deep litter, ferns and mosses. Abundant lianes.

Land Capability.—VII–VIIIt_{7-8},d.

Land Unit 107 (940 km²)

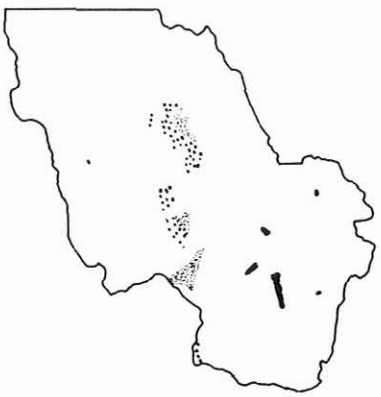
Field Criteria.—Rolling terrain, mountain coolibah woodland, skeletal soils.

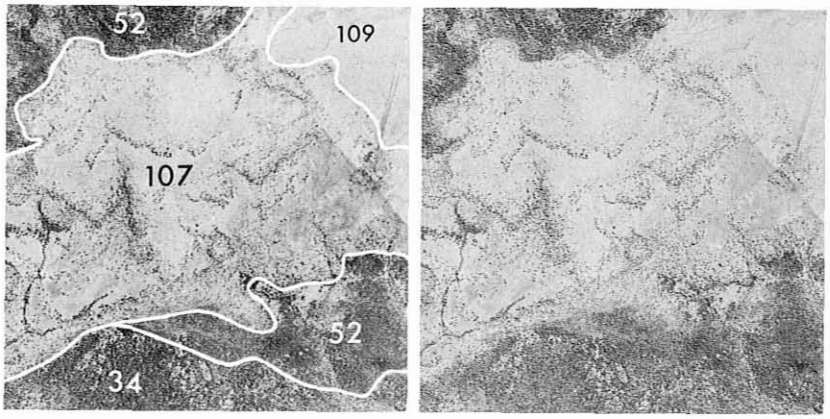
Climatic Zones.—6,8,10(4,5,7,9,11). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Hilly to undulating.

Position on Slope.—Crests and upper slopes, mainly 2–10%, up to 60% locally; on rocky mesas and benches.





Soil.—Skeletal soils: very shallow loams and clays, Rugby (Um1.4, Uf6.32), generally gravelly or stony with extensive outcrop.

Vegetation.—Mountain coolibah grassy woodland: *E. orgadophila* and/or *E. melanophloia*, *E. dichromophloia*, 12 ± 3 m; understorey absent or sparse; mesic mid-height grass or blue grass.

Land Capability.—VI–VIId_{6-7},r_{6-7}.

LAND UNIT 108 (1935 KM²)

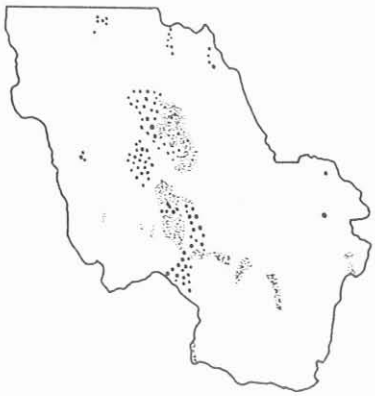
Field Criteria.—Undulating terrain, mountain coolibah woodland, shallow cracking clay soils.

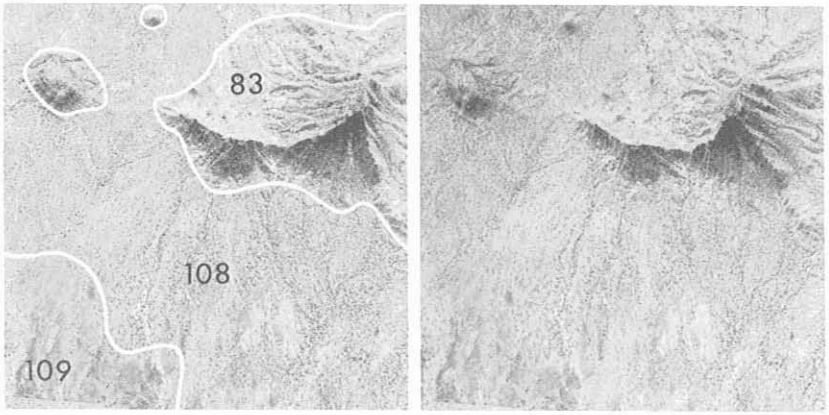
Climatic Zones.—6,7,8,10(11,9,5,4). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Undulating.

Position on Slope.—Crests and upper slopes of low ridges, slopes 2–6%, up to 10% locally.





Soil.—Cracking clay soils: shallow, Bruce (Ug5.12, 5.13, 5.14, 5.32, 5.37); generally stony with extensive outcrop.

Vegetation.—Mountain coolibah grassy woodland: *E. orgadophila* and/or *E. melanophloia*, *E. dichromophloia*, 12 ± 3 m; understorey absent or sparse; blue grass with localized mesic mid-height grass.

Land Capability.—IVd$_4$.r$_4$.

Land Unit 109 (3010 km²)

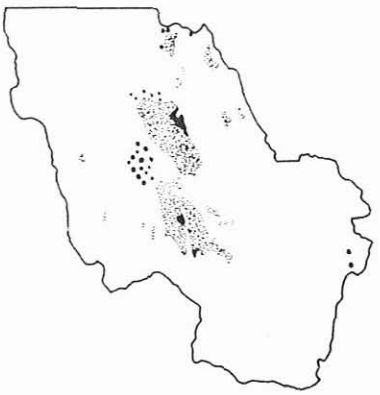
Field Criteria.—Undulating terrain, grassland, self-mulching cracking clay soils.

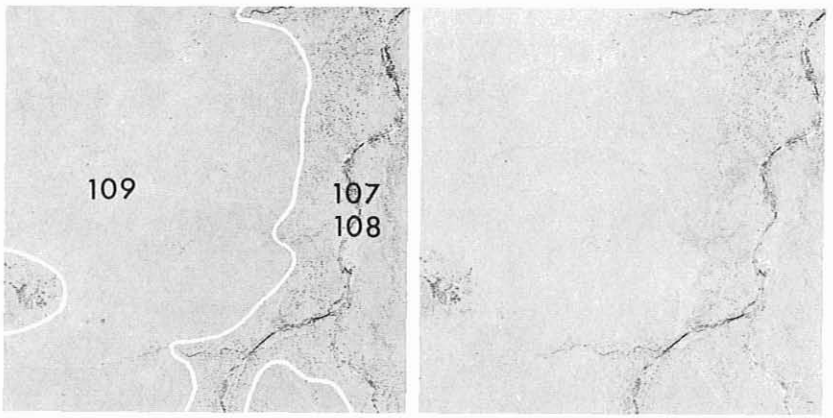
Climatic Zones.—6,7,8,10(11,9,5,4). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Undulating.

Position on Slope.—Upper and middle slopes, mainly less than 2%, up to 5% locally.





Soil.—Cracking, self-mulching clay soils: moderately deep, Arcturus (Ug5.12, 5.32, 5.37), gravelly or stony in places; commonly with linear gilgai microrelief.

Vegetation.—Tussock grassland: perennial drought-evading tussock grasses of the blue grass community (*Dichanthium sericeum, Aristida latifolia, A. leptopoda, Panicum decompositum, P. queenslandicum, Enneapogon flavescens, Thellungia advena, Astrebla lappacea, Ophiuros exaltatus* and other species) with localized areas occupied by species prominent in the mesic mid-height grass community (*Heteropogon contortus, Bothriochloa decipiens*), 1 ± 0·3 m; occasional scattered shrubs (*Acacia farnesiana*), 1 ± 0·5 m; occasional scattered trees (*E. orgadophila, E. dichromophloia, E. terminalis, E. melanophloia, E. tessellaris*), 11 ± 3 m.

Land Capability.—$IIIk_{2-3},e_{2-3},d_3$.

Land Unit 110 (3125 km²)

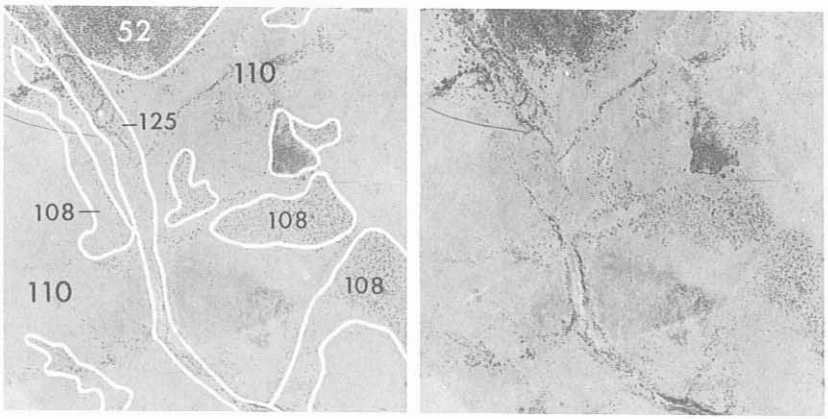
Field Criteria.—Gently undulating terrain, grassland, self-mulching cracking clay soils.

Climatic Zones.—6,7,8,10(11,9,5,4). Median rainfall: Nov.–Apr., 425 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Level to gently undulating.

Position on Slope.—Middle and lower slopes, 0–2%, up to 5% locally.



Soil.—Cracking, self-mulching clay soils: deep, May Downs (Ug5.12, 5.15, 5.16, 5.18); stony in places; commonly with linear gilgai microrelief on steeper slopes.

Vegetation.—Tussock grassland: perennial drought-evading tussock grasses of the blue grass community (*Dichanthium sericeum*, *Aristida latifolia*, *A. leptopoda*, *Panicum decompositum*, *P. queenslandicum*, *Enneapogon flavescens*, *Thellungia advena*, *Astrebla lappacea*, *Ophiuros exaltatus* and other species) with localized areas occupied by species prominent in the mesic mid-height grass community (*Heteropogon contortus*, *Bothriochloa decipiens*), 1 ± 0·3 m; occasional scattered shrubs (*Acacia farnesiana*), 1 ± 0·5 m.

Land Capability.—II–IIIk_{2-3},e_{2-3}.

Land Unit 111 (305 km²)

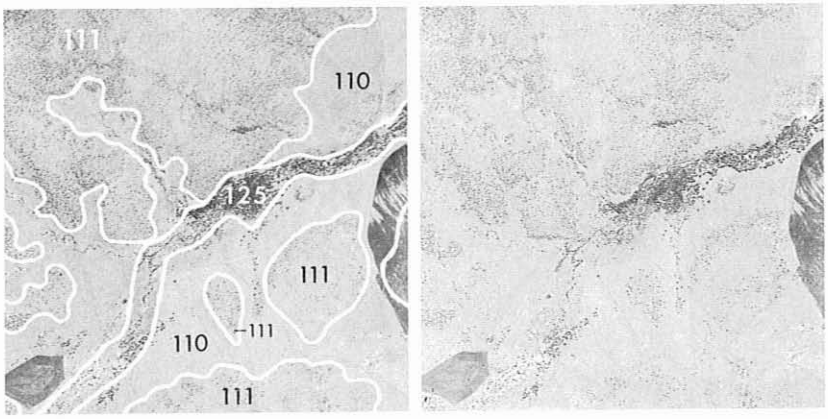
Field Criteria.—Undulating terrain, silver-leaved ironbark woodland, self-mulching cracking clay soils.

Climatic Zones.—8,9,5. Median rainfall: Nov–Apr., 450 ± 75 mm; May–Oct., 175 ± 50 mm.

Lithology.—Basalt.

Terrain.—Undulating.

Position on Slope.—Upper, middle and lower slopes, mainly less than 3%, up to 5% locally.



Soil.—Cracking, self-mulching clay soils: moderately deep to deep, Arcturus (Ug5.12) and May Downs (Ug5.12, 5.15, 5.16).

Vegetation.—Silver-leaved ironbark grassy open-woodland: *E. melanophloia–E. dichromophloia* (*E. orgadophila*, *E. papuana*, *E. tessellaris*), 11 ± 3 m; understorey absent or sparse; blue grass and/or mesic mid-height grass.

Land Capability.—$IIIk_{2-3},e_{2-3}$.

Land Unit 112 (1140 km²)

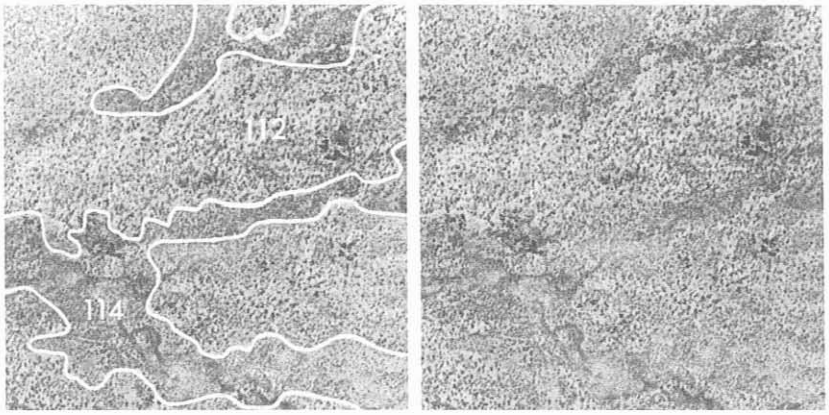
Field Criteria.—Alluvial fans, silver-leaved ironbark woodland, uniform sandy soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 350 ± 75 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium–colluvium, coarse-textured, derived from quartz sandstone ranges and Tertiary mantle materials.

Terrain.—Level to very gently sloping.

Position on Slope.—Upper and middle slopes on stable fans: 0–1%, up to 5 km wide.



Soil.—Deep uniform sandy soils: Highmount (Uc1.22, 4.2), medium sand to loamy sand, soft and structureless to 60 cm, firm and massive beneath, underlain by hard mottled zone materials in places; slightly acid to neutral reaction throughout.

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia*, 11 ± 3 m; sparse to moderately dense understorey of *A. coriacea*, *A. laccata*, *A. tenuissima* (*Eremophila mitchellii*, *Albizia basaltica*), 5 ± 3 m; spinifex and/or xeric mid-height grass.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

Land Unit 113 (255 km²)

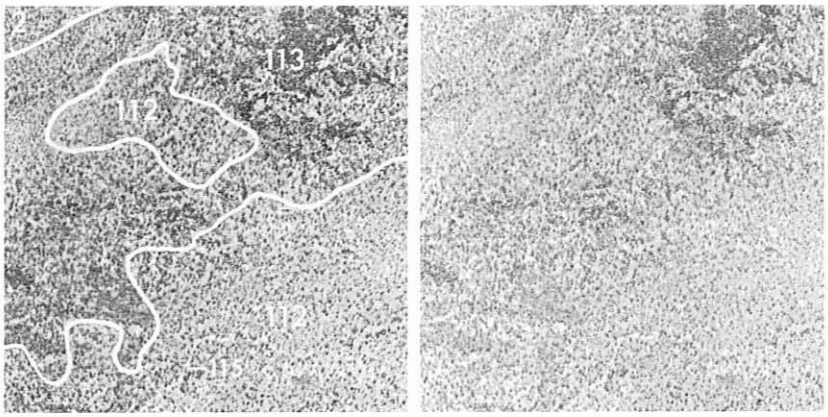
Field Criteria.—Alluvial plains and fans, bloodwood–cabbage gum woodland, uniform sandy soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium–colluvium, coarse-textured, derived from quartz sandstone ranges and Tertiary mantle materials.

Terrain.—Level to very gently sloping terrain: mainly east of Lake Buchanan.

Position on Slope.—Sand plains and small fans, slopes 0–1%.



Soil.—Deep uniform sandy soils: Highmount (Uc4.2), coarse sand underlain by gravel at depth in places, soft and structureless, slightly acid to neutral reaction throughout; extensive sandy yellow earths, Forrester (Gn2.22, 2.92), in some occurrences.

