DEPT CONSERVATION AND LAND MANAGEMENT

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Assessment of the Conservation Significance of the Cane River Pastoral Lease

1. Background.

1.1 The 'IBRA' Report.

The development of a comprehensive representative conservation reserve system for Australia began in the mid 1980's, with the National Index of Ecosystems, providing a nationally accepted ecosystem classification. In 1989, this process was incorporated into the Environmental Resources Inforamtion Network, which lead to development of a national system of biogeographic regions.

Thackway and Cresswell (1995; An interim biogeographic regionalisation for Australia, IBRA), present the results of these studies, and develop a range of conservation planning attributes for assessing the conservation priorities for individual bioregions. These planning attributes included

- The reservation status of each IBRA region, as percentage area in reservation.
- The bias in comprehensiveness of existing reserved areas. High bias means that conservation reservation does not cover all sub-regions, or that many of the extensive ecosystems that characterise a region are excluded.
- Constraints and limitations to planning the nature reserve system.
- Opportunities for alternative conservation management measures, including land aquisition, voluntary agreements and planning options.
- Determining priorities for filling gaps in the nature reserve system

1.2 Results of the IBRA study relevant to the Pilbara.

The IBRA biogeographic region 'Pilbara' corresponds to Beard's (1975) Fortescue phytogeographic district. Of the 80 regions recognised throughout Australia, Pilbara is the fifteenth largest (179287 sq kms).

Between 1-5% of the Pilbara is currently within conservation reserve (reservation status Low to Moderate), with a high index of bias (few of the environments represented, or one or more important land systems not represented in current reservations). Dominant limiting factors for the Pilbara include extinction of critical weight range (CWR) mammals, fire, feral animals (fox and cat), weeds and grazing. Existing and potential alternative conservation measures identified are land purchase, voluntary agreements and planning instruments. The IBRA report notes that land

purchase is essential for aquisition of a comprehensive nature reserve system in the Pilbara.

Of Beard's (1975) physiographic units of the Pilbara region, Cane Rive falls on two which are currently entirely unrepresented in existing conservation reserves. The IBRA report notes that two of the four major components of the Pilbara bioregion are currently unrepresented in conservation reserves.

The IBRA report clearly identifies the Pilbara as an area requiring additional conservation estate, and where land aquisition through purchase is essential.

1.3 WA Pastoral Lands Review.

In 1990, CALM set up an internal task force to identify major gaps present in the existing and proposed conservation reserve system for the Murchison, Gascoyne, Pilbara, Carnarvon and Coolgardie bioregions of Thackway and Cresswell (1995). This task force evaluated the conservation reserve network within each bioregion, and proposed areas of high conservation value as potential additions to the reserve network.

The lack of broad scale data on species distribution across most of the pastoral regions of WA presented a major obstacle to this process. However, good information on surficial geology (1: 250 000), vegetation (1:1 000 000) and climate is available. As patterns of species distribution are known to closely correlate with surface geology and landform, geological mapping was used as the basis for this review. The task force then determined which major stratigraphic units were represented within existing conservation estate, and which were not. Prospective additions to the reserve network were identified by the distribution of significant surface geological units not represented within existing or proposed conservation estate.

The task force found that many major ecosystem types in the pastoral regions are represented only on pastoral leases. Consequently, a number of areas on pastoral lands were identified as targets for aquisition should they become available, provided thay are in good condition. These were in addition to those areas identified by the Conservation Through Reserves Committee (EPA 1975).

On the basis of surficial geology, part of the Cane River pastoral lease was identified by the task force as a target for aquisition as a conservation reserve (Figure 1). This recommedation targetted the southern portion of the lease (part of the old Range pastoral lease).

Figure 1. Location of Cane River pastoral lease. The shaded southern portion of the lease is the area identified by CALM's task force as a valuable potential addition to the conservation estate, on the basis of the distribution of surface geological units.

3. Biological Resources of the Cane River Pastoral Lease.

Cane River station was visited on two occasions (25 - 26 October, and 1 November 1995). This report is a compilation of field observations and syntheses of a number of published sources.

3.1 Surface Geology.

This description is derived from maps and explanatory notes of the 1:250,000 Geological Series (van de Graaff *et al.* 1980, Seymore *et al.* 1988 and Williams *et al.* 1972).

Two major groups dominate the eastern part of Cane River, approximately defined to the west by the North West Coastal Highway (NWC Hwy). The Ashburton Group is an extensive group comprising mud-stones and sandstones with minor exposures of volcanics and banded iron formation. Exposures of Ashburton Formation, Robe Pisolite and Wongida Dolomite are surrounded by extensive unconsolidated colluviums, from fine silts through sands to gravels. The Robe Pisolite follows ancient river valleys across the southern and eastern part of the lease. Small occurrences of Nanutarra Formation conglomerates occur in the north.

Overlying the Ashburton Group in the north western part of Cane River (but to the east of the NWC Hwy) is the Mount Minnie Group, which includes Mount Minnie, surrounding hills and the Parry Range. These rugged hills are mainly silicified sand stones (Warramboo and Brodage Sandstones) and conglomerates, and minor exposures of silicified mudstones. Lying around the base of these hills, particularly the Parry Range, are a number of tall sand-ridges, up to 4 km long. Although a minor unit, these sand ridges are the most easterly of their type in this area and are clearly very different biologically from the surrounding rocky hills and colluvial slopes and plains.

To the west of the NWC Hwy, exposures of lower Proterozoic basement formations form a complex mosaic. These include gneiss, granitic gneiss, quartz-feldspar gneiss and porphyritic adamellites. Nanutarra Formation conglomerates outcrop throughout this half of the lease, with some laterite exposures in the north west.

Calcretes formations are extensive across this part of the lease. Valley floors are largely filled with Quaternary unconsolidated colluviums, from fine silts through sands to gravels. In some areas, particularly along minor creeks and washes, there are extensive sandy areas.

Two mines are located in the western part of the Cane River lease. The Turtle Mine produced copper, and the Range Mine produced lead. These mines are still subject to occasional exploration, but production was historically low (van de Graaff *et al.* 1980).

3.1.2 Regional context.

None of the geological structures occurring within the Cane River lease are represented within any of the conservation estate of the Pilbara. With the exception of minor exposures of granites within the MCNP, none of the basement formations are represented in conservation estate elsewhere. Consequently, the colluvial and alluvial units derived from the proterozoic units are distict also.

3.2 Soils.

3.2.1 Description.

Bettenay *et al.* (1967) provides a soils map of the Pilbara at 1:2 000 000. At this scale, much detail is missing. However, broad patterns are discernable.

The eastern and central portions of the Cane River lease are primarily alkaline hard setting loamy soils with red clayey subsoils (duplex soils). These are primarily plains, or areas of low hills with shallow and stoney soils. These soils include area of calcrete.

Non-coherant red sandy soils (with uniform profiles) occur around the bases of, and within valleys adjacent to, ranges of sandstone, dolomite and conglomerate. In the west of the lease, gravelly surfaced neutral red earths with gradational profiles are widespread.

Localised areas of sand ridges occur int he vicinity of the Mount Minnie Group sandstones, and in the extreme western parts of the lease. Dunes are up to approximately 15 metres in height. Sand plains and sand sheets also occur in in shallow drainage washes in the west.