Vegetation.—Bloodwood–cabbage gum woodland: *E. polycarpa–E. papuana*, 14 ± 3 m; sparse to moderately dense understorey, usually *Melaleuca nervosa* and *E. setosa*, occasional scattered stands of *Callitris columellaris*, 8 ± 4 m; xeric mid-height grass.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

Land Unit 114 (255 km²)

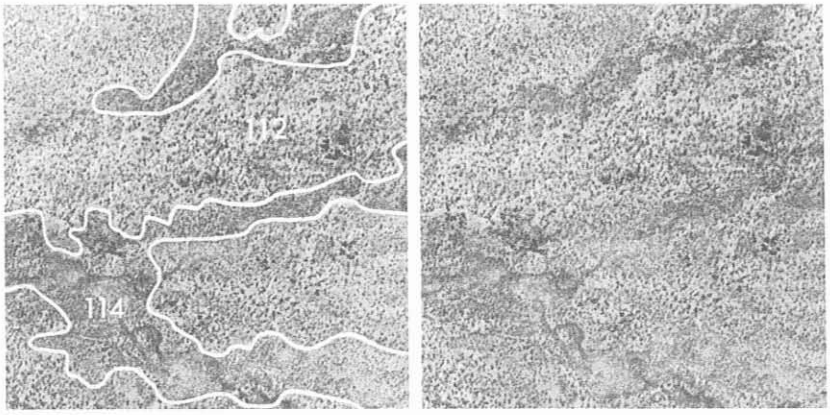
Field Criteria.—Alluvial fans, box woodland, texture-contrast soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium–colluvium, coarse-textured, derived from quartz sandstone ranges and Tertiary mantle materials.

Terrain.—Level to very gently sloping.

Position on Slope.—Lower slopes on fans: less than 1%.



Soil.—Deep texture-contrast soils: thick sandy surface horizons and mottled clayey subsoils, Luxor (Dy3.42).

Vegetation.—Box woodland: *E. brownii* (*E. populnea*), 12 ± 4 m; sparse understorey (*Eremophila mitchellii*, *Terminalia chillagoensis*) and shrub layer (*Carissa ovata*), 5 ± 3 m; xeric mid-height grass.

Land Capability.—VIp_{3-4}. Downgraded on account of low and less effective rainfall.

Land Unit 115 (180 km²)

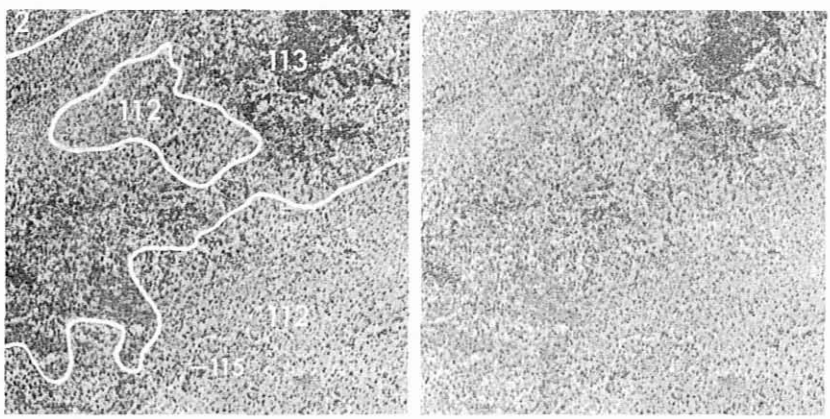
Field Criteria.—Prior channels on fans, ironbark–bloodwood–cabbage gum woodland, uniform sandy soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 50 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium–colluvium, coarse-textured, derived from quartz sandstone ranges and Tertiary mantle materials.

Terrain.—Level to very gently sloping.

Position on Slope.—Shallow, anastomosing abandoned channels on fans, 9–275 m wide and 30–90 cm deep.



Soil.—Deep uniform sandy soils: Highmount (Uc1.22); dark brown to yellowish brown medium sand, neutral reaction throughout; underlain by hard mottled-zone materials at depths exceeding 2 m in places.

Vegetation.—Mixed eucalypt woodland: *E. melanophloia–E. polycarpa–E. papuana*, 11 ± 3 m; sparse understorey (*Melaleuca nervosa*, *E. setosa*, *Grevillea parallela*), 6 ± 3 m; spinifex.

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

Land Unit 116 (850 km²)

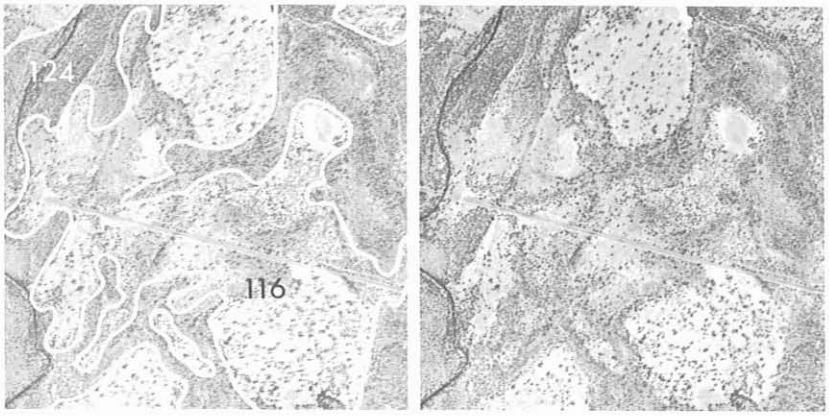
Field Criteria.—Levees and plains, bloodwood–cabbage gum–ash woodland, uniform sandy soils.

Climatic Zones.—11,7,10(5,6,8). Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 125 ± 50 mm.

Lithology.—Alluvium, coarse-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Higher sandy levees and sand sheets; not subject to flooding.



Soil.—Deep uniform sandy soils: dark brown, brown, and reddish brown medium sands with neutral reaction throughout, Davy (Uc.1.23, 5.11); minor sandy red massive earths, Wilpeena (Gn2.12).

Vegetation.—Bloodwood–cabbage gum–ash grassy woodland: *E. polycarpa–E. papuana–E. tessellaris*, 16 ± 4 m, widely spaced with large crowns and grading into open-woodland formation; understorey absent or sparse (*A. salicina*, *Bauhinia hookeri*, *Grevillea striata*), 9 ± 3 m; xeric mid-height grass.

Land Capability.—IVm$_4$,n$_4$.

Land Unit 117 (910 km²)

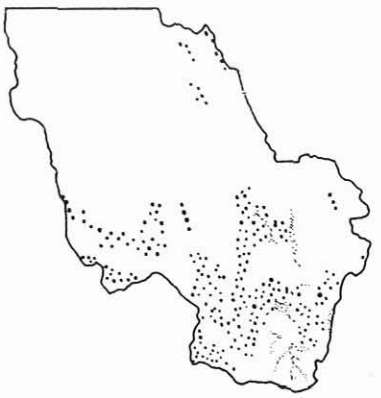
Field Criteria.—Sandy levees and depressions, blue gum–ash–bloodwood woodland, uniform sandy and alluvial soils.

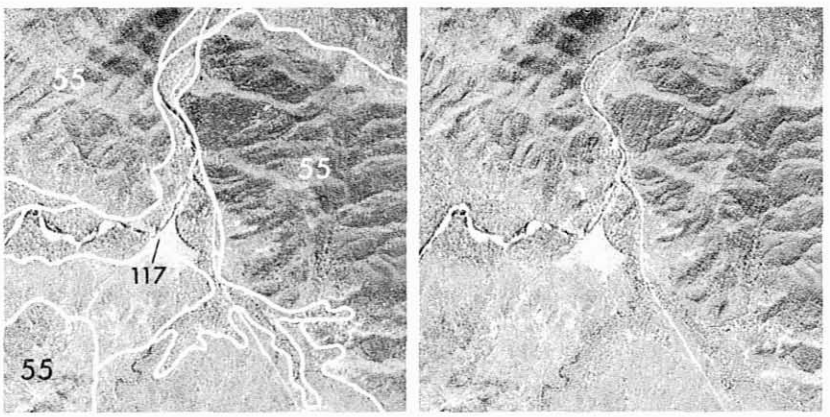
Climatic Zones.—8,9,10(4,5,6,11). Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 175 ± 50 mm.

Lithology.—Alluvium, coarse- to medium-textured.

Terrain.—Level to gently sloping.

Position on Slope.—Sandy levees and drainage floors: associated with old channel remnants and levees in places; up to 1 km wide.





Soil.—Deep uniform sandy soils and layered alluvial soils: deep structureless sands with slightly acid to neutral reaction throughout, Davy (Uc1.21, 1.23, 2.12, 5.11, 5.21), and layered alluvial soils, Warrinilla (Um5.5 on sand), Moolayember (Uc and Um soils on clay) and Consuelo (stratified Um and Uf soils).

Vegetation.—Blue gum–ash–bloodwood grassy woodland: *E. tereticornis–E. tessellaris–E. polycarpa* (*E. maculata*, *E. crebra*/*E. drepanophylla*, *E. melanophloia* and *Angophora floribunda*, *Tristania suaveolens* in the south and east), 25 ± 8 m, often grading into open-forest on favoured sites; frontage grass.

Land Capability.—IVm_4,n_4.

Land Unit 118 (855 km²)

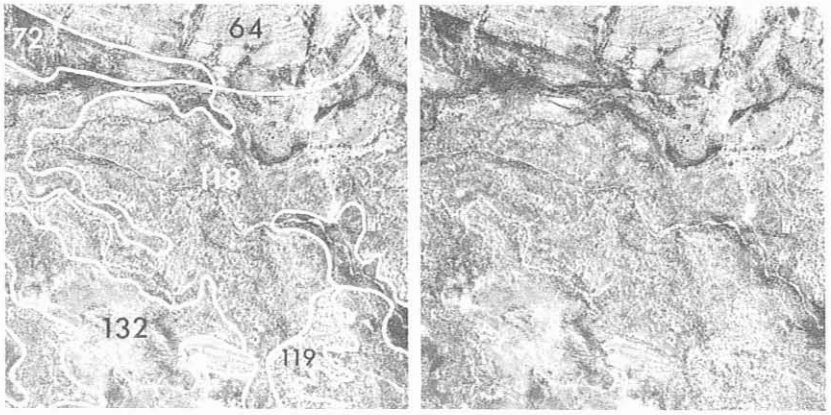
Field Criteria.—Alluvial plains, box woodland, red and yellow earths.

Climatic Zones.—7,11(10). Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 100 ± 50 mm.

Lithology.—Alluvium, medium- to coarse-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Alluvial plains: up to 5 km wide; minor terraces and lower levees; flooded occasionally in lowest parts.



Soil.—Deep red and yellow massive earths: dark brown sandy loams to clay loams grading to reddish brown or yellowish red light to medium clays, slightly acid to neutral reaction throughout, Wilpeena (Gn2.12, 2.22).

Vegetation.—Box woodland: *E. brownii*/*E. populnea* (*E. terminalis*, *E. papuana*, *E. melanophloia*), 12 ± 3 m; understorey sparse to moderately dense *Eremophila mitchellii*, *Acacia* spp., *Eremocitrus glauca*, 5 ± 3 m; sparse to moderately dense shrub layer of *Carissa ovata*, 1 ± 0·5 m; xeric mid-height grass.

Land Capability.—IVm_4,n_4.

Land Unit 119 (460 km²)

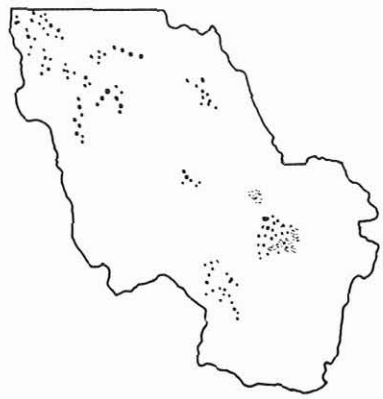
Field Criteria.—Alluvial plains, silver-leaved ironbark woodland, red and yellow earths.

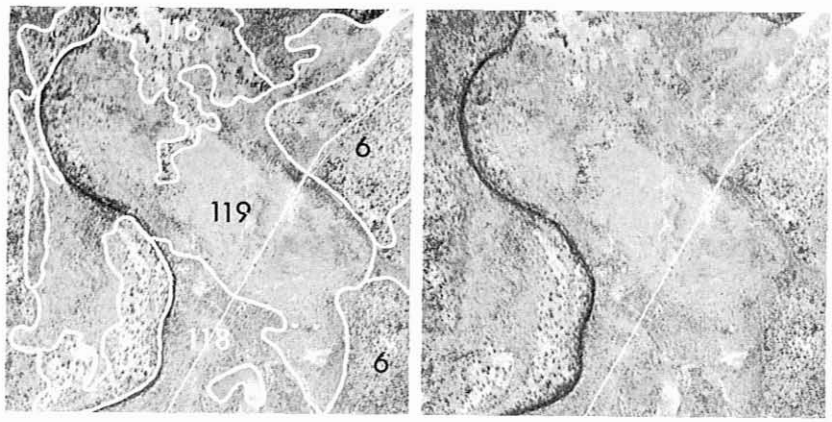
Climatic Zones.—4,5,6,7,8,10,11. Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 150 ± 75 mm.

Lithology.—Alluvium, medium- to coarse-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Alluvial plains and terraces: up to 3·5 km wide; flooded occasionally in lowest parts.





Soil.—Deep red and yellow massive earths: dark brown loamy sand to sandy loam grading to reddish brown, yellowish red or yellowish brown light clay; slightly acid to neutral reaction throughout, Wilpeena (Gn2.12, 2.22).

Vegetation.—Silver-leaved ironbark woodland: *E. melanophloia* (*E. crebra*, *E. papuana*, *E. tessellaris*, *E. tereticornis*), 14 ± 4 m; understorey sometimes absent, but normally moderately dense *Petalostigma pubescens*, *Alphitonia excelsa*, *Lysicarpus angustifolius*, 5 ± 3 m; mesic grading through to xeric mid-height grass.

Land Capability.—IVm_{4},w_{3-4}.

LAND UNIT 120 (665 KM²)

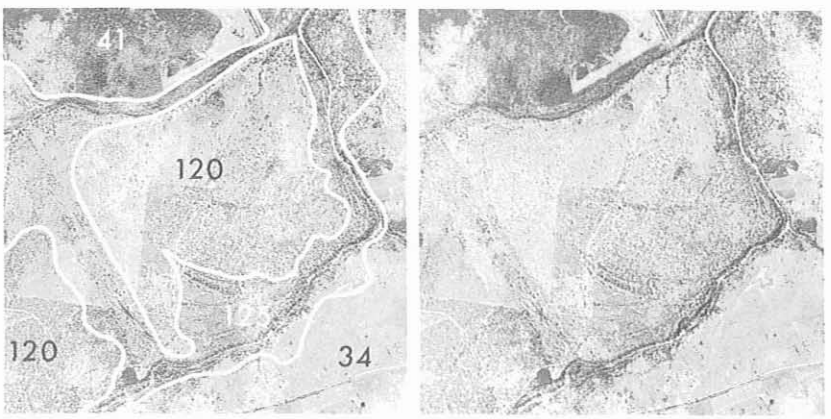
Field Criteria.—Levees and back slopes, silver-leaved ironbark woodland, texture-contrast soils.

Climatic Zones.—5,8,9(4,6,7,10,11). Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 175 ± 75 mm.

Lithology.—Alluvium.

Terrain.—Level to very gently sloping.

Position on Slope.—Broad levees and back slopes: up to 1 km wide; minor tributary drainage floors; slopes up to 2%.



Soil.—Deep texture-contrast soils: sandy surface horizons (20–125 cm thick) overlying neutral to strongly alkaline clay subsoils, Springwood (Db1.12, Dd1.32), Taurus (Dr2.13, Dy2.33, 2.43), Luxor (Dr4.22, 5.22, Dy3.42) and Broadmeadow (Dr2.23); minor occurrences of soils with thin loamy surface horizons, Wyseby (Db1.22), and alluvial soils with uniform medium to fine textures, Clematis (Um6.4, 6.22 ,Uf6.23).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. tereticornis*, *E. tessellaris* and also *E. populnea*, *E. dichromophloia* and *E. orgadophila* in localized occurrences), 14 ± 4 m; frontage grass.

Land Capability.—$IIIp_{2-3}$.

Land Unit 121 (4780 km²)

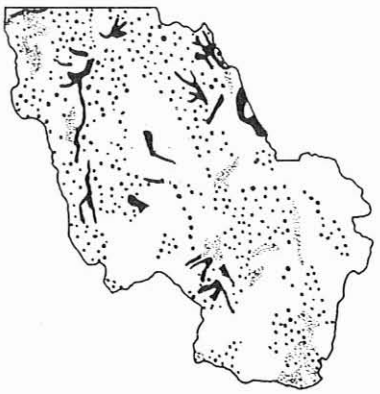
Field Criteria.—Alluvial plains and levees, box grassy woodland, texture-contrast soils.

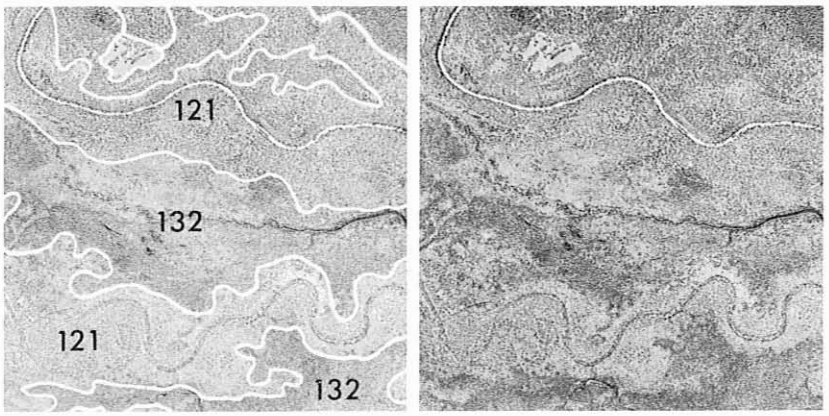
Climatic Zones.—5,6,7,8,9,10,11(4). Median rainfall: Nov.–Apr., 400 ± 100 mm; May–Oct., 150 ± 75 mm.

Lithology.—Alluvium.

Terrain.—Level to very gently sloping.

Position on Slope.—Alluvial plains and broad levees: up to 5 km wide; minor drainage floors, terraces and lower levees; flooded occasionally.





Soil.—Deep texture-contrast soils: sandy surface horizons, generally more than 40 cm thick, over neutral to strongly alkaline clay subsoils, Luxor (Dy2.22, 3.42) and Broadmeadow (Dy2.23, 3.43, 3.23); thin-surfaced soils extensive in places, Springwood (Db1.22, 1.32) and Taurus (Db1.43, Dy 2.43, Dr2.13).

Vegetation.—Box grassy woodland: *E. populnea*/*E. brownii*, 12 ± 3 m; understorey absent or sparse *Eremophila mitchellii*, 3 ± 1 m; sparse shrub layer of *Carissa ovata*, 1 ± 0·5 m in places; mesic mid-height grass.

Land Capability.—III–IVp_{3-4},w_{3-4}.

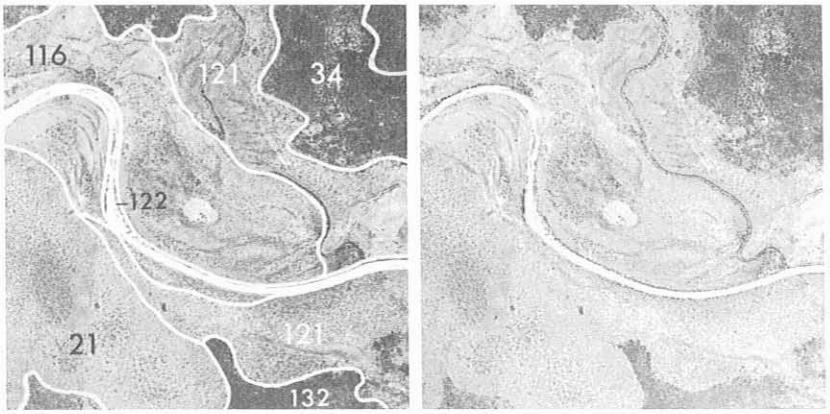
Land Unit 122 (1885 km²)

Field Criteria.—Meandering channels, fringing forest, sandy beds.

Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 475 ± 150 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium.

Position on Slope.—Channels: single meandering, 3–10 m deep, 30–90 m wide, with steep banks and flat floors.



Soil.—Bed loads: variable, depending on nature of source materials; mainly deep sands and gravels.

Vegetation.—Fringing open-forest: *E. tereticornis–E. tessellaris* (*Angophora floribunda* in south), 25 ± 8 m, commonly associated with smaller trees such as *E. polycarpa*, *E. melanophloia*, *A. salicina*, 12 ± 4 m; channel margins usually lined with *Casuarina cunninghamiana*, *Callistemon viminalis* and/or *Melaleuca* spp. and occasionally *E. microtheca* along more permanent water-holes. N.B. *Livistona australis* occurs in dense stands in localized areas of the upper Dawson and Comet River catchments. *Nauclea orientalis* and *Melaleuca quinquenervia* assume prominence in coastal and near-coastal areas.

Land Capability.—VIIIt$_{7-8}$,w$_5$.

Land Unit 123 (565 km²)

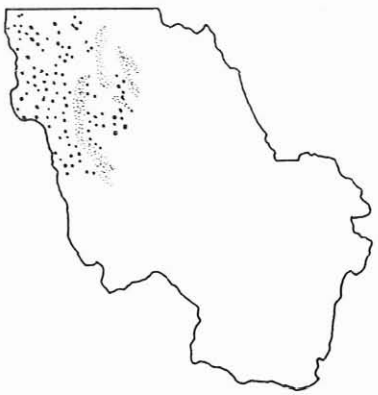
Field Criteria.—Levees, gidgee forest, texture-contrast soils.

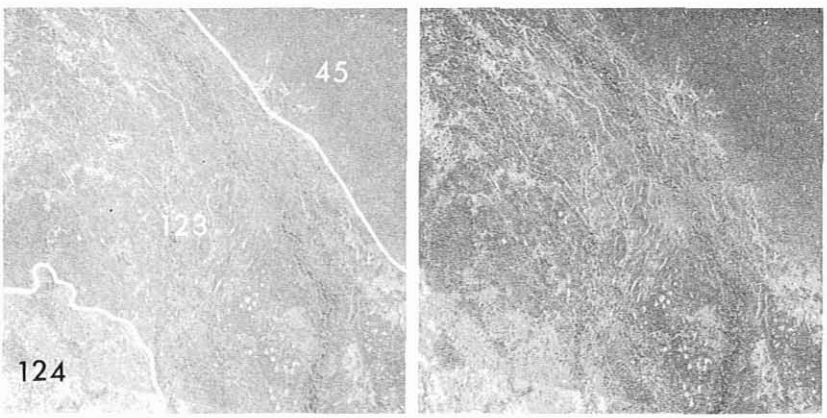
Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium, medium- to fine-textured.

Terrain.—Level to very gently undulating.

Position on Slope.—Levees, very gentle slopes, mainly less than 1%, rarely flooded.





Soil.—Deep texture-contrast soils: thin sandy or loamy surface horizons and strongly alkaline to neutral clay subsoils, Taurus (Db1.13, Dr2.33), Retro (Db1.33, Dd1.33, Dr2.33) and Wyseby (Dd1.12); minor Luxor (Dy2.22, 2.12) and Broadmeadow (Db1.43, Dy3.43).

Vegetation.—Gidgee open-forest: *A. cambagei*, 12 ± 3 m, usually dense, but sometimes in scattered clumps, interspersed with scalded areas; sparse to moderately dense smaller tree layer of *Terminalia oblongata*, *Eremophila mitchellii*, 5 ± 3 m; sparse to moderately dense scrub grass, with some blue grass in open areas and *Tripogon loliiformis* communities on scalded areas.

Land Capability.—IVp_{3-4}.

LAND UNIT 124 (3280 KM²)

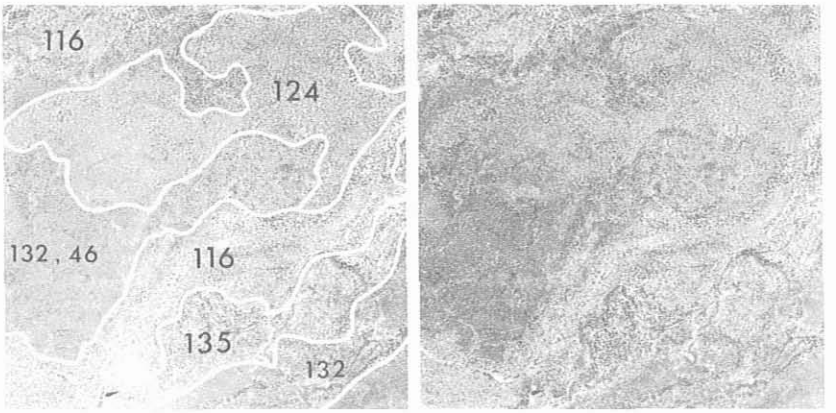
Field Criteria.—Alluvial plains, box woodland, texture-contrast soils.

Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 475 ± 150 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium, medium- to fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Alluvial plains: up to 5 km wide; drainage floors, minor terraces and lower levees, flooded occasionally.



Soil.—Deep texture-contrast soils: loamy surface horizons generally < 36 cm thick, and neutral to strongly alkaline subsoils, Wyseby (Dy2.22, Dd1.12) and Retro (Dy2.33, 2.43, Db1.13, Dr2.33); minor uniform medium- to fine-textured soils, Clematis (Um5.5, Uf6.31).

Vegetation.—Box woodland: *E. populnea*/*E. brownii*, 12 ± 3 m; sparse to moderately dense understorey of *Eremophila mitchellii*, *Bauhinia carronii* and/or *B. hookeri*, *Acacia* spp., *Cassia brewsteri* (in the north), 6 ± 4 m; or no understorey in flood-prone sites; mesic mid-height grass.

Land Capability.—III–IVp_{3-4},w_{3-4}.

Land Unit 125 (4405 km²)

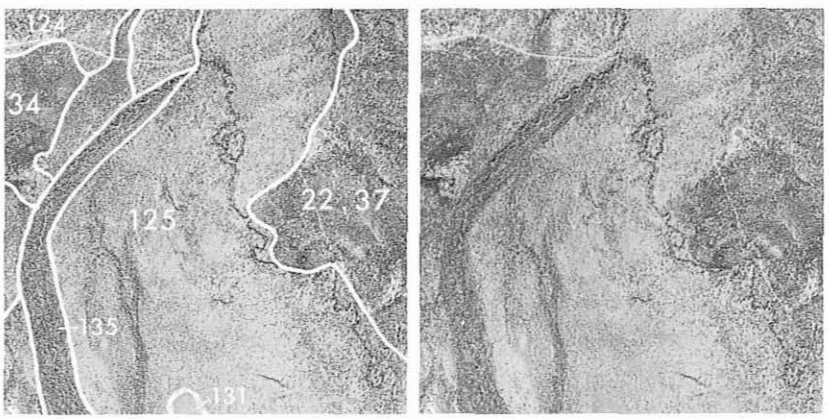
Field Criteria.—Alluvial plains subject to flooding, coolibah woodland, cracking clay and uniform fine-textured soils.

Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 475 ± 150 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Plains, up to 5 km wide, associated with major streams, slopes less than 1%; uneven microrelief; subject to seasonal prolonged flooding.



Soil.—Deep cracking clay and fine-textured alluvial soils: Vermont (Ug5.16, 5.15, 5.22, 5.4), neutral reaction at or near the surface becoming alkaline below 60 cm or strongly alkaline throughout; commonly with small amounts of carbonate and gypsum at depth; extensive fine-textured alluvial soils, Clematis (Uf6.33, 6.32, 6.31), underlain by medium- to coarse-textured materials below 100 cm in places.

Vegetation.—Coolibah woodland: *E. microtheca* (*E. tessellaris*, *E. tereticornis*, *E. polycarpa*), 15 ± 5 m, commonly associated with *A. harpophylla*/*A. argyrodendron*, 14 ± 4 m; understorey absent in more flooded sites, but usually sparse to moderately dense with *Eremophila mitchellii*, *Terminalia oblongata*, *Bauhinia hookeri* (*B. carronii*, *Eremophila bignoniiflora*, *Atalaya hemiglauca*, *Acacia pendula*), 8 ± 3 m; frontage grass and/or blue grass.

Land Capability.—Vw_5.

Land Unit 126 (740 km²)

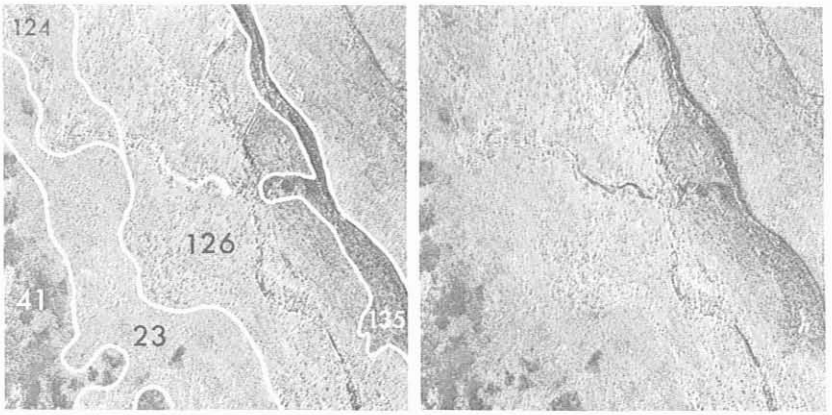
Field Criteria.—Back plains and drainage floors, subject to flooding, blue gum woodland, texture-contrast soils.

Climatic Zones.—4,5,6,8,9. Median rainfall: Nov.–Apr., 475 ± 125 mm; May–Oct., 200 ± 75 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Back plains and tributary drainage floors: up to 3·5 km wide; gradients 1 in 70 to 1 in 500; transverse slopes up to 1%; subject to flooding.



Soil.—Deep texture-contrast soils: thin loamy surface horizons over strongly alkaline to neutral clay subsoils, Retro (Dd1.33, 1.43) and Wyseby (Db1.42); minor thin sandy surface horizons, Springwood (Db1.32, Dd1.12) and Taurus (Db1.43).

Vegetation.—Blue gum grassy woodland: *E. tereticornis*, 25 ± 6 m (often associated with scattered *E. tessellaris*, *E. polycarpa* and *E. crebra*/*E. drepanophylla*, 15 ± 5 m); understorey absent or very sparse; frontage grass.

Land Capability.—II–IIIp$_{2-3}$,w$_3$.

Land Unit 127 (850 km²)

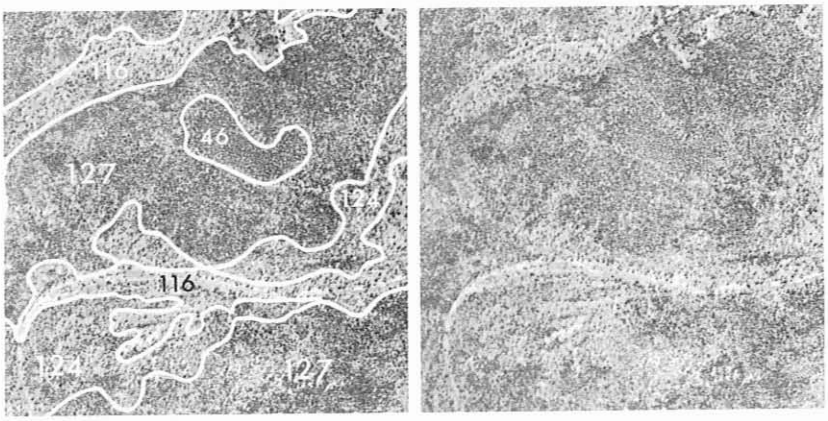
Field Criteria.—Alluvial plains, subject to flooding, brigalow forest, texture-contrast soils.

Climatic Zones.—All zones. Median rainfall: Nov.–Apr., 475 ± 150 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium, medium- to fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Plains, back plains and drainage floors: subject to flooding.



Soil.—Deep texture-contrast soils: thin (< 40 cm) loamy or sandy surface horizons and clay subsoils with strongly alkaline reaction, and commonly with carbonate and/or gypsum accumulations, Retro (Db1.13, 1.33) and Taurus (Db1.43, Dy2.33, Dr2.33).

Vegetation.—Brigalow open-forest: *A. harpophylla* (*A. argyrodendron*, *A. cambagei* in north-west, *E. populnea* in south-east), 15 ± 5 m; understorey absent in more flood-prone sites, otherwise sparse *Eremophila mitchellii* and/or *Terminalia oblongata*, 5 ± 3 m; litter and sparse scrub grass, sometimes blue grass in more open stands.