3.2.1 Regional context.

Hard setting duplex soils do occur within the MCNP (along a relatively small area of the Fortescue River valley) and Collier Range National Park. However, although within a similar soil class a those occurring within the Cane River lease, they are distinct. These soils do not occur within KNP. Otherwise, the soil types on the Cane River lease are not represented within existing conservation estate. The extensive red dune fields and sand plains of the Collier Range National Park are geologically and biologically distinct from these coastal features, lying some 500 km south east.

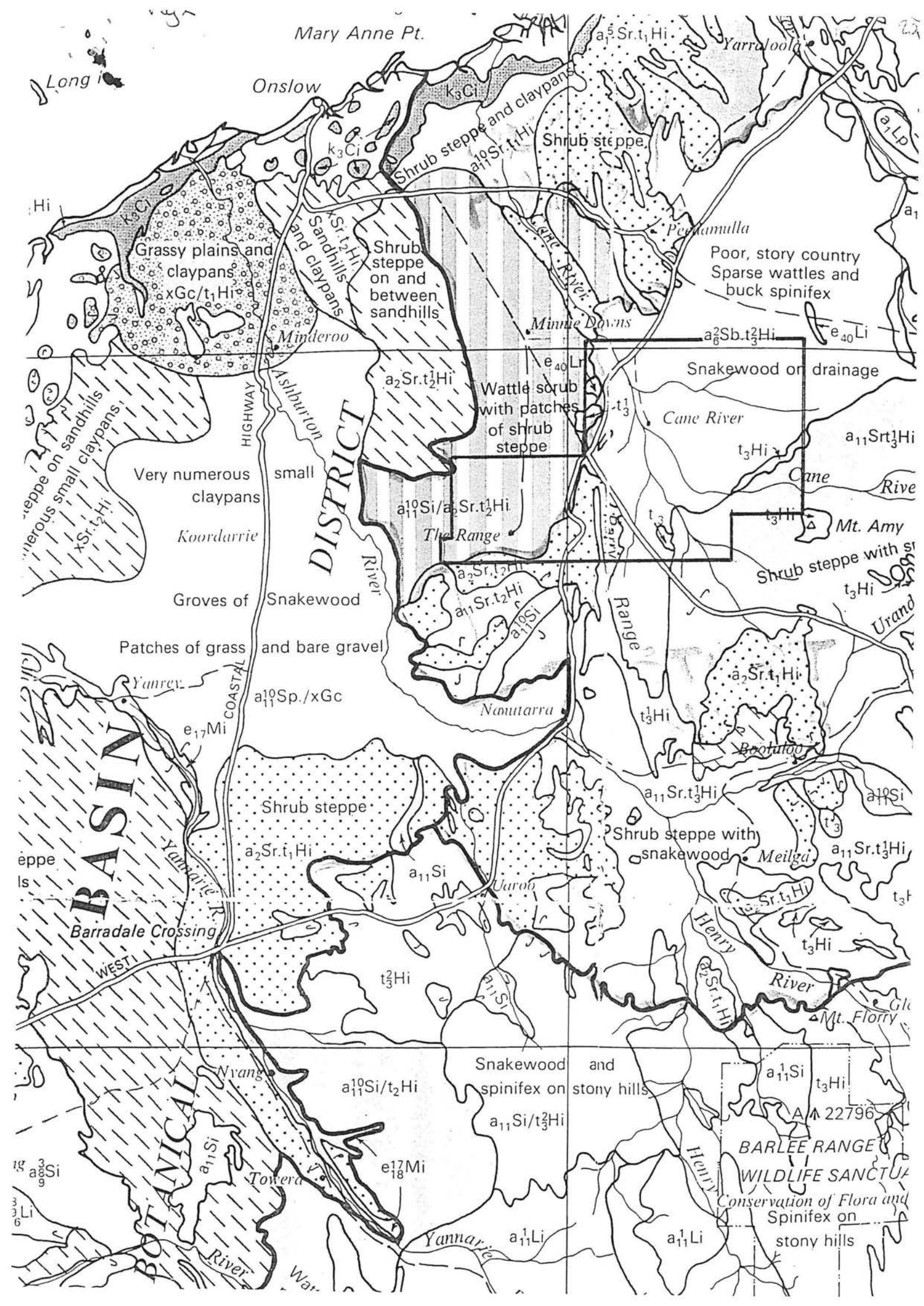
3.3 Vegetation.

3.3.1 Description.

Beard (1975) mapped major vegetation units of the Pilbara at 1:1,000,000.

Cane River lies across the southern junction of the 'Stuart Hills' and 'Onslow Coastal Plain' physiographic sub-units of the Fortescue Botanical District (corresponding to the IBRA Pilbara bioregion). These units are the western-most within the Fortescue District. They show distinct surface geology, with Quaternary alluviums over lower Proterozoic basement rocks (granites) being dominant in the Onslow Coastal Plains, while Stuart Hills has a more complex mix of Lower Proterozoic shales, greywackes and dolomites, granite outcrops and sandstone ranges (Figure 2). Cane River station lies very close to the boundary between Beard's 'Fortescue' and 'Carnarvon' phytogeographic districts.

Figure 2. Distribution of the Onslow Plains and Stuart Hills physiographic units of Beard's (1975) 'Fortescue' phytogeographic district. This district corresponds to the 'Pilbara' biogeographic region of the IBRA report (Thackway and Cresswell 1995).


Mary Anne Pt.
Long I.
Onslow
Yarraloola
Shrub steppe and claypans
Shrub steppe
Grassy plains and claypans
xGc/t1Hi
Sandhills and claypans
Shrub steppe on and between sandhills
Peedamulla
Poor, story country
Sparse wattles and buck spinifex
Minderoo
Minnie Downs
Snakewood on drainage
Wattle scrub with patches of shrub steppe
Cane River
Very numerous small claypans
Koordarrie
DISTRICT
HIGHWAY
Ashburton
Groves of Snakewood
Patches of grass and bare gravel
Yanrey
COASTAL
BASIN
Shrub steppe
Yannarie R.
Barradale Crossing
WEST
Nanutarra
Range
River
Meilga
Shrub steppe with snakewood
Henry River
Mt. Amy
Mt. Florry
Uaroo
Nyang
Towera
Yannarie River
BOTANICAL
Snakewood and spinifex on stony hills
BARLEE RANGE
WILDLIFE SANCTUA
Conservation of Flora and
Spinifex on stony hills

Most of Cane River is vegetated by *Acacia* shrublands or shrub steppes, over *Triodia* hummock grasslands. Vegetation units present on the eastern portion of Cane River (the Stuart Hills units) are dominated by shrub steppes of *Acacia pyrifolia / A. bivenosa* over either *Triodia basedowii / T. wiseana* hummock grasslands, with snakewood *A. xiphophylla* occurring in drainage lines, and *Acacia* shrublands of *A. xiphophylla* over *Triodia pungens / T. wiseana* hummock grasslands. Some mulga (*Acacia anuera*) occurs along drainage in the eastern parts of the lease. To the west (the Onslow Plains) lie mosaic units of shrub savanna and shrub steppe, consisting of *A. victoriae / A. xiphophylla* or *A. pyrifolia* over *Triodia pungens* or *T. basedowii* hummock grasslands.