Land Capability.—Vw_{4-5},p_{3-4}.

Land Unit 128 (265 km²)

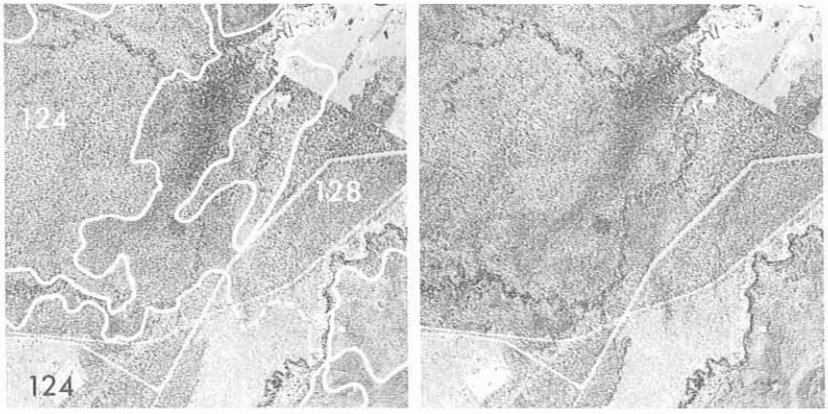
Field Criteria.—Plains and drainage floors, gum-topped box woodland, texture-contrast soils.

Climatic Zones.—4,5,6,8,9. Median rainfall: Nov.–Apr., 525 ± 75 mm; May–Oct., 200 ± 50 mm.

Lithology.—Alluvium, medium- to fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Drainage floors and slopes in older alluvium: up to 1 km wide; slopes mainly less than 1%, attaining 2% in places; seasonally waterlogged in low-lying sites.



Soil.—Deep texture-contrast soils: thin loamy or sandy surface horizons over clay subsoils with strongly alkaline to acid reaction, Retro (Dy2.23, 3.43), Taurus (Dy3.43), Wyseby (Db1.32) and Springwood (Dy2.47); minor areas of uniform clay soils, cracking and gilgaied, Pegunny (Ug5.25, 5.28), or non-cracking, Carraba (Uf6.31).

Vegetation.—Gum-topped box woodland: *E. moluccana* (*E. populnea*, *E. melanophloia*), 15 ± 4 m; understorey absent or sparse (*Eremophila mitchellii*, *Flindersia dissosperma*, *Eremocitrus glauca*, *Petalostigma pubescens*), 6 ± 4 m; sparse mesic mid-height grass. N.B. This community grades into open-forest.

Land Capability.—IVp_{3-4}.

Land Unit 129 (1255 km²)

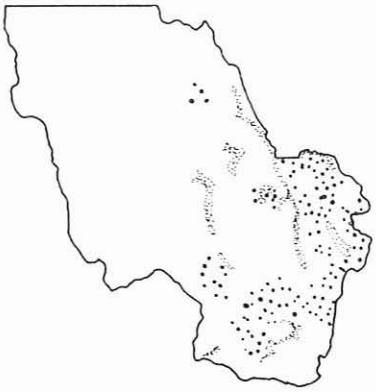
Field Criteria.—Levees and back slopes, blue gum woodland, alluvial soils.

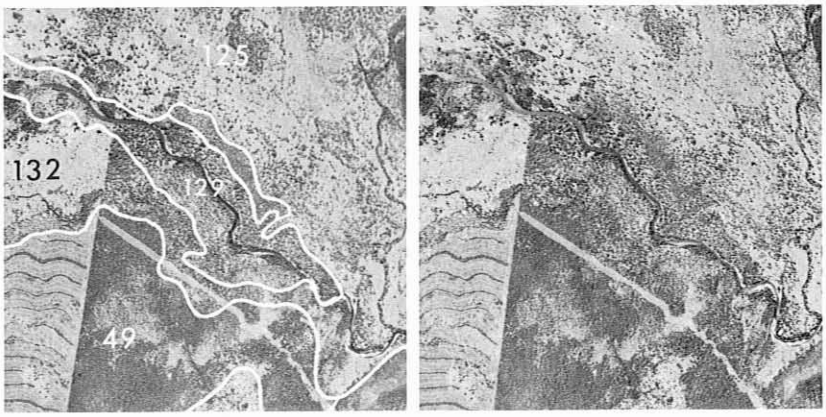
Climatic Zones.—4,5,6,8,9. Median rainfall: Nov.–Apr., 450 ± 100 mm; May–Oct., 200 ± 75 mm.

Lithology.—Alluvium, medium- to fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Broad levees, back slopes, terraces and drainage floors: up to 3·5 km wide; slopes up to 2%; dissected in places by parallel linear depressions; flooded in lowest parts.





Soil.—Deep, medium- to fine-textured alluvial soils: uniform, gradational and layered texture profiles, Clematis (Um6.42, Uf6.33), Moolayember (Um5.5 on layered materials, Gn3.22, 3.42, 3.92), Warrinilla (Gn3.22, 3.92 on sandy materials), Consuelo (layered Um/Uf).

Vegetation.—Blue gum grassy woodland: *E. tereticornis*, 25 ± 6 m (often associated with scattered *E. tessellaris*, *E. polycarpa* and *E. melanophloia*, 15 ± 5 m); understorey absent or very sparse; frontage grass. N.B. This community grades into open-forest, but stands usually thinned through selective logging and/or ring-barking.

Land Capability.—II–IIIk_{2-3},m_{2-3}.

Land Unit 130 (980 km²)

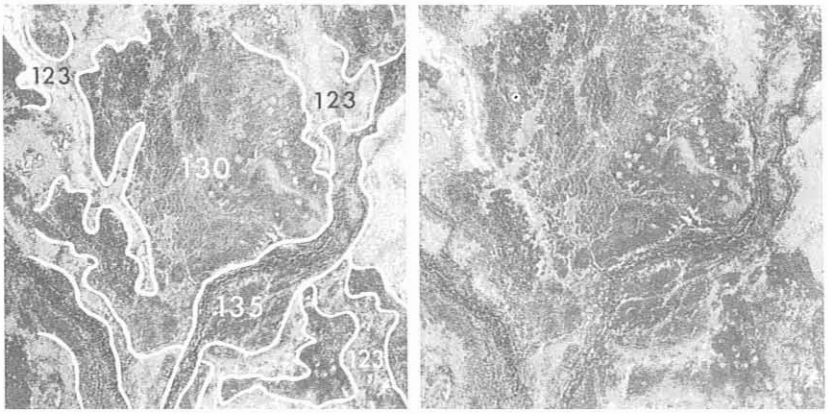
Field Criteria.—Alluvial plains and back swamps, gidgee forest, cracking clay soils.

Climatic Zones.—11,7. Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 125 ± 25 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Plains and back swamps, mainly less than 1%, flooded in lowest situations.



Soil.—Deep cracking clay soils: Vermont (Ug5.16, 5.24, 5.34), generally strongly alkaline and calcareous below 60 cm.

Vegetation.—Gidgee open-forest: *A. cambagei*, 12 ± 3 m, generally in dense clumps and often associated with *E. microtheca*; understorey absent or sparse *Eremophila mitchellii* and/or *Terminalia oblongata*, 5 ± 3 m; sometimes a sparse shrub layer of *Carissa ovata*, 1 ± 0·5 m; sparse scrub grass grading into blue grass in open areas between clumps.

Land Capability.—IV–Vw_{4-5},s_{3-4}.

Land Unit 131 (1020 km²)

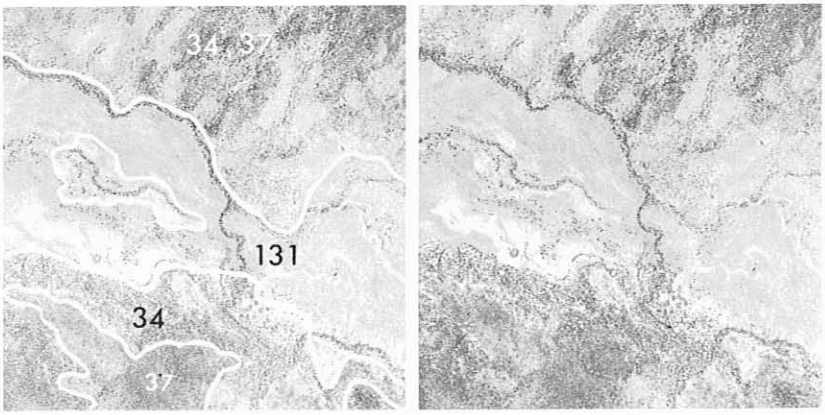
Field Criteria.—Alluvial plains and terraces, grassland, cracking clay soils.

Climatic Zones.—11,10,9,8,7,6. Median rainfall: Nov.–Apr., 400 ± 75 mm; May–Oct., 150 ± 75 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Plains, terraces, back swamps and old channels, 0·5–2 km wide, slopes less than 1%, flooded in low-lying sites.



Soil.—Deep cracking clay soils: Vermont (Ug5.16, 5.15, 5.22), generally with neutral reaction at or near the surface becoming strongly alkaline below 60–90 cm; extensive fine-textured alluvial soils, Clematis (Uf6.11, 1.4), in places.

Vegetation.—Tussock grassland: blue grass communities (*Dichanthium sericeum*, *Thellungia advena*, *Aristida latifolia*, *Panicum decompositum*) with occasional areas dominated by *Astrebla* spp. or mesic mid-height grass; commonly with scattered *E. microtheca* and/or *E. populnea*.

Land Capability.—II–IIIk_{2-3},w_3.

Land Unit 132 (2900 km²)

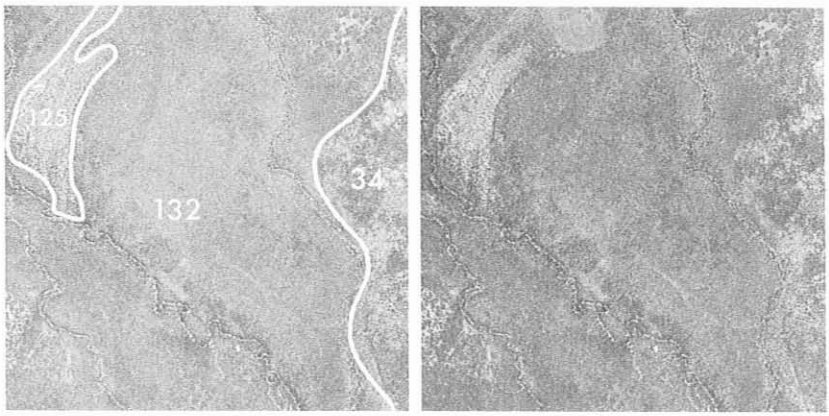
Field Criteria.—Alluvial plains, subject to flooding, brigalow forest, cracking clay soils.

Climatic Zones.—4,5,6,7,8,10,11(9). Median rainfall: Nov.–Apr., 425 ± 100 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Plains in back swamps or valley floors, up to 8 km wide near major streams, slopes less than 1%, frequently flooded in lower parts to depths of up to 150 cm.



Soil.—Deep cracking clay soils: Vermont (Ug5.16, 5.15, 5.24, 5.34), generally neutral reaction at or near the surface becoming strongly alkaline below 90 cm with small amounts of carbonate and gypsum; minor uniform fine-textured alluvial soils, Clematis (Uf1.4, 6.33, 6.23), in places.

Vegetation.—Brigalow open-forest: *A. harpophylla* (*A. cambagei* in north-west), 14 ± 4 m, often with scattered *E. microtheca*; understorey absent or sparse (*Bauhinia carronii*, *B. hookeri*, *Terminalia oblongata*, *Eremophila mitchellii*), 8 ± 3 m; litter and sparse scrub grass.

Land Capability.—Vw_{4-5}.

Land Unit 133 (910 km²)

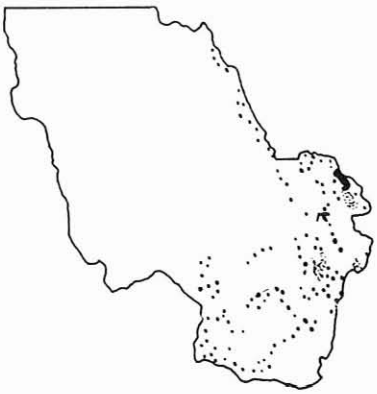
Field Criteria.—Back plains and depressions, blue gum woodland, cracking clay soils.

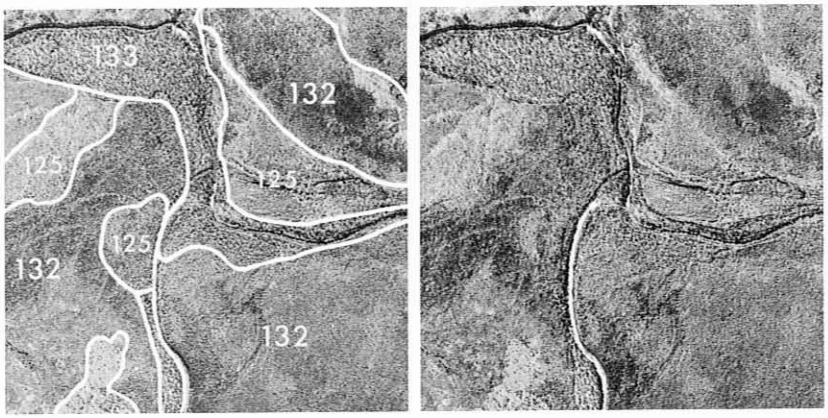
Climatic Zones.—4,5,6,8,9. Median rainfall: Nov.–Apr., 475 ± 75 mm, May–Oct., 200 ± 50 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to very gently sloping.

Position on Slope.—Back plains, drainage floors, distributary channels and depressions: up to 5 km wide with minor levees; transverse slopes up to 2%; seasonal flooding and waterlogging in lowest parts.





Soil.—Deep cracking clay soils: Vermont (Ug5.15, 5.16, 5.24, 5.28), locally non-cracking, Clematis (Uf6.22, 6.23); minor layered alluvial soils, Moolayember (Um/Uf), on levees.

Vegetation.—Blue gum grassy woodland: *E. tereticornis*, 25 ± 8 m (*E. populnea*, *E. tessellaris*, *E. melanophloia* commonly associated, particularly on layered alluvial soils); understorey absent or very sparse; frontage grass.

Land Capability.—Vw_{4-5}.

Land Unit 134 (175 km²)

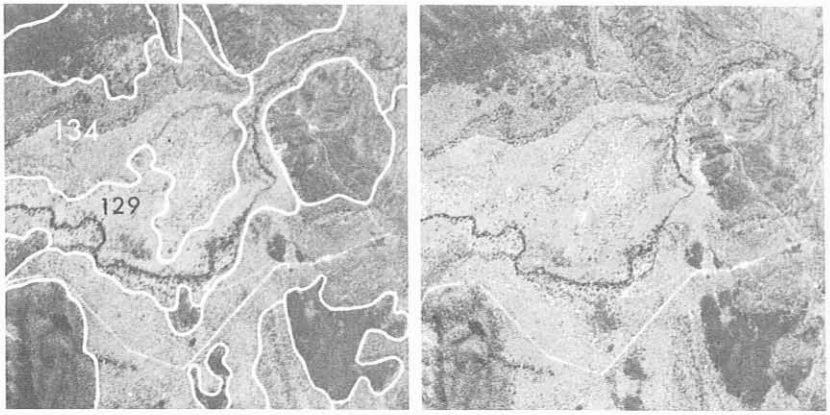
Field Criteria.—Drainage floors, silver-leaved ironbark woodland, cracking clay soils.

Climatic Zones.—4,5,8. Median rainfall: Nov.–Apr., 500 ± 50 mm; May–Oct., 200 ± 50 mm.

Lithology.—Alluvium, fine-textured.

Terrain.—Level to gently sloping.

Position on Slope.—Tributary drainage floors: less than 0·5 km wide; slopes up to 3%.



Soil.—Deep cracking clay soils: Vermont (Ug5.16, 5.34); minor deep texture-contrast soils with thin loamy surface horizons over alkaline clay subsoils, Retro (Dd1.43).

Vegetation.—Silver-leaved ironbark grassy woodland: *E. melanophloia* (*E. dichromophloia*, *E. papuana*, *E. crebra*), 15 ± 4 m; understorey absent or sparse; mesic mid-height grass.

Land Capability.—$IIIk_{2-3}$.

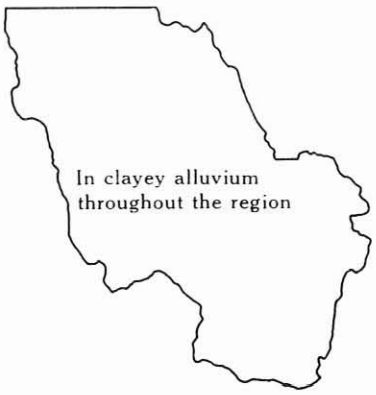
Land Unit 135 (1050 km²)

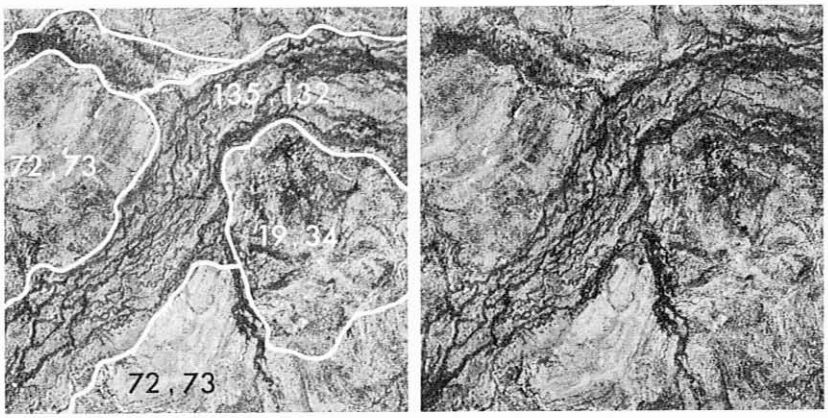
Field Criteria.—Braided channels, fringing forest of coolibah or paperbark, clay or silt beds.

Climatic Zones.—All zones, but mainly 6,7,8,10,11. Median rainfall: Nov.–Apr., 475 ± 140 mm; May–Oct., 175 ± 100 mm.

Lithology.—Alluvium, fine-textured.

Position on Slope.—Channels: anastomosing or braided; 1–8 m deep and 2–15 m wide.





Soil.—Bed loads: clay or silt with varying proportions of cobbles and boulders.

Vegetation.—Fringing open-forest/woodland: floristic composition variable and dependent on channel-bank material, river flow regimes and rainfall. Commonly *E. microtheca*, 15 ± 5 m, and/or *Melaleuca bracteata*, 8 ± 3 m; *A. harpophylla* and/or *A. cambagei* open-forest communities are also common; *A. pendula* occurs locally; sparse frontage grass and annual herbs.

Land Capability.—VII–VIIIt_{7-8},w_5.

Land Unit 136 (40 km²)

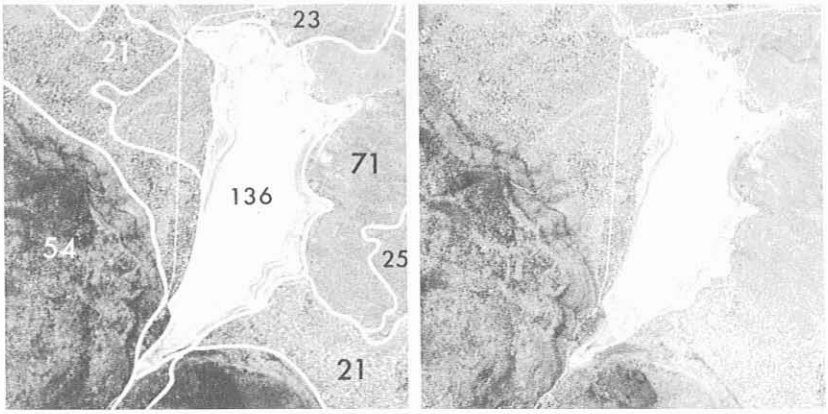
Field Criteria.—Freshwater lakes or swamps, fringing forest of blue gum or paperbark.

Climatic Zones.—All zones, but mainly 4,5,6,8,9. Median rainfall: Nov.–Apr., 525 ± 75 mm; May–Oct., 200 ± 75 mm.

Lithology.—Alluvium.

Terrain.—Level to very gently sloping.

Position on Slope.—Freshwater lakes and swamps: varying in extent from 0·25 to 10 km², 1–3 m deep, generally permanent, but water levels fluctuate seasonally according to rainfall variations in catchments.



Vegetation.—Fringing open-forest: commonly *E. tereticornis*, 25 ± 8 m; *Melaleuca quinquenervia*, 12 ± 3 m, and less frequently *Tristania suaveolens*, 14 ± 3 m; *Cyperus* spp. on receding lake margins; aquatic *Nymphaea* spp. common and *Nelumbo* sp. localized.

Land Capability.—VIIIw$_8$.

Land Unit 137 (95 km²)

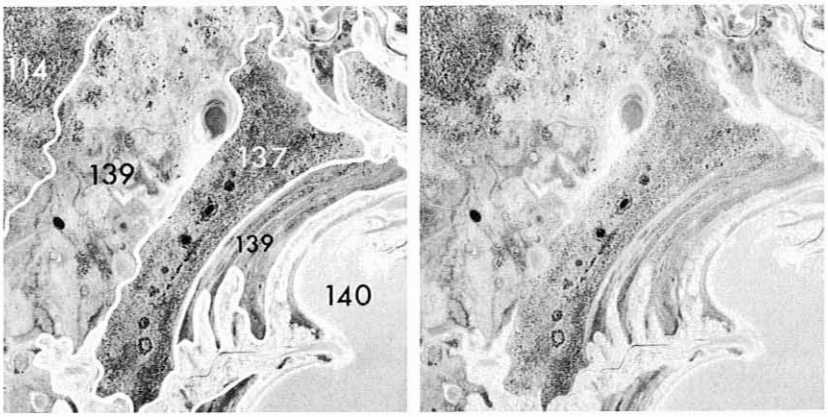
Field Criteria.—Lake beach ridges and sand plains, beefwood woodland, uniform sandy and texture-contrast soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium, coarse-textured, lake beach deposits.

Terrain.—Level to very gently undulating.

Position on Slope.—Sand plains and old beach ridges: up to 10 m above lake floors; minor linear or oval depressions between ridges.



Soil.—Deep uniform sandy and texture-contrast soils: Highmount (Uc1.22, 1.23), soft, structureless, fine sand and texture-contrast soils with thick sandy surface horizons and strongly alkaline mottled clay subsoils, Broadmeadow (Dy3.43, 3.23, 5.53).

Vegetation.—Beefwood grassy woodland: *Grevillea striata* (*G. parallela*, *A. salicina*, *A. bidwillii*), 11 ± 3 m; sparse understorey (*Myoporum deserti*), 3 ± 1 m; xeric mid-height grass. In linear depressions between old beach ridges a low shrubland of *Arthrocnemum* spp., *Atriplex* spp., with saltwater couch grass (*Sporobolus virginicus*).

Land Capability.—VIm_4,n_4. Downgraded on account of low and less effective rainfall.

Land Unit 138 (25 km²)

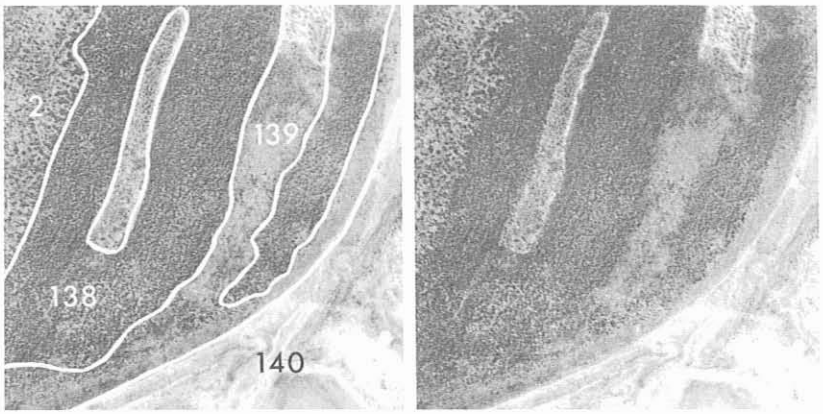
Field Criteria.—Lake beach ridges and depressions, gidgee forest, texture-contrast soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium, medium- to fine-textured lake beach deposits.

Terrain.—Level to very gently undulating.

Position on Slope.—Old beach ridges with intervening narrow depressions: up to 10 m above lake floors.



Soil.—Deep texture-contrast soils: thick sandy surface horizons and strongly alkaline mottled clayey subsoils, Broadmeadow (Dy3.43); minor Taurus (Dy4.53) and uniform fine-textured soils, Clematis (Uf6.33), in depressions.

Vegetation.—Gidgee open-forest: *A. cambagei*, 11 ± 3 m; moderately dense understorey of *Eremophila mitchellii*, *Heterodendrum oleifolium*, *Santalum lanceolatum*, *Myoporum deserti*, 3 ± 1 m. N.B. Included within this unit are associated low woodlands of *Acacia excelsa*, 8 ± 3 m, with an understorey of *Geijera parviflora*, 3 ± 1 m, on ridges and open-woodland of *E. microtheca*, 11 ± 3 m, in the depressions.

Land Capability.—VIp_{3-4},s_{3-4}. Downgraded on account of low and less effective rainfall.

LAND UNIT 139 (70 KM²)

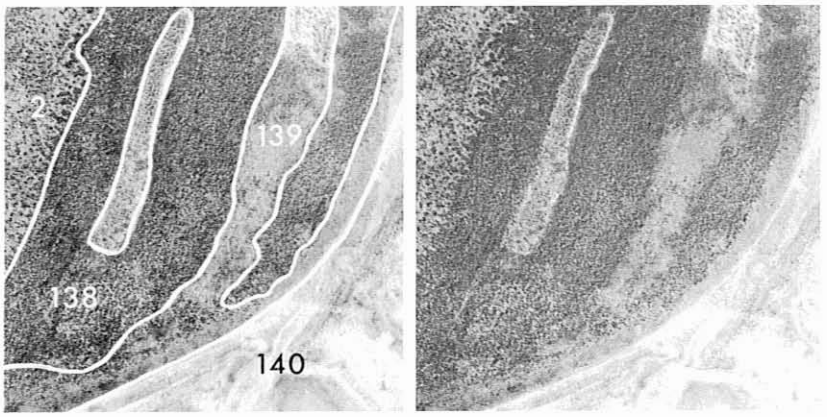
Field Criteria.—Outer lake floors, samphire, texture-contrast soils.

Climatic Zone.—11. Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 100 ± 25 mm.

Lithology.—Alluvium, medium- to fine-textured lake beach deposits.

Terrain.—Level to very gently undulating.

Position on Slope.—Outer lake floors and young beach ridges, 30–100 cm high and 45–60 m wide; occasionally flooded.



Soil.—Deep texture-contrast soils: thin sandy surface horizons and strongly alkaline mottled subsoils, Taurus (Dy3.23), on ridges; uniform fine-textured soils, Clematis (Uf6.51), on outer lake floor.

Vegetation.—Samphire low open-shrubland: *Arthrocnemum* spp. forming a complex of seral communities, 60 ± 30 cm. N.B. At Lake Galilee, sometimes associated with low, dense stands of *A. stenophylla*, 3 ± 1 m.

Land Capability.—$VIIs_{6-7},w_5$.

LAND UNIT 140 (550 KM²)

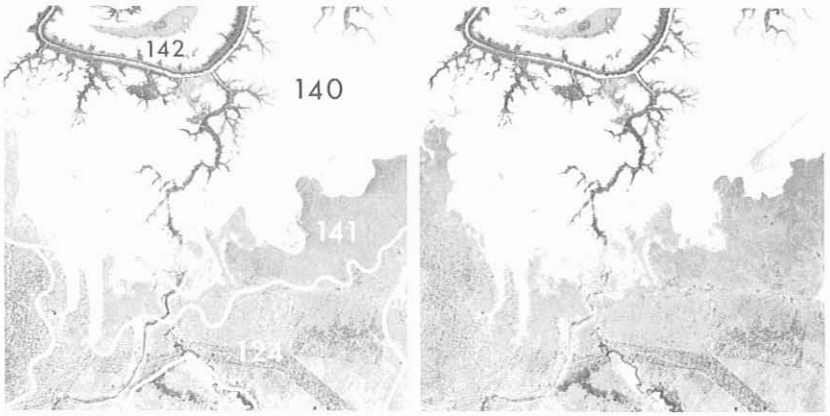
Field Criteria.—Lake floors and littoral plains, barren, saline mud and clay.

Climatic Zones.—11 (inland salt lakes). Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 100 ± 25 mm. Zone 4 (marine plains). Median rainfall: Nov.–Apr., 550 ± 50 mm; May–Oct., 225 ± 25 mm.

Lithology.—Alluvium, fine-textured lacustrine and estuarine deposits.

Terrain.—Level to very gently sloping.

Position on Slope.—Lake floors and littoral plains seasonally or tidally inundated.



Soil.—Saline muds and clays: salt-encrusted surfaces on lake floors during the dry season.

Vegetation.—Barren.

Land Capability.—VIIIs_8.

Land Unit 141 (150 km²)

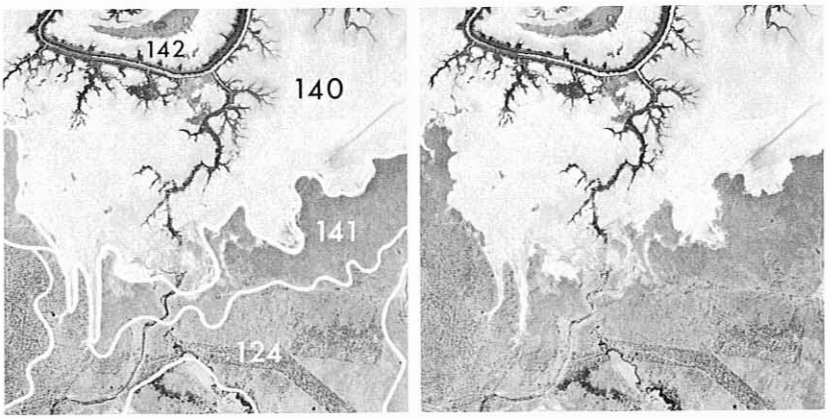
Field Criteria.—Estuarine plains, saltwater couch, saline clay soils.

Climatic Zones.—11 (inland salt lakes). Median rainfall: Nov.–Apr., 375 ± 25 mm; May–Oct., 100 ± 25 mm. Zone 4 (marine plains). Median rainfall: Nov.–Apr., 550 ± 50 mm; May–Oct., 225 ± 25 mm.

Lithology.—Alluvium, fine-textured estuarine deposits.

Terrain.—Level to very gently sloping.

Position on Slope.—Slightly elevated parts of littoral plains; subject to seasonal flooding; small depression on lake margins.



Soil.—Deep saline clay soils: Vermont (Ug5.26, 5.28) and Alma (Uf6.61).

Vegetation.—Saltwater couch grassland: closed monospecific community of *Sporobolus virginicus*.

Land Capability.—VIs_{4-6},w_5.

LAND UNIT 142 (55 KM²)

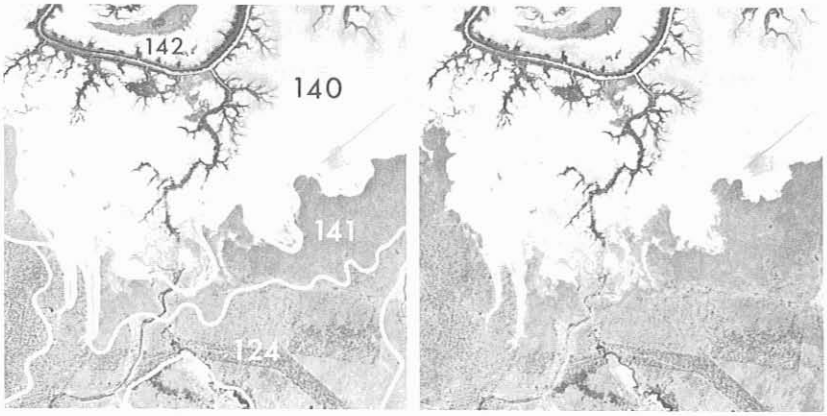
Field Criteria.—Intertidal flats and inlets, mangrove thicket, saline mud and clay.