Major drainage lines contain *Eucalyptus camaldulensis* and *Acacia citrinoviridis.* Occasional permanent waters support *Melaleuca argentia. Eucalyptus deserticola* and *E. hamersleyana* (bloodwoods) are found on the floodplains and drainage lines throughout the area. Beard (1975) also maps an area of *Eucalyptus aspera* close to the course of the Cane River.

3.3.2 Regional context.

Shrub steppes similar to those on Cane River are present within Millstream-Chichester National Park (MCNP) and Karijini National Park (KNP). However, no areas within the current conservation estate within the Pilbara contains these units on Quaternary alluvials, sandstones or Proterozoic units present in the Cane River area. The shrub steppes of MCNP grow in the Fortescue valley, while those of KNP lie on the banded ironstone hills and colluvial slopes of the Hamersley Ranges.

4. Condition of the lease.

Cane River is in good pastoral condition, primarily due to the low stocking rates imposed in recent years. The lease has only ever run sheep, and improvements are suitable for sheep only. Localised impacts of sheep around water points can be severe, and the wind mills and some pools on Cane River are no exception. However, most of the gazed areas are *Acacia* shrublands over *Triodia* hummock grass lands. These areas appear to be in very good condition.

4.1 Boundary fencing.

Boundary fences are in reasonable condition, although some internal fences not required for stock management are in disrepair. The current management boundaries on the southern side conform to fenced alignments which do not follow the cadastral boundaries of the lease (Figure 3). By arrangement with the lessee of Nanutarra station, the accepted management boundary of Cane River is to the south of the cadastral boundary to the east of the NWC Hwy, and north of the boundary to the west of the NWC Hwy. Rationalisation of this boundary would require approximately 45 kilometres of fence construction. This is easy country to fence, with few odstacles and generally soft ground. However, this fence would need to cross the NWC Hwy.

Figure 3. Alingment of cadastral and present management boundaries used between the Cane River and Nanutarra pastoral leases. The black line indicates the cadastral boundar of the stations. This is currently undefined. The red line indicates the fenced lines used to define the boundaries between the stations.

4.2 Feral animals.

Feral animals present on the Cane River lease appear to be limited to foxes and cats (in low numbers), and perhaps mice and rats. No declared species are present on the lease, and very little dingo baiting is undertaken. Boundary fences are in good enough condition to prevent stock or declared animals from entering from adjacent lands.

4.3 Weeds.

No declared weed infestations are present on the lease. Buffel grass (*Cenchrus ciliaris*) is present along the Cane River and Paradise Creek systems, but is heavily established in only small areas of suitable country on both these drainage systems. Low stocking rates in recent years have resulted in perennial grasses building up heavily in the upper reaches of the Paradise Creek. However, it appears that much of the length of these streams is unsuitable to buffel grass, probably due to their relatively deeply incised channel mortphology.

4.4 Erosion.

Very little erosion was apparent during our visits. Even around wind mills there was little evidence of erosion apart from minor areas of sheet erosion due to the high level of stock disturbance around the watering point. Much of the lease has a very low topography, and all wind mills are located on flats. Minor gully erosion was apparent along the northern boundary fence, where the fence line track has eroded. Old tracks in the vicinity of the Cane River (to the west of NWC Hwy) had also gullied, some quite severely. These will stabilise in time, once vegetation re-established on the disturbed areas (this is already beginning). The problem on the boundary track would be solved by minor re-alignment of the track and appropriate minor earth works (drains).

4.5 Surface waters.

With the exception of Cattle Pool, on the lower reaches of the Cane River, there are no permanent natural waters on the lease. Ephemeral pools lie along the course of the Cane River (some of which may last for maonths after rain), but all other water is from wells or bores. The control of stock and feral animals would therefore be simple. Most windmills discharge into small 'turkey-nest' dams, and few tanks are servicable.

REFERENCES.

Beard, J. S. 1975. Vegetation Survey of Western Australia. Pilbara. 1:1 000 000 Vegetation series. Explanatory notes to Sheet 5. The Vegetation of the Pilbara Area. University of Western Australia Press, Perth, Western Australia.

Bettenay, E., Churchward, H. M., McArthur, W. M. and Northcote, K. H. 1967. Atlas of Australian Soils. Explanatory data for Sheet 6, Meekatharra - Hamersley Range area. Commonwealth Scientific and Industrial Research Organisation, and Melbourne University Press. Cambridge University Press, London and New York.

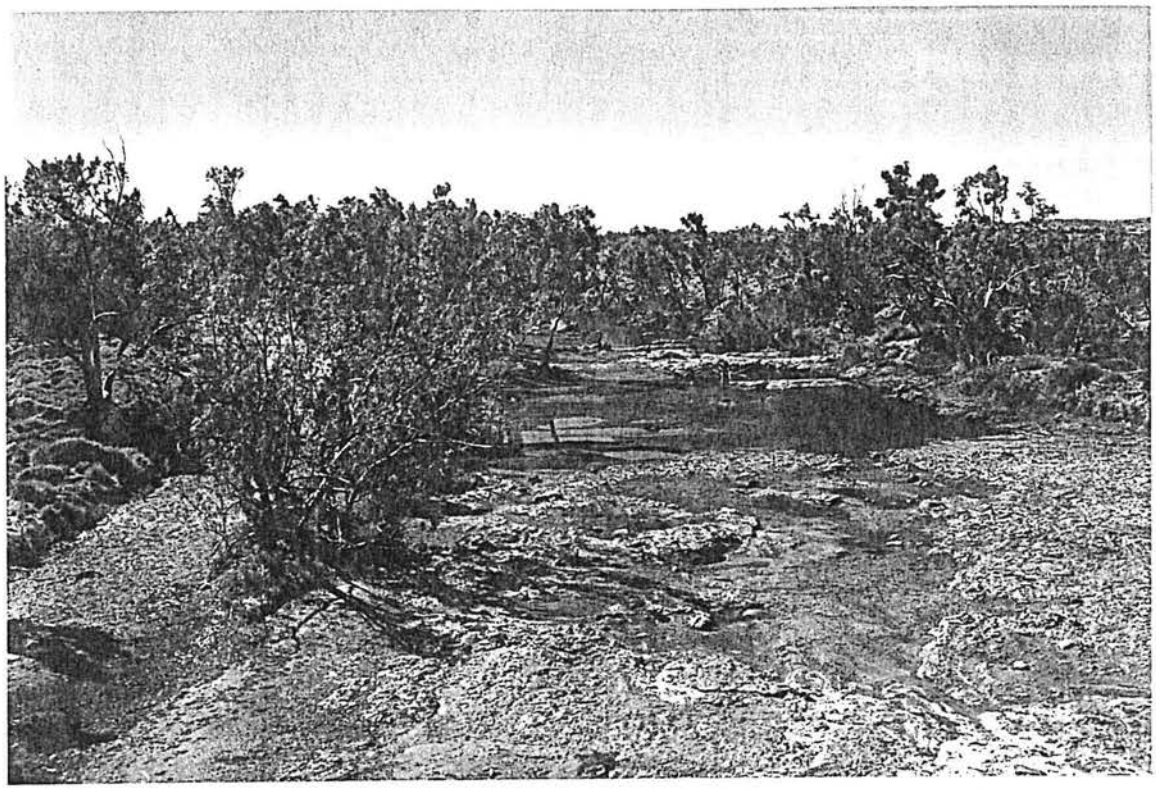
EPA. 1975. Conservation reserves for Western Australia. Systems 4, 8, 9, 10, 11, 12. Department of Conservation and Environment, Perth, Western Australia.

Seymore, D. B., Thorne, A. M. and Blight, D. F. 1988. Wyloo, Western Australia, Second Edition. Geological Survey of Western Australia, 1:250 000 Geological Series - Map Sheet SF 50-10 and Explanatory Notes. Geological Survey, Department of Mines, Perth, WA.

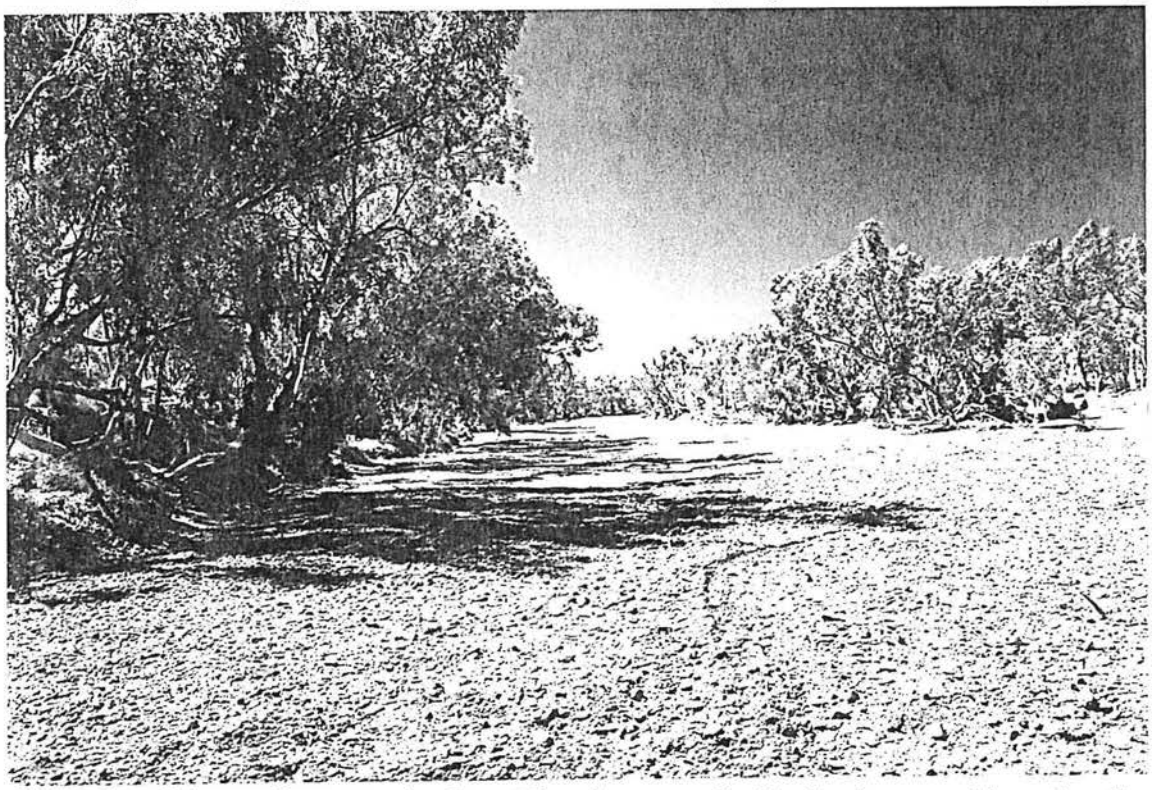
Thackway, R. and Cresswell, I. D. (Eds). 1995. An interim biogeographic regionalisation for Australia: A framework for setting priorities in the national reserve system cooperative program. Version 4.0. Australian Nature Conservation Agency, Canberra.

van de Graaff,W. J. E., Denman, P. D., Hocking, R. M. and Baxter, J. L. 1980. Yanrey - Ningaloo, Western Australia. Geological Survey of Western Australia, 1:250 000 Geological Series - Map Sheet SF 49-12, SF 50-9, and Explanatory Notes. Geological Survey, Department of Mines, Perth, WA.

Williams, I. R., Ryan, G. R. and Halligan, R. 1972. Yarraloola, Western Australia. Geological Survey of Western Australia, 1:250 000 Geological Series - Map Sheet SF 50-6. No explanatory notes. Bureau of Mineral Resources, Canberra, ACT, Australia.

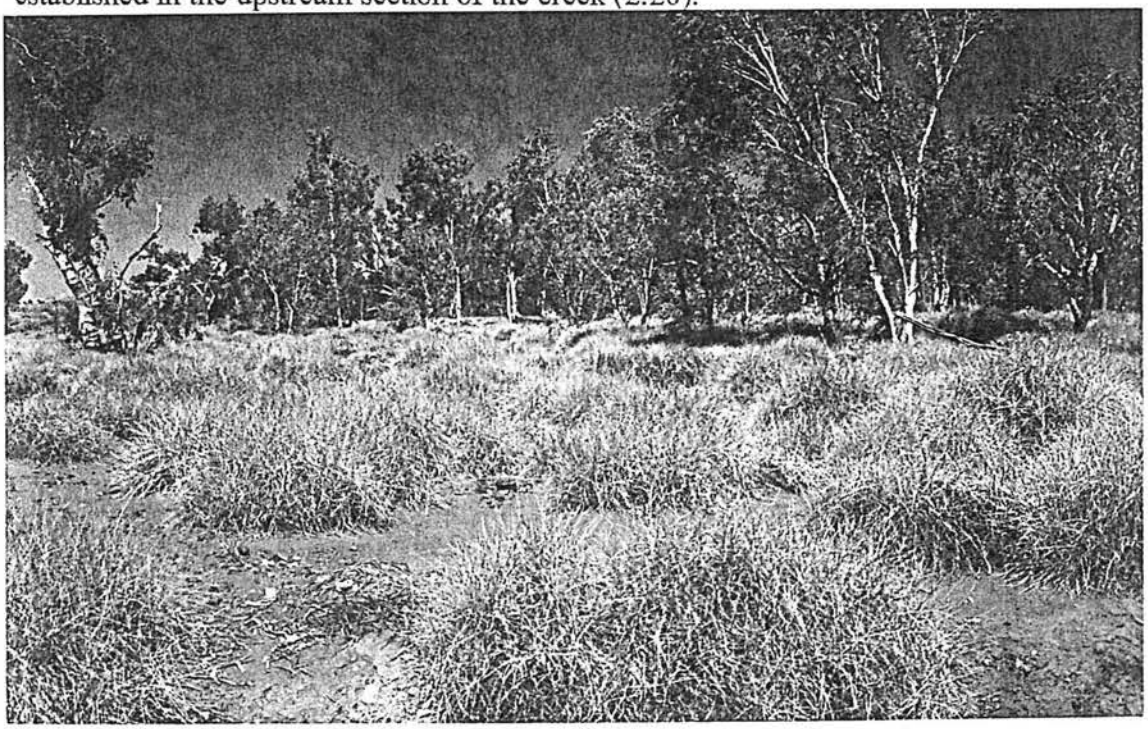


1. Cane River crossing of the North West Coastal Highway, from the traffic bridge, looking east. The pools in the river bed are not permanent, but persist for months following rain. *Eucalyptus camaldulensis* and *Triodia pungens* line the banks. (1.4)



2. Cane River, adjacent to the Cane River homestead. The banks are stable and well vegetated, with very little Buffel grass (2.18).