Climatic Zones.—1,2,3,4. Median rainfall: Nov.–Apr., 550 ± 50 mm; May–Oct., 225 ± 25 mm.

Lithology.—Alluvium, fine-textured estuarine deposits.

Terrain.—Nearly level.

Position on Slope.—Low-lying parts of littoral plains and tidal inlets: continual flooding.



Soil.—Saline mud: Alma (Uf6.61).

Vegetation.—Mangrove thicket: *Rhizophora stylosa*, *Aegiceras corniculatum*, *Ceriops tagal*, *Avicennia marina*, *Osbornia octodonta*, 8 ± 3 mm; associated open areas with *Arthrocnemum* spp. and *Sporobolus virginicus*.

Land Capability.—$VIIIs_8$.

APPENDIX I

Land Systems and Component Simple Land Units

The occurrence and extent of the 142 simple land units in the 120 land systems into which the region has been mapped are shown in Tables 12–14. The land systems in each of the three survey areas are listed alphabetically and the estimated proportions of the component land units are shown in the tables. The dominant, codominant or subdominant land units are shown in italics, and the capital letters preceding the numbers indicate the geomorphic category into which they were classified (see Part II, Section II). The estimated number of occurrences of each land unit in the land systems of the three survey areas is shown in Table 15.

TABLE 12

LAND SYSTEMS AND COMPONENT SIMPLE LAND UNITS IN THE NOGOA–BELYANDO AREA

Dominant or subdominant unit is in italics

Land system and extent (km^2)	Geomorphic category, land units and estimated percentage of total area
Alpha (3235)	C45 2, C46 2, E116 10, E118 20, *E121 50*, E122 5, E125 3, E130 3, E131 2, E132 3
Avon (1190)	B37 1, C42 4, *C43 63*, C44 30, E131 1, E135 1,
Banchory (775)	E123 19, E124 1, E125 5, *E130 70*, E135 5
Blackwater (1760)	B17 1, B19 4, B23 10, B34 10, B36 2, B37 2, C39 2, C40 2, *C41 50*, C45 2, C46 8, D100 2, E132 4, E135 1
Bogantungan (1630)	*D64 80*, D65 8, D66 7, E121 4, E122 1
Borilla (1035)	B17 5, B34 4, B35 3, B37 3, *D83 72*, D87 10, E122 1, E124 1, E127 1
Carborough (5825)	*B17 30*, B19 1, B20 1, B23 4, B24 1, B25 2, B34 1, *D54 35*, D55 15, D58 5, E116 2, E117 2, E122 1
Comet (1785)	*E116 10*, *E118 5*, *E119 2*, *E122 2*, *E124 18*, *E125 10*, *E127 5*, *E131 5*, *E132 40*, E135 3
Copperfield (2330)	A9 3, B17 17, B19 1, B34 1, B37 2, *D62 70*, D63 6
Craven (880)	D65 3, D71 20, D72 15, *D73 45*, D74 12, E121 2, E127 2, E135 1
Cungelella (1710)	B21 3, B34 5, B37 5, C41 5, D68 2, D91 20, D93 10, D95 10, *D100 35*, E132 4, E135 1
Degulla (2540)	A6 15, *E112 45*, E113 10, E114 10, E115 7, E119 2, E121 10, E122 1
Disney (1165)	A2 5, A3 5, *A4 23*, A7 2, B20 3, *B21 11*, *B23 11*, *B34 12*, B35 2, B36 5, *B37 10*, C45 1, C46 2, D72 3, E122 1, E124 3, E127 1
Durrandella (1685)	A4 10, A7 7, A11 3, *B17 45*, B18 5, B20 5, B21 5, B23 5, B25 5, B34 5, B37 2, E121 1, E127 1, E135 1
Funnel (2590)	E122 2, E123 10, E124 11, *E125 52*, E127 1, E130 13, E131 7, E132 1, E135 3

TABLE 12 (*Continued*)

Land system and extent (km²)	Geomorphic category, land units and estimated percentage of total area
Galilee (465)	E137 20, E138 5, E139 15, *E140 60*
Hillalong (285)	C41 15, C46 10, *D71 50*, D74 17, D94 3, E124 3, E127 1, E132 1
Hope (1970)	B17 2, B20 3, D64 20, *D65 50*, D66 15, D71 5, E122 1, E124 2, E127 2
Humboldt (5540)	A6 2, A11 1, B17 2, B22 5, B23 10, *B34 47*, C41 17, C46 15, E135 1
Islay (2255)	A6 2, B23 3, B34 10, B37 7, C41 8, *C45 66*, E118 1, E121 1, E132 1, E135 1
Kareela (440)	*C41 20*, *C48 30*, *C50 15*, C53 10, D96 5, D105 5, D106 10, E122 1, E131 4
Kinsale (1530)	C47 5, C50 17, C51 3, *C52 35*, *C53 20*, D109 3, D110 12, E125 4, E135 1
Lennox (9635)	*A2 47*, A3 4½, A6 10, A7 12, A8 5, A10 1, A11 3, B17 2½, B21 3, B22 1, B23 6, E118 1, E121 1, E122 1, E123 1, E127 1
Loudon (3730)	A2 7, A3 1, A7 2, A9 3, *B17 44*, B18 3, B20 8, B23 9, B25 5, B34 4, B36 3, B37 3, D83 2, D84 1, E121 2, E122 1, E127 2
Mantuan (725)	D94 20, *D99 50*, E122 2, E125 8, E131 20
Monteagle (4430)	A6 10, A7 4, A8 4, A11 2, B17 3, B19 2, B20 5, B21 5, B22 1, *B23 50*, B34 3, B35 2, B37 2, C39 1, C41 1, E120 1, E121 2, E122 1, E127 1
Moray (1035)	*C42 85*, C43 10, C44 5
Oxford (3755)	C47 20, D108 5, D109 25, *D110 45*, E125 4, E135 1
Peak Vale (1685)	B23 3, B37 4, C41 3, D78 30, *D79 50*, D105 1, D106 1, D108 1, D109 2, E116 1, E122 1, E124 3
Percy (880)	D84 10, D104 10, *D105 75*, D106 5
Pinehill (1090)	A5 20, A7 5, *B22 61*, B34 4, B35 3, B37 3, E121 1, E122 1, E123 1, E127 1
Playfair (855)	B17 5, B23 10, B34 3, B37 2, *D54 30*, *D57 30*, D58 12, D59 3, E116 2, E121 2, E122 1
Portwine (1865)	B22 5, B34 3, D64 7, D65 3, *D66 50*, D73 22, D74 5, E122 1, E124 3, E132 1
Ronlow (1995)	*A1 70*, A2 21, A3 4, A4 3, A10 1, B17 1
Rutland (3235)	B19 5, B22 5, B34 1, B36 6, B37 11, D65 5, D66 8, D71 2, *D72 27*, *D73 20*, D75 5, E124 3, E127 1, E135 1
Skye (960)	A6 15, A11 2, B17 5, B18 3, *B22 48*, B34 3, B37 14, E121 7, E122 1, E122 1, E127 2
Somerby (1760)	A6 1, B17 2, B23 4, B34 13, C39 2, C40 3, C41 15, C45 5, *C46 52*, E131 1, E132 1, E135 1
Tichbourne (4300)	A1 3, *A2 50*, A3 15, A4 4, A7 5, B17 5, B19 5, B20 8, E121 1, E122 ½, E123 1, E125 1, E127 1, E135 ½
Ulcanbah (595)	A6 4, B34 9, B35 3, B37 12, *C39 50*, C41 4, C45 5, C46 3, D94 1, E123 1, E124 6, E127 1, E135 1
Waterford (2330)	A6 2 (Surbiton area), C47 3, C50 3, C51 2, D105 3, D107 12, *D108 35*, *D109 35*, E125 2, E131 2, E135 1
Wharton (2150)	A6 1, B17 1, B21 1, B23 2, B34 17, B37 5, C41 10, D68 1, D91 2, D93 5, D95 2, *D100 48*, E124 2, E127 1, E132 1, E135 1
Willows (415)	A6 1, A7 1, A11 2, B17 1, B23 1, B24 4, B34 25, *C41 50*, C46 10, E124 2, E132 2, E135 1
Wondabah (490)	C50 15, *C51 70*, D109 10, E131 4, E135 1

TABLE 13

LAND SYSTEMS AND COMPONENT SIMPLE LAND UNITS IN THE ISAAC–COMET AREA

Dominant or subdominant unit is in italics

Land system and extent (km²)	Geomorphic category, land units and estimated percentage of total area
Arcadia (1750)	B18 1, B37 10, C41 10, C46 10, D91 5, D93 5, D100 15, *D101 35*, D102 5, E120 1, E124 2, E135 1
Barwon (365)	B23 5, B34 5, D71 13, D72 10, D73 12, D74 5, *D75 45*, E122 1, E127 4
Bedourie (325)	*C48 35*, D68 3, *D93 17*, D95 10, D96 10, D98 5, D104 10, D105 10
Black Alley (140)	*D103 85*, D104 5, D105 10
Blackwater (2135)	B23 5, B34 7, B38 3, *C41 65*, C46 10, D100 5, E127 4, E135 1
Britton (130)	*D84 60*, D106 40
Carborough (3910)	B17 10, B23 2, B34 2, D54 20, *D55 48*, D56 6, D58 10, E121 1, E122 1
Comet (2085)	C46 3, E122 2, E124 6, E125 17, E129 15, *E132 54*, E135 3
Connors (2510)	C46 2, E116 3, E117 3, E119 3, E120 9, *E121 46*, E122 2, E124 12, *E126 5*, E129 5, E132 7, E133 3
Cotherstone (1500)	*B17 30*, B19 2, B21 9, *B23 30*, B24 9, B25 12, D67 3, E116 1, E121 3, E122 1
Daunia (1245)	A8 7, A11 5, B17 3, B22 3, B23 7, B34 3, B37 5, B38 2, C41 10, C46 5, *D75 50*
Durrandella (2615)	A8 18, A11 6, *B17 50*, B18 3, B19 4, B23 15, B34 1, B37 1, E121 1, E122 1
Funnel (1205)	E120 5, E121 10, *E125 55*, E131 15, E132 10, E135 5
Girrah (1360)	B37 10, C41 10, D68 6, D71 4, D94 25, *D99 42*, E122 ½, E124 2, E135 ½
Hillalong (310)	C41 2, *D65 67*, D71 20, D74 5, D75 3, E120 1, E122 1, E124 1
Humboldt (5815)	A6 1, A8 1, A10 1, A14 1, B22 5, B23 5, *B34 40*, B38 5, C41 20, C46 20, E135 1
Junee (1775)	A6 5, *A8 50*, A9 5, A10 2, A11 1, A14 1, A15 1, B17 5, B21 5, B23 10, B25 10, B27 1, B37 2, C41 2
Monteagle (4285)	A2 1, A6 1, A7 1, A8 1, A10 3, A11 1, B21 11, *B23 50*, B25 18, B27 5, C41 2, C46 3, E121 1, E122 1, E127 1
Moorooloo (350)	*B24 80*, B37 2, C47 5, C53 3, D109 5, E122 ½, E125 4, E135 ½
Nebo (465)	*D87 30*, D88 10, *D89 25*, *D90 30*, E121 4, E122 1
Oxford (2590)	C47 3, D108 10, D109 28, *D110 45*, D111 9, E125 4, E135 1
Percy (775)	D76 10, D84 10, D104 10, *D105 70*
Planet (1035)	B17 5, B18 5, *D55 50*, D56 10, D58 15, D60 10, E117 4, E122 1
Racecourse (425)	*C49 35*, *C50 40*, C52 5, D108 20
Rewan (805)	B26 5, C41 3, C46 2, D65 15, *D68 60*, D71 5, D96 5, E117 2, E122 1, E124 2
Skeleton (740)	*D64 45*, D105 20, D107 20, D108 5, D110 5, E122 1, E134 4
Somerby (945)	B22 2, B23 3, B34 10, B37 10, B38 3, C41 10, *C46 60*, E132 1, E135 1
Waterford (920)	D107 25, *D108 30*, *D109 40*, E131 4, E135 1

TABLE 14

LAND SYSTEMS AND COMPONENT SIMPLE LAND UNITS IN THE DAWSON–FITZROY AREA

Dominant or subdominant unit is in italics

Land system and extent (km²)	Geomorphic category, land units, and estimated percentage of total area
Auburn (180)	B26 10, *B32 43*, B33 30, C41 5, E117 10, E122 2
Banana (1190)	C41 10, C46 15, C49 15, D68 3, D73 2, D75 10, *D89 25*, D106 5, D108 5, E122 1, E124 3, E129 1, E133 5
Bannockburn (335)	D64 25, *D68 60*, D97 4, E122 1, E124 10
Barfield (335)	*D89 70*, D90 15, E122 5, E133 10
Barwon (675)	B34 16, *C46 20*, D71 10, *D73 25*, *D75 22*, E122 2, E127 5
Boomer (1190)	*D64 55*, D68 20, D70 15, D95 3, E122 1, E128 4, E129 2
Boulderombe (1475)	B37 5, D69 3, D76 10, D77 2, *D80 25*, D81 10, D82 5, D84 5, D87 5, *D88 24*, E122 1, E129 2, E133 3
Carborough (1735)	D54 15, *D55 46*, D56 5, D60 10, D68 10, D91 5, D96 3, E117 3, E121 2, E122 1
Carpentaria (440)	*E140 60*, E141 28, E142 12
Conloi (155)	*D56 55*, D68 25, D96 10, E117 3, E120 3, E122 1, E126 3
Coolibah (1605)	E120 2, E122 7, *E125 65*, E126 5, E129 18, E133 3
Coreen (675)	C41 25, C46 20, E122 5, *E132 50*
Dakenba (700)	B34 10, *C41 50*, C46 10, D93 5, D100 10, E122 1, E124 5, E127 5, E132 4
Dingo (310)	C46 15, *E121 30*, E122 1, *E124 30*, E126 4, E128 10, E129 10
Doonkuna (1400)	C41 2, *D55 50*, D56 30, D68 5, D91 5, D96 3, E122 1, E124 4
Doughboy (415)	D57 15, D59 3, *D60 50* D61 15, D68 10, D96 4, E122 1, E124 2
Duaringa (2125)	*A8 45*, A9 3, A10 2, A15 7, B17 7, B18 3, B19 3, B25 15, B26 2, E116 5, E121 3, E122 1, E128 4
Eurombah (4065)	B34 10, C41 10, C48 3, C49 3, C50 3, D92 3, *D93 20*, *D100 22*, *D101 20*, E122 1, E124 3, E127 2
Gavial (365)	E120 2, E122 5, E125 25, E126 5, E129 3, *E133 60*
Gelobera (880)	*D84 30*, *D85 25*, D86 20, D88 4, D106 15, E122 4, E126 2
Glenhaughton (1735)	D59 5, *D60 55*, D61 25, D68 5, D96 5, E122 1, E124 4
Grevillea (335)	C48 2, C49 2, D104 20, D105 10, *D108 40*, D109 5, D110 5, D111 5, E122 1, E133 10
Highworth (3080)	B30 3, B34 25, C41 10, *C46 45*, D68 3, D97 2, D101 5, D102 3, E122 1, E124 3
Hillmore (2745)	*D84 75*, D87 5, D88 10, D106 3, E122 2, E129 2, E134 3
Hinchley (285)	D68 5%, D97 14, *D100 75*, E121 5, E122 1
Irving (880)	*D76 45*, D80 10, D82 5, D84 15, D87 5, D88 10, D106 3, E117 3, E122 1, E133 3
Juandah (1010)	C41 5, D68 5, D96 10, E117 12, *E120 20*, *E121 30*, E122 3, E124 15
Kaiuroo (595)	A6 5, *A8 35*, A9 20, A10 4, *B17 30*, C46 2, E121 3, E122 1
Kariboe (205)	*C41 47*, C48 15, C49 10, D91 1, D93 1, D97 3, D106 15, E122 1, E124 2, E126 3, E129 2
Kiddell (1735)	B34 10, C41 10, D68 5, D93 5, D96 5, *D100 29*, D101 10, *D102 15*, E122 1, E124 3, E131 7
Kroombit (805)	E120 5, E122 5, E124 15, E125 10, *E126 40*, E129 20, E133 5
Langmorn (365)	*D84 25*, D88 10, E122 5, E124 10, E125 10, *E126 30*, E133 10
Lawgi (390)	*C48 30*, *C49 25*, C50 5, C52 10, D101 15, D105 5, D106 10
Malakoff (960)	B34 10, D68 15, D69 10, D70 15, D95 3, D98 3, *D106 41*, E122 1, E128 2