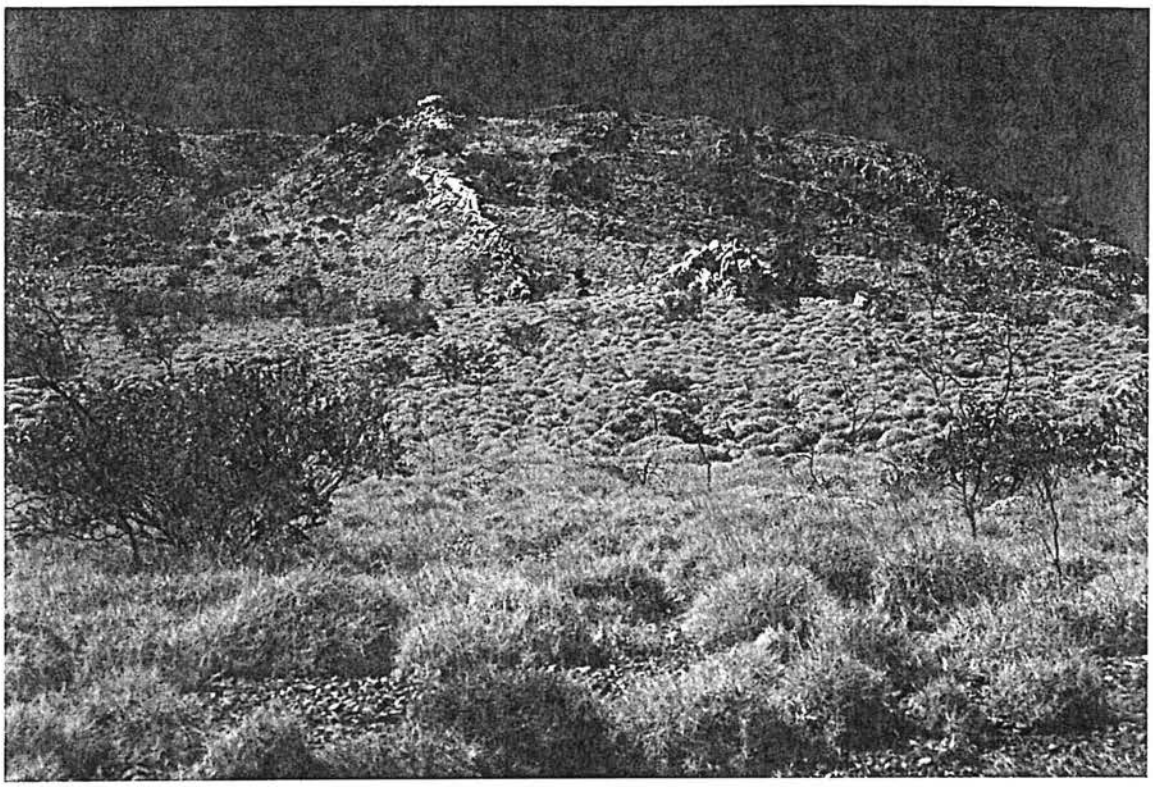
3. Paradise Creek, approx 3 km north of the homestead. As for the Cane River (previous photograph). Further upstream, the profile of this creek flattens out and is heavily and continuously vegetated with *Eucalyptus* and *Acacia*. Buffel grass has established in the upstream section of the creek (2.20).



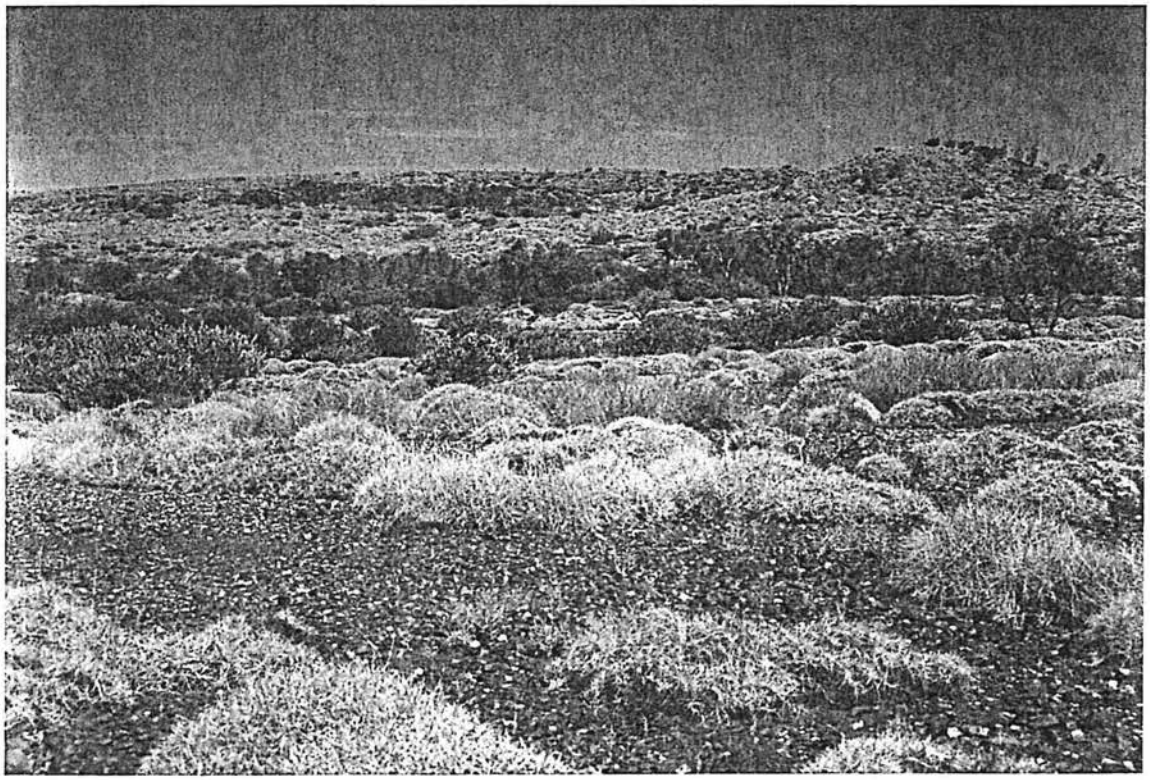
4. Banks of Paradise Creek, adjacent to where Photograph 3 was taken. Banks are well vegetated and stable, and little Buffel grass is apparent. (2.21).

5. Semi-permanent pool adjacent to Cattle Pool, on the Cane River, near the Peedamulla boundary. (3.9).

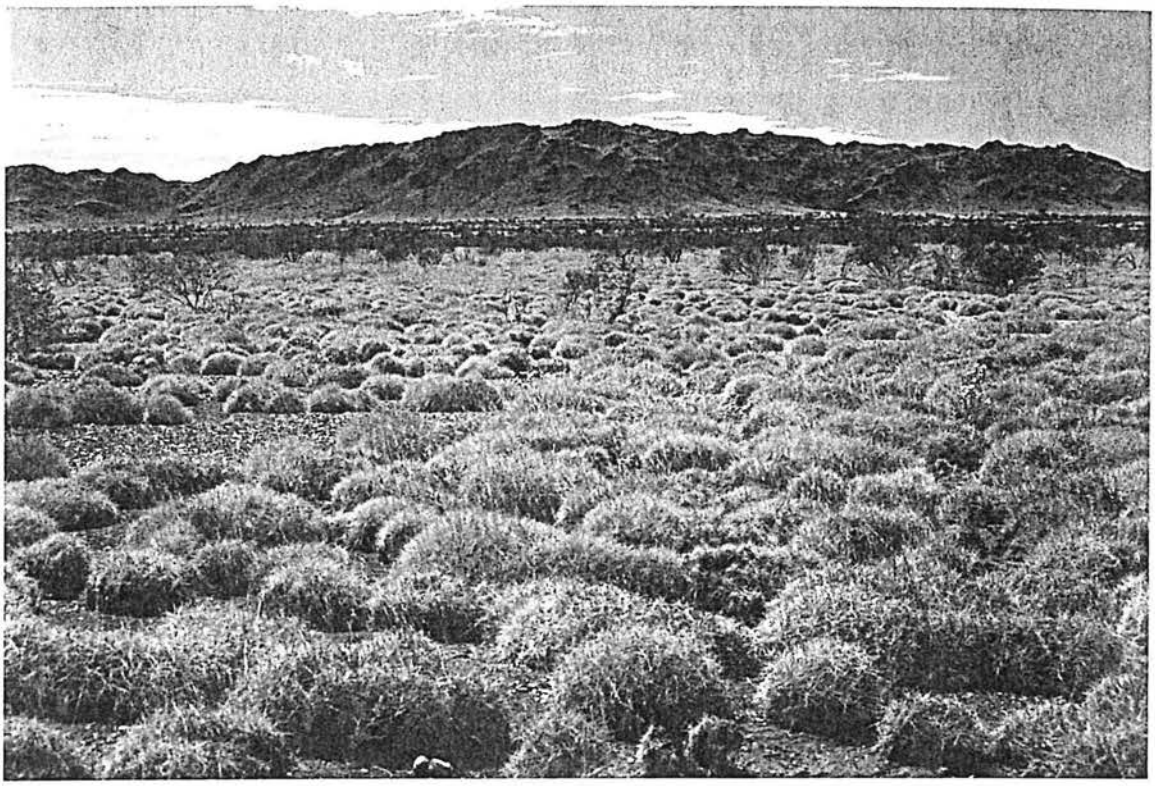
6. Cattle Pool, a permanent pool lying on the Cane River near the Peedamulla boundary. The banks of the pool are almost completely low cliffs of exposed Nanutarra formation. Large cajeputs (*Melaleuca argentia*) grow on this pool. (3.8).



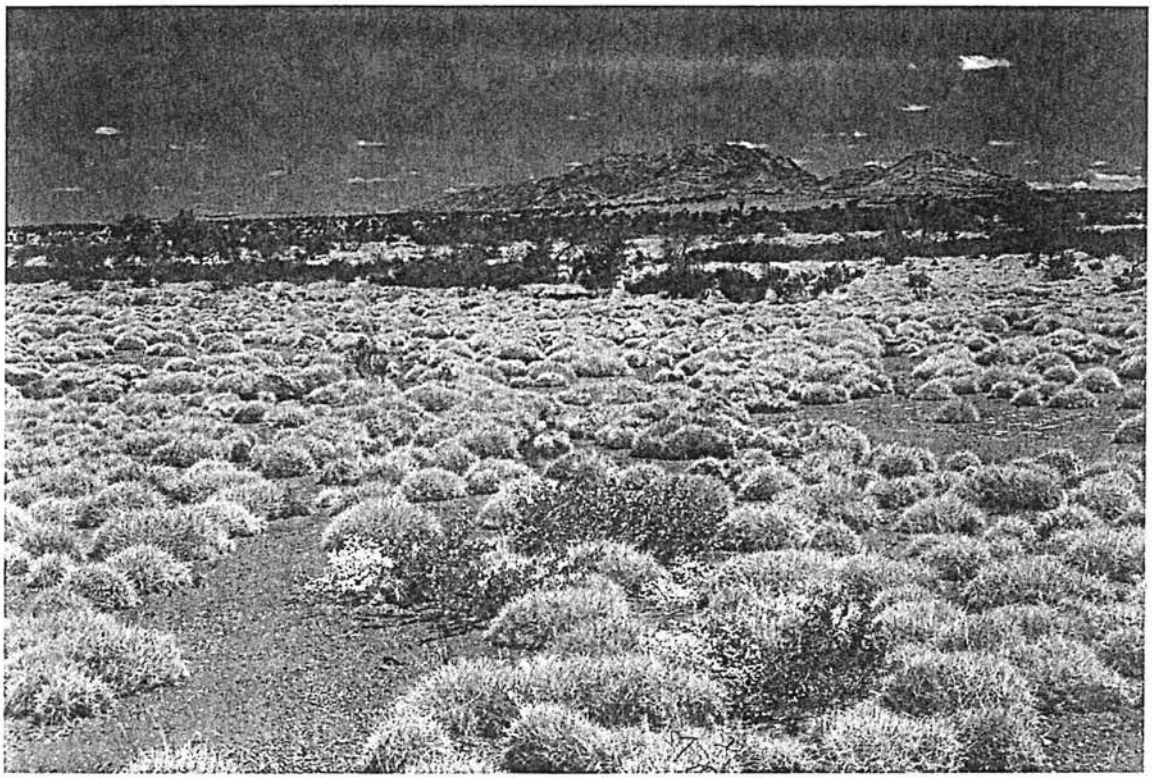
7. Brodage sandstone hills near the Onslow turnoff, from North West Coastal Highway. This rugged totpography is typical of the Mount Minnie group hills outcropping along the NWC Hwy. (1.6).