TABLE 14 (*Continued*)

Land system and extent (km²)	Geomorphic category, land units, and estimated percentage of total area
Melbadale (1090)	A8 10, A16 5, B17 5, B18 15, B23 10, *B25 25*, B26 20, E121 3, E122 1, E128 3, E129 3
Mimosa (205)	*B25 40*, E117 15, *E119 40*, E122 5
Montana (2200)	D59 10, *D68 50*, D96 15, E117 5, E122 1, E124 15, E133 4
Mourangie (415)	*D68 30*, *D69 35*, D70 9, *D95 5*, *D98 10*, *E122 1*, *E128 5*, *E129 5*
Mundell (335)	B34 10, C41 10, D68 10, D91 10, *D93 40*, D100 10, D102 4, E122 1, E124 5
Narowie (105)	A15 20, *A16 65*, D111 10, E128 2, E133 3
Narran (1580)	B34 5, *D56 35*, D68 5, D92 5, D95 10, D96 5, D100 15, D101 16, E122 1, E124 3
Nathan (3420)	B17 5, B18 3, D54 10, *D55 40*, D56 30, D60 5, E117 3, E122 1, E129 3
Oakleigh (985)	*D56 30*, D68 10, D92 20, D93 5, D96 5, D100 25, E122 1, E124 4
Ohio (1215)	D84 5, D87 10, *D88 65*, D89 5, D90 5, E122 2, E124 3, E131 5
Orana (335)	B37 5, D88 20, *D89 55*, D90 10, E122 1, E133 4, E134 5
Palmtree (390)	D59 10, *D68 25*, *D71 20*, E117 10, E122 2, *E124 15*, E129 5, E133 3, E136 10
Perch (645)	A8 10, A11 10, *B23 15*, *B25 15*, B26 7, D68 10, *E119 20*, E122 1, E124 3, E126 5, E128 4
Raglan (205)	E122 5, E124 10, E126 5, *E133 65*, E140 2, E141 13
Ramsay (260)	A6 5, B34 5, B38 5, C41 10, C46 10, D95 5, *D101 45*, E122 1, E132 14
Range (170)	*A8 30*, B17 10, B18 10, B25 10, *D55 39*, E122 1
Redcliffe (335)	A8 8, A10 3, B23 10, B25 10, *B28 30*, *B29 20*, E117 13, E119 5, E122 1
Redrange (390)	B38 5, C41 15, D68 10, D93 15, D96 5, *D101 35*, D102 10, E122 1, E124 4
Rosewood (245)	C46 2, D69 30, *D70 60*, D95 2, E122 1, E124 5
Surprise (750)	A13 4, A14 2, C41 3, *D67 50*, D68 25, D96 5, D98 5, E122 1, E124 2, E129 3
Thomby (3575)	A6 1, A8 1, A14 2, B19 1, B23 1, B25 1, B30 3, B34 14, B37 10, B38 5, *C41 15*, *C46 20*, D68 10, D97 5, D101 5, E120 1, E124 2, E129 3
Toonda (645)	B26 7, B38 2, *C41 25*, C46 10, *C49 20*, *D84 15*, D88 3, *D106 15*, E122 1, E133 2
Torsdale (1475)	C41 4, C46 2, D84 5, *D88 45*, D89 13, D90 12, D96 5, D106 5, E122 1, E124 5, E134 3
Wandoan (3935)	B34 15, C41 15, D68 5, D92 5, D93 5, D97 4, *D100 32*, D101 14, E121 2, E122 1, E124 2
Westwood (440)	C41 3, D87 5, *D107 60*, D108 10, D110 5, D111 10, E122 1, E131 6
Woleebee (1010)	B37 3, D59 10, *D68 20*, *D96 15*, D97 10, E117 3, E119 5, *E121 30*, E122 1, E133 3
Womblebank (390)	*B34 15*, *C41 15*, D64 3, *D67 17*, D68 5, D91 10, *D93 15*, D101 5, D104 2, D107 5, D108 5, E122 1, E124 2
Wooroonah (1940)	A6 3, A7 1, A11 1, A12 10, B17 3, *B23 15*, B26 10, *B28 15*, B29 10, *B31 25*, E117 3, E119 1, E121 1, E122 1, E124 1
Yebna (595)	D55 5, *D56 55*, D57 10, D68 15, D96 5, E117 4, E120 5, E122 1

TABLE 15

OCCURRENCES OF SIMPLE LAND UNITS IN LAND SYSTEMS OF THE FITZROY REGION

Land unit	Occurrences in land systems			Land unit	Occurrences in land systems		
	Nogoa–Belyando area	Isaac–Comet area	Dawson–Fitzroy area		Nogoa–Belyando area	Isaac–Comet area	Dawson–Fitzroy area
1	2			47	3	2	
2	5	1		48	1	1	4
3	5			49		1	6
4	4			50	4	1	2
5	1			51	3		
6	11	3	4	52	1	1	1
7	8	1	1	53	2	1	
8	2	5	7	54	2	1	2
9	2	1	2	55	1	2	5
10	2	3	3	56		2	7
11	6	4	1	57	1		2
12			1	58	2	2	
13			1	59	1		5
14		2	2	60		1	4
15		1	2	61			2
16			2	62	1		
17	16	6	6	63	1		
18	2	3	4	64	2	1	3
19	6	2	2	65	4	2	
20	7			66	2		
21	6	2		67		1	2
22	7	3		68	2	3	27
23	12	10	4	69			4
24	1	2		70			4
25	2	3	7	71	4	4	2
26		1	6	72	3	1	
27		2		73	3	1	2
28			2	74	3	2	
29			2	75	1	3	2
30			2	76		1	2
31			1	77			1
32			1	78	1		
33			1	79	1		
34	20	7	12	80			2
35	4			81			1
36	4			82			2
37	16	7	2	83	2		
38		4	4	84	2	2	8
39	4			85			1
40	2			86			1
41	11	10	20	87	1	1	5
42	3			88		1	9
43	2			89		1	5
44	2			90		1	4
45	6			91	2	1	5
46	8	9	12	92			4

TABLE 15 (*Continued*)

Land unit	Occurrences in land systems Nogoa–Belyando area	Isaac–Comet area	Dawson–Fitzroy area	Land unit	Occurrences in land systems Nogoa–Belyando area	Isaac–Comet area	Dawson–Fitzroy area
93	2	2	9	118	4		
94	3	1		119	2	2	5
95	2	1	6	120	1	3	7
96	1	2	14	121	13	7	10
97			7	122	20	14	58
98		1	3	123	6		
99	1	1		124	13	6	30
100	3	2	8	125	9	4	4
101		1	10	126		1	10
102		1	4	127	17	3	3
103		1		128			8
104	1	3	2	129		2	15
105	4	4	2	130	3		
106	3	1	9	131	9	2	3
107	1	2	2	132	11	4	3
108	3	4	4	133		1	16
109	5	3	1	134		1	3
110	2	2	2	135	20	10	
111		1	3	136			1
112	1			137	1		
113	1			138	1		
114	1			139	1		
115	1			140			2
116	5	2	1	141	1		2
117	1	3	12	142			1

APPENDIX II

PHOTOGRAPHIC PATTERNS

(*a*) *General*

The relief and form of landscapes and their component soils and vegetation reflect the nature of the underlying rocks or materials and the various processes which have acted upon them. In turn, these features are reflected as distinctive patterns in aerial photographs. Smith (1943)* defines a pattern as 'a more-or-less orderly spatial arrangement of particular elements shown on the photograph and implies a characteristic repetition of certain general forms or relationships'. The patterns are identified by their characteristic assemblages of component elements which are reflected as differences in tone, texture, relief and drainage nets by examination with stereoscopes.

* Smith, H. T. U. (1943). 'Aerial Photographs and Their Applications.' (Appleton-Century-Crofts Inc.: N.Y.)

The broad patterns reflecting differences in the genesis of landscapes are generally identified more readily in small-scale than large-scale photography because less detail is apparent and a greater number of contrasting patterns usually occurs in individual photographs. These patterns may be classified initially as follows.

(i) Simple: comprising one dominant element which occurs in uniform areas of varying extent; small inclusions of other elements may be present.

(ii) Complex: comprising two or more genetically related elements with intricate spatial distribution.

(iii) Compound: comprising two or more composite elements, usually of different genesis.

The principal factors causing differences in photographic patterns are changes in landform and vegetation. Landforms are generally correlated closely with the lithology of the underlying rocks and the past history of weathering, erosion and deposition. They are identified by stereoscopic examination of photographs by means of their structural form, dissection, erosion and drainage patterns, presence or absence of strike, and relationships to adjacent landforms. Some examples of characteristic drainage patterns in various terrain types underlain by rocks of different lithology are shown in Figure 13. Together with geological information, landforms indicate the nature and mode of formation of soil parent materials and hence the kinds of soils present.

The distribution of undisturbed native plant communities generally reflects the complex environmental conditions of the region and is an important factor in what causes differences between patterns. Changes in tone and texture of patterns are caused mainly by variations in the light-reflecting properties of species, the density and height of trees and shrubs, the colour, density and degree of smoothness of leaves, structure of tree canopies, proportion of ground cover exposed and shadow effects.

The broad distribution of plant communities and formations in the region is controlled mainly by gradual climatic changes, particularly the decrease in annual rainfall and its effectiveness westwards and in winter rainfall northwards. The local distribution, however, is generally correlated closely with variations in soils. The most important soil properties in this regard are those which affect the supply of water to plants, such as effective depth, the thickness, texture, structure and porosity of surface and subsoil horizons, salt, alkali and organic matter contents, and types of clay minerals. Such close correlations between vegetation and soils are not universal. In some humid tropical regions, for example, an apparently uniform forest cover occurs on various soils. Similarly in regions at higher latitudes or greater elevations, variations in temperature, controlled by changes in altitude, aspect and cold air drainage, are often of greater importance than soil factors in influencing species distribution.

(*b*) *Identification of Land Units*

In general, most of the land units described and illustrated in Part V can be identified fairly easily in black and white photographs when sufficient experience has been gained in recognizing landforms and vegetation and when the broad relationships between the various landscapes within the region are known. The following cases, however, are exceptions to this generalization and problems of identification can be

resolved only by direct observations on the ground, the use of large-scale photographs or an early series of photographs, or colour or false-colour photography.

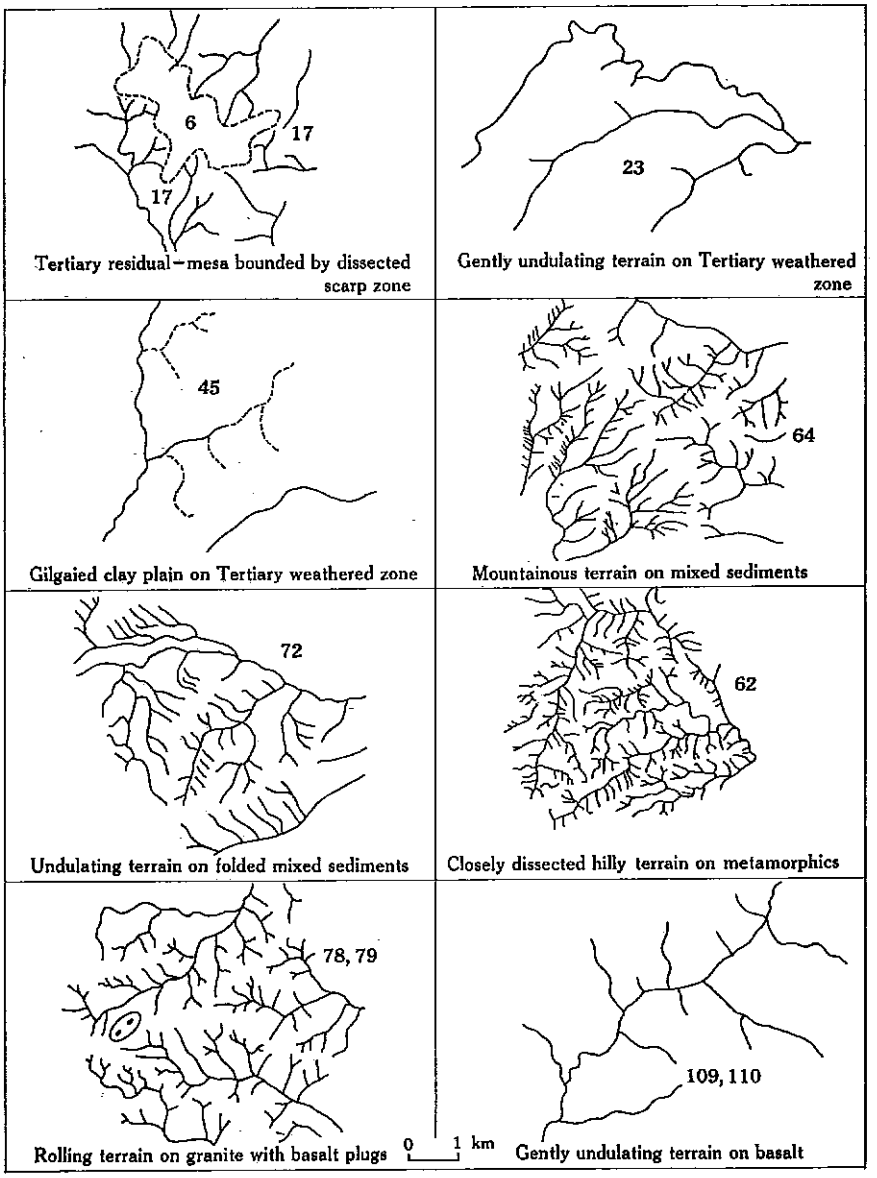


Fig. 13.—Drainage patterns in various terrain and rock types (numbers indicate typical land units).

(i) Land units in which the natural vegetation had been cleared prior to photography. Certain features of the landscapes may still be evident and provide clues to aid identification, e.g. marked changes in slopes, evidence of strike in underlying rocks,

gilgai microrelief, large trees left standing or tone changes reflected by variations in soils.

(ii) Land units with similar landforms, vegetation and soils differentiated on the basis of variations in slopes not readily discernible in the photographs (e.g. land units 93 and 95).

(iii) Land units with similar landforms, vegetation and soils differentiated according to variations in lithology and geomorphic history. For example, *E. populnea* woodland on texture-contrast soils in level to gently undulating terrain occurs in land units 23 (on Tertiary weathered zone), 96 (on argillaceous sediments) and 124 (on alluvium). These land units reflect similar or identical patterns but they occur in association with different assemblages of other land units. In some cases 23 merges with 124 and can be differentiated accurately only by detailed examination of soil profiles and/or slopes.

(iv) Land units with similar landforms and vegetation but with different soils (e.g. 37 and 41). These sometimes occur in mosaics.

(v) Land units with different plant communities which reflect very similar photographic patterns (e.g. brigalow, gidgee and blackwood forests or some *E. populnea* and *E. melanophloia* woodlands).

The nature of boundaries between adjacent land units is illustrated in the stereograms in Part V. Some, which reflect topographic or parent rock discontinuities, are abrupt and clear and are easily delineated. Others have diffuse boundaries which reflect the transitional nature of plant communities or the intergrading of soil parent materials on gradual slopes. In such cases, delineation involves interpretation and judgment or mapping the transitional areas where the photographic scale permits.

Where land unit maps are deemed necessary for detailed planning, large-scale (1 : 10,000–25,000) photography will be required in most cases. Large uniform occurrences of some land units are mappable at smaller scales (1 : 50,000–85,000). Other land units occur in complex linear or catenary patterns, the elements of which are mappable only at the larger scales, but in view of their complexity and generally low potential value for intensive use this may not be justified.