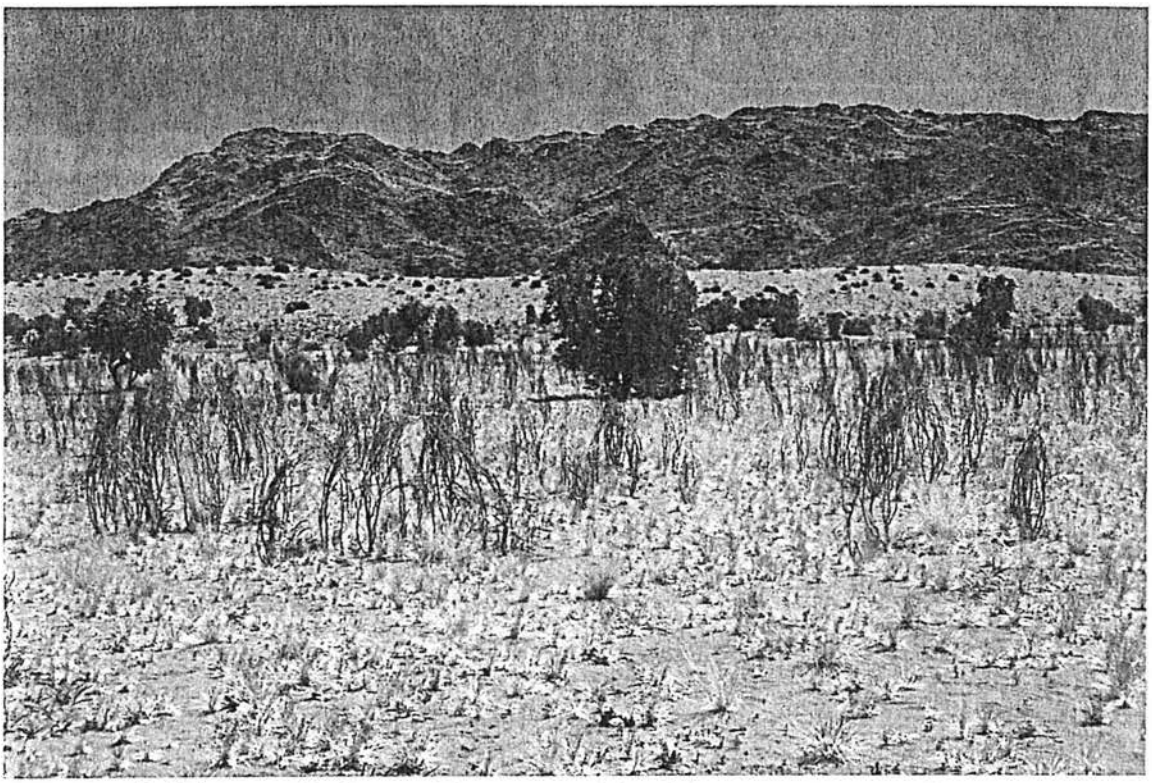
8. Hills of Warramboo sandstone, outcropping on the homestead entry road. (2.22).



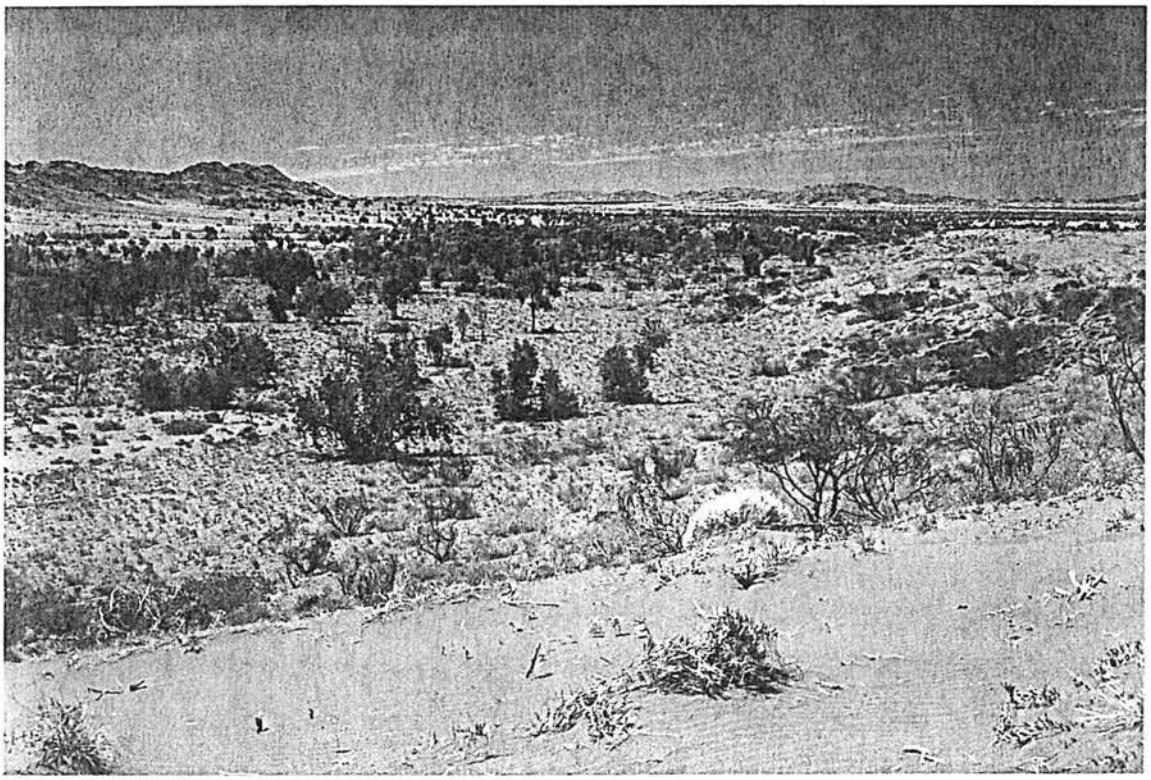
9. Parry Range, lokking east from North West Coastal Highway. Rugged hills of Brodage and Warramboo sandstone, rising above unsorted colluvial plains. (1.12).



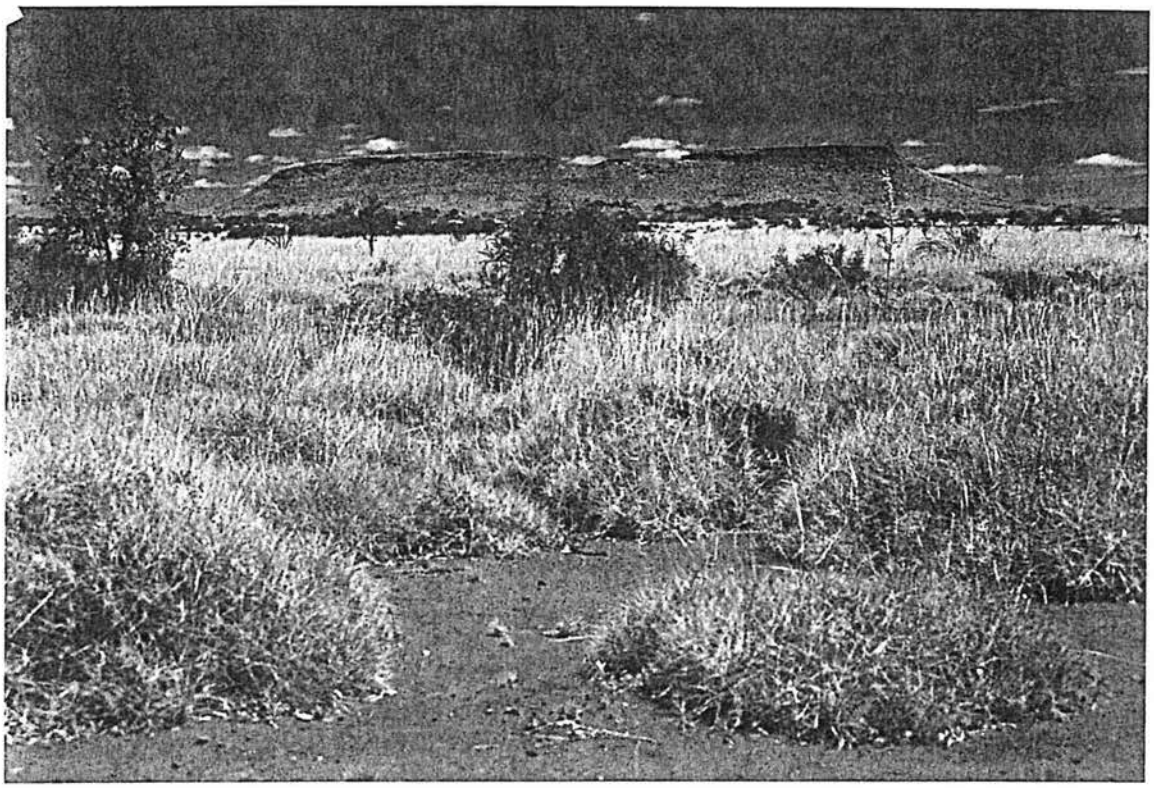
10. Parry Range, looking south from the Onslow turn-off, with associated sand ridges visible at the base of the hills. The ranges and sand hills are surrounded by extensive colluvail plains. (2.5).