APPENDIX III

Plant Names and their Common Equivalents

Abutilon auritum	Chinese lantern
A. oxycarpum var. *acutatum*	Flannel weed
Acacia aneura	Mulga
A. argyrodendron	Blackwood
A. bancroftii Maid.	
A. bidwillii Benth.	
A. brevifolia Benth.	
A. cambagei R. T. Bak.	Gidgee
A. catenulata C. T. White	Bendee

A. coriacea DC.	Desert oak
A. cunninghamii Hook.	Black wattle
A. excelsa Benth.	Ironwood
A. farnesiana Willd.	Mimosa bush
A. fasciculifera F. Muell.	Scrub ironbark
A. glaucocarpa Maid. et Blakely	
A. harpophylla F. Muell.	Brigalow
A. laccata Pedley	
A. leptocarpa A. Cunn. ex Benth.	
A. leptostachya Benth.	
A. omalophylla A. Cunn. ex Benth.	Yarran
A. orthocarpa A. Cunn. ex Benth.	
A. oswaldii F. Muell.	Nelia
A. pendula A. Cunn. ex G. Don	Myall
A. rhodoxylon Maid.	Rosewood
A. salicina Lindl.	Willow wattle
A. shirleyi Maid.	Lancewood
A. simsii A. Cunn. ex Benth.	
A. sparsiflora Maid.	
A. stipuligera F. Muell.	
A. tenuissima F. Muell.	
A. torulosa Benth.	
A. whitei Maid.	
A. sp. aff. *burrowii* Maid.	
A. sp. aff. *cana* Maid.	
A. sp. aff. *cunninghamii* Hook.	
A. sp. aff. *julifera* Benth.	
Acanthospermum hispidum DC.	Star burr
Achyranthes aspera	Chaff-flower
Actinotus	Flannel flower
Aegiceras corniculatum	River mangrove
Albizia basaltica (F. Muell.) Benth.	Dead finish
Alphitonia excelsa (Fenzl.) Benth.	Redash, soaptree
Alstonia constricta F. Muell.	Bitter bark
Alternanthera	Khaki weed
Alysicarpus rugosus DC.	Rough chain-pea
Ancistrachne uncinulata (R. Br.) S. T. Blake	Hooky grass
Angophora costata (Gaertn.) J. Britt	Sugar gum, cabbage gum, rusty gum, smooth-barked apple
A. floribunda	Rough-barked apple
Apophyllum anomalum F. Muell.	Broom bush
Araucaria cunninghamii	Hoop-pine
Argemone ochroleuca Sweet	Mexican poppy
Aristida browniana Henr.	Kerosene grass
A. caput-medusae Domin	Wire grass, three-awned spear grass
A. glumaris Henr.	
A. helicophylla S. T. Blake	
A. hygrometrica R. Br.	
A. jerichoensis (Domin) Henr.	
A. latifolia Domin	Feather-top wire grass
A. leptopoda Benth.	White spear grass
A. ramosa R. Br.	Wire grass, three-awned spear grass
Arthrocnemum spp.	Samphire
A. leiostachyum	Samphire
Arundinella nepalensis	Reed grass

Astrebla elymoides F. Muell. ex F. M. Bail.	Hoop or weeping Mitchell grass
A. lappacea (Lindl.) Domin	Curly Mitchell grass
A. pectinata (Lindl.) F. Muell. ex Benth.	Barley Mitchell grass
Atalaya hemiglauca (F. Muell.) F. Muell. ex Benth.	Whitewood
Atriplex muelleri	Annual saltbush
A. nummularia Lindl.	Old-man saltbush
Avicennia marina	Grey mangrove
Bassia echinopsila F. Muell.	Red burr
B. quinquecuspis	Black roly-poly, prickly roly-poly
B. tetracuspis C. T. White	Brigalow burr, dog burr
Bauhinia carronii F. Muell.	Bauhinia
B. hookeri F. Muell.	
Boerhavia diffusa L.	Tar-vine
Boronia bipinnata	Boronia
B. glabra	
B. obovata C. T. White	
B. rosmarinifolia A. Cunn.	
Bothriochloa decipiens (Hack.) C. E. Hubb.	Bitter or pitted blue grass
B. erianthoides (F. Muell.) C. E. Hubb.	Satin-top grass
B. ewartiana (Domin) C. E. Hubb.	Desert blue grass
B. intermedia (R. Br.) A. Camus	Forest blue grass
Brachyachne convergens	Common native couch
Brachychiton australe (Schott) C. T. White	Broad-leaved bottle tree
B. populneum (Schott) R. Br.	Kurrajong
B. rupestre (Lindl.) K. Schum.	Narrow-leaved bottle tree
Bursaria incana Lindl.	
Cadellia pentastylis	Ooline, solid-wood
Callistemon	Bottlebrush
C. viminalis (Sol. ex Gaertn.) G. Don ex Loudon	Bottlebrush
Callitris columellaris F. Muell.	Cypress pine
Calotis cuneata (F. Muell. ex Benth.) G. L. Davis	
Canthium oleifolium	
Capparis lasiantha R. Br. ex DC.	Nipan
C. loranthifolia	Wild pomegranate
C. mitchellii	Bumble tree
Carissa ovata R. Br.	Currant-bush, broom-bush
Cassia brewsteri F. Muell.	Leichhardt bean
C. nemophila Vogel	
Casuarina cristata	Belah
C. cunninghamiana Miq.	River oak
C. inophloia	Thready-bark oak
C. luehmannii R. T. Bak.	Bull oak
C. torulosa	Forest oak
Caustis sp.	
Centipeda minima (L.) A. Br. et Aschers.	
Cheilanthes sp.	Rock fern
C. distans	Rock fern
Chloris acicularis Lindl.	Curly windmill grass, spider grass

C. divaricata R. Br.	Small chloris
C. gayana	Rhodes grass
C. scariosa F. Muell.	
C. truncata R. Br.	
C. unispicea F. Muell.	
C. ventricosa	Tall chloris
Chrysopogon fallax S. T. Blake	Ribbon grass
Cissus opaca	Native grape, yam vine
Citriobatus spinescens (F. Muell.) Druce	Wallaby apple, wallaby berry
Cleistochloa subjuncea C. E. Hubb.	
Crotalaria dissitiflora Benth.	Rattle pod
Croton phebalioides F. Muell. ex Muell. Arg.	
C. insularis	
Cymbopogon bombycinus (R. Br.) A. Camus	Barbed-wire grass
Cynodon dactylon	Couch grass
Cyperaceae	Sedges
Cyperus gracilis R. Br.	Slender sedge
C. retzii Nees	Downs nut-grass
Dampiera sp.	
Danthonia	Wallaby grass
Daucus glochidiatus (Labill.) Fisch., Mey. et Ave-Lall.	Native carrot
Denhamia obscura Meissn.	
Desmodium brachypodum A. Gray	
Dichanthium fecundum S. T. Blake	
D. sericeum (R. Br.) A. Camus	Queensland blue grass
Distichostemon sp.	
Dodonaea filifolia Hook.	Hop bush
D. vestita	Hop bush
D. viscosa (L.) Jacq.	Hop bush
Echinochloa colonum (L.) Link	Awnless barnyard grass
Ehretia membranifolia R. Br.	Peach bush
Enchylaena tomentosa R. Br.	Berry cotton-bush
Enneapogon flavescens (Lindl.) N. T. Burbidge	
E. pallidus (R. Br.) Beauv.	
E. polyphyllus (Domin) N. T. Burbidge	
Epaltes australis Less.	
Eragrostis cilianensis	Stink grass
E. megalosperma F. Muell. ex Benth.	
Eremochloa bimaculata	Poverty grass
Eremocitrus glauca (Lindl.) Swingle	Limebush
Eremophila bignoniiflora F. Muell.	Creek wilga, gooramurra
E. mitchellii Benth.	False sandalwood, sandalwood, budda
Eriachne mucronata R. Br.	Wanderrie grass
E. obtusa R. Br.	
Eriochloa procera	Spring grass, early spring grass
E. pseudo-acrotricha	Spring grass, early spring grass
Erythroxylum australe R. Br.	
Eucalyptus acmenioides	White stringybark, white mahogany
E. alba Reinw. ex Bl.	Poplar gum
E. brownii Maid. et Cambage	Reid river box

E. camaldulensis Dehn.	River red gum
E. cambageana Maid.	Blackbutt or Dawson gum
E. citriodora Hook.	Lemon-scented gum
E. cloeziana F. Muell.	Queensland or Gympie messmate
E. crebra F. Muell.	Narrow-leaved ironbark
E. dealbata A. Cunn. ex Schau.	Tumble-down gum
E. decorticans (F. M. Bail.) Maid.	Gum-topped ironbark
E. dichromophloia F. Muell.	Red-barked bloodwood
E. drepanophylla F. Muell. ex Benth.	Grey ironbark, narrow-leaved ironbark
E. eugenioides	Stringybark
E. exserta F. Muell.	Queensland peppermint, bendo
E. fibrosa	Broad-leaved ironbark
E. intermedia R. T. Bak.	
E. maculata	Spotted gum
E. melanophloia (F. Muell.)	Silver-leaved ironbark
E. melliodora	Yellow box
E. microcarpa	Green-leaved box
E. microtheca F. Muell.	Coolibah
E. moluccana	Gum-topped box
E. normantonensis Maid.	Normanton box
E. oleosa F. Muell. ex Mia. var. *glauca* Maid.	
E. orgadophila Maid. et Blakely	Mountain coolibah
E. papuana F. Muell.	Cabbage gum, ghost gum, desert gum, carbeen
E. peltata Benth.	Yellowjack
E. phaeotricha	
E. polycarpa F. Muell.	Bloodwood, grey bloodwood, long-fruited bloodwood
E. populnea F. Muell.	Poplar box
E. propinqua	Grey gum
E. punctata	Grey gum
E. saligna	Sydney blue gum
E. setosa Schau.	Nutwood
E. similis Maid.	Yellowjack
E. tenuipes Blakely et C. T. White	Narrow-leaved mahogany
E. tereticornis Sm.	Blue gum, Queensland blue gum, forest red gum
E. terminalis F. Muell.	Bloodwood
E. tessellaris F. Muell.	Carbeen, Moreton Bay ash
E. thozetiana F. Muell. ex R. T. Bak.	Yapunyah, tapunyah
E. trachyphloia F. Muell.	Bloodwood
E. watsoniana	Yellowjack
Eulalia fulva (R. Br.) Kuntze	Brown-top grass
Evolvulus alsinoides (L.) L.	
Exocarpos sp.	
Fimbristylis sp.	
Flindersia australis	Crow's ash
F. dissosperma (F. Muell.) Domin	Leopardwood
F. maculosa	Leopardwood
Gahnia sp.	
Gastrolobium grandiflorum F. Muell.	Heart-leaf poison
Geijera parviflora Lindl.	Wilga
Glycine glacata Benth.	
G. tabacina	Pea glycine
Gomphrena celosioides	Gomphrena weed
Goodenia spp.	

Gossypium australe F. Muell.	
Grevillea decora Domin	
G. parallela Knight	Narrow-leaf beefwood, silver oak
G. striata R. Br.	Beefwood
Grewia retusa	Dysentery plant
Hakea leucoptera R. Br.	
H. lorea	Bootlace oak, needlewood
Hardenbergia sp.	
Heterodendrum diversifolium F. Muell.	Scrub boonaree, holly bush
H. oleifolium Desf.	Boonaree
Heteropogon contortus (L.) R. et S. ex Beaure.	Black or bunch spear grass
Hibbertia	Buttercup bush
H. stricta	Guinea flower
Hibiscus sturtii Hook.	
Hovea longifolia R. Br.	Purple bush pea, hovea
H. longipes Benth.	Purple bush pea, hovea
Imperata cylindrica	Blady grass
Indigofera australis	Australian indigo
Iseilema sp.	Flinders grasses
I. vaginiflorum	Flinders grass
Jacksonia ramosissima Benth.	
Jasminum lineare	Native jasmine
J. racemosum	Native jasmine
Juncus spp.	Rushes
Justicia procumbens L.	
Keraudrinia corollata (Steetz) Domin	
Kochia sp.	Cotton bush
Leptochloa sp.	
L. digitata	Cane grass
Leptospermum	Tea-tree
Livistona australis	Cabbage palm
Lomandra leucocephala (R. Br.) Ewart	Iron grass
Lysicarpus angustifolius (Gook.) Druce	Budgeroo
Maba geminata	Native ebony
Macropteranthes leichhardtii F. Muell.	Bonewood
Macrozamia moorei F. Muell.	Zamia
Malaisia scandens	Fire-vine
Mallotus claoxyloides	Stink bush
Malvastrum spicatum A. Gray	Malvastrum
Marsilea spp.	Nardoo
Maytenus cunninghamii (F. Muell.) Loes.	
Melaleuca argentea W. V. Fitzg.	
M. bracteata F. Muell.	River or white tea-tree
M. linariifolia Sm.	
M. nervosa (Lindl.) Cheel	
M. quinquenervia	
M. tamariscina Hook.	
M. uncinata R. Br.	
Micromyrtus sp.	
Mitrasacme spp.	

Muehlenbeckia cunninghamii	Lignum
Murraya ovatifoliolata (Engl.) Domin	
Myoporum deserti A. Cunn. ex Benth.	Ellangowan poison-bush
Neptunia gracilis Benth.	Native sensitive plant
Neurachne mitchelliana Nees	Mulga grass
Notelaea longifolia	Native olive
Olearia sp.	
Ophiuros exaltatus (L.) Kuntze	Cane grass
Opuntia tomentosa	Velvety tree pear
Osbornia octodonta	Mangrove
Owenia acidula	Emu apple, gruie
Panicum buncei	Panic
P. decompositum R. Br.	Barley grass
P. fulgidum	Panic
P. queenslandicum Domin	Yabila grass
Paspalidium caespitosum C. E. Hubb.	Brigalow grass
P. constrictum (Domin) C. E. Hubb.	Belah grass
P. globoideum (Domin) Hughes	Shot grass, sago grass
P. gracile	Belah grass
P. jubiflorum (Trin.) Hughes	Warrego summer grass
Patersonia sp.	Native iris
Perotis rara	Comet grass
Persoonia falcata R. Br.	
Petalostigma banksii Britten et S. Moore	
P. pubescens Domin	Quinine berry, quinine bush
Phebalium sp.	
Pimelea haematostachya	Pimelea poppy
Polycarpaea spp.	
Polymeria longifolia Lindl.	
Pomax sp.	
Portulaca filifolia F. Muell.	
P. oleracea L.	Pigweed
Prostanthera sp.	Mint bush
Ptilotus semilanatus	Prince of Wales feathers, fox bush
Rhagodia hastata	Berry saltbush
R. parabolica R. Br.	
Rhizophora stylosa	Red mangrove
Rhynchelytrum repens (Willd.) C. E. Hubb.	Red Natal grass
Rhynchosia minima (L.) DC.	
Ricinocarpos ledifolius F. Muell.	
R. pinifolius Desf.	Wedding bush
Salsola kali	Soft roly-poly
Santalum lanceolatum	
Sarcostemma australe	Caustic vine
Schizachyrium obliqueberbe	
Scleria novae-hollandiae Boeck.	
Sesbania sp.	Sesbania pea
Sexaria sp.	
Sida sp.	
Sorghum sp.	
Sporobolus caroli Mez	Fairy grass

S. elongatus R. Br.	Rat's-tail grass
S. mitchellii	Rat's-tail couch
S. scabridus S. T. Blake	Fairy grass
S. virginicus (L.) Kunth	Salt-water couch
Stipa verticillata	Bamboo spear grass
Terminalia oblongata F. Muell.	Yellow-wood
T. chillagoensis	
Thellungia advena Stapf.	Coolibah grass
Themeda australis (R. Br.) Stapf.	Kangaroo grass
Tieghemopanax elegans	Celery-top
Trema aspera	Poison peach, peach-leaf, poison bush
Trianthema triquetra Rottler ex Willd.	
Tribulus terrestris L.	Caltrop
Trichodesma zeylanicum (Burm. f.) R. Br.	
Triodia mitchellii Benth.	Spinifex
T. pungens R. Br.	Spinifex
Tripogon lolliiformis (F. Muell.) C. E. Hubb.	Minute grass
Tristania suaveolens	Swamp box, swamp mahogany
T. conferta	Brisbane box
Ventilago viminalis Hook.	Vine-tree, supple jack
Xanthorrhoea sp.	Grass-tree
Zornia spp.	