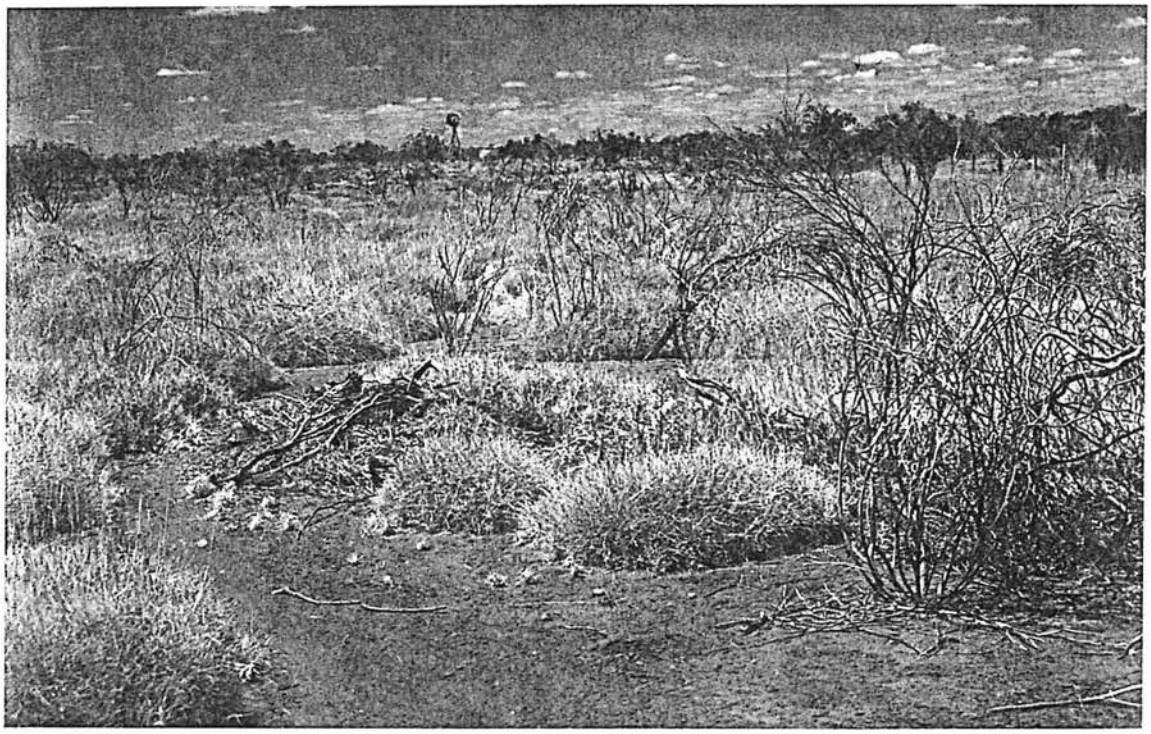
11. Sand hill lying at the base of the eastern side of the Parry Range, adjacent to the Warramboo sandstone unit. The sand hill is about between 10 - 15 m tall. (2.7).



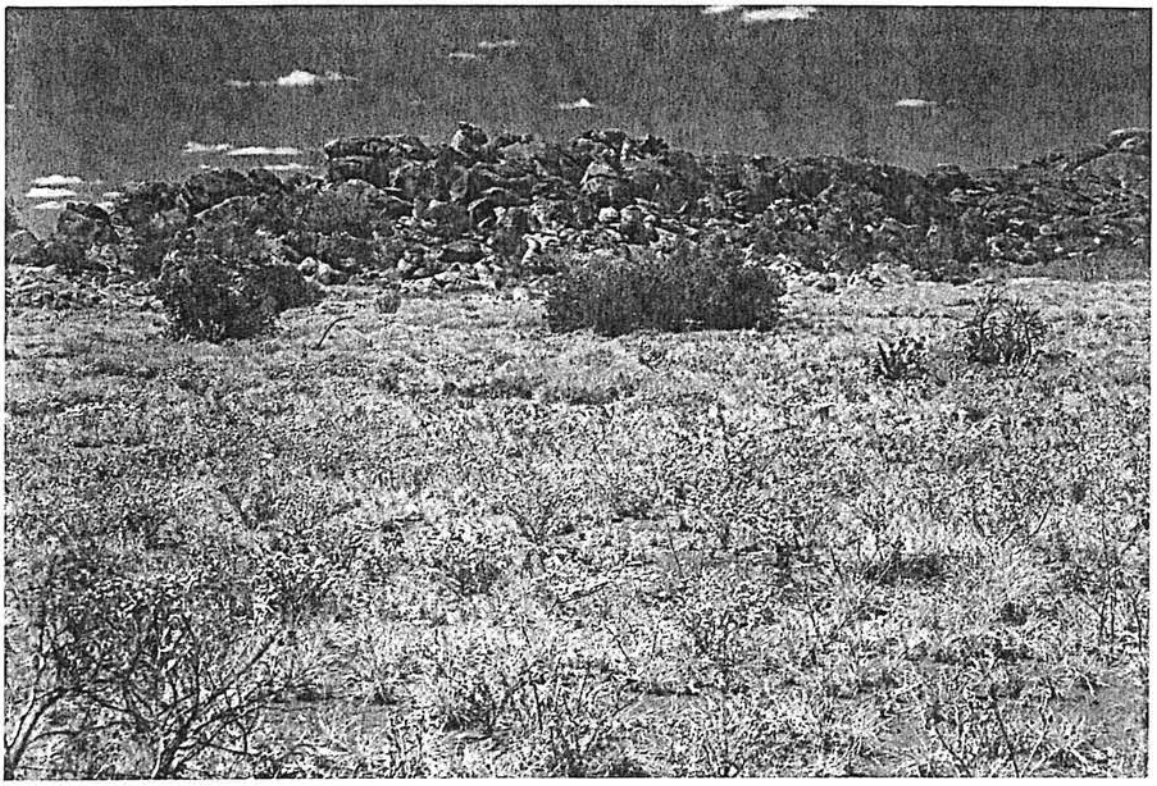
12. Sandplain 'swale' lying between the Parry Range and the sand ridges lying along the eastern side of the range. Looking northward, toward Mount Minnie. (2.11).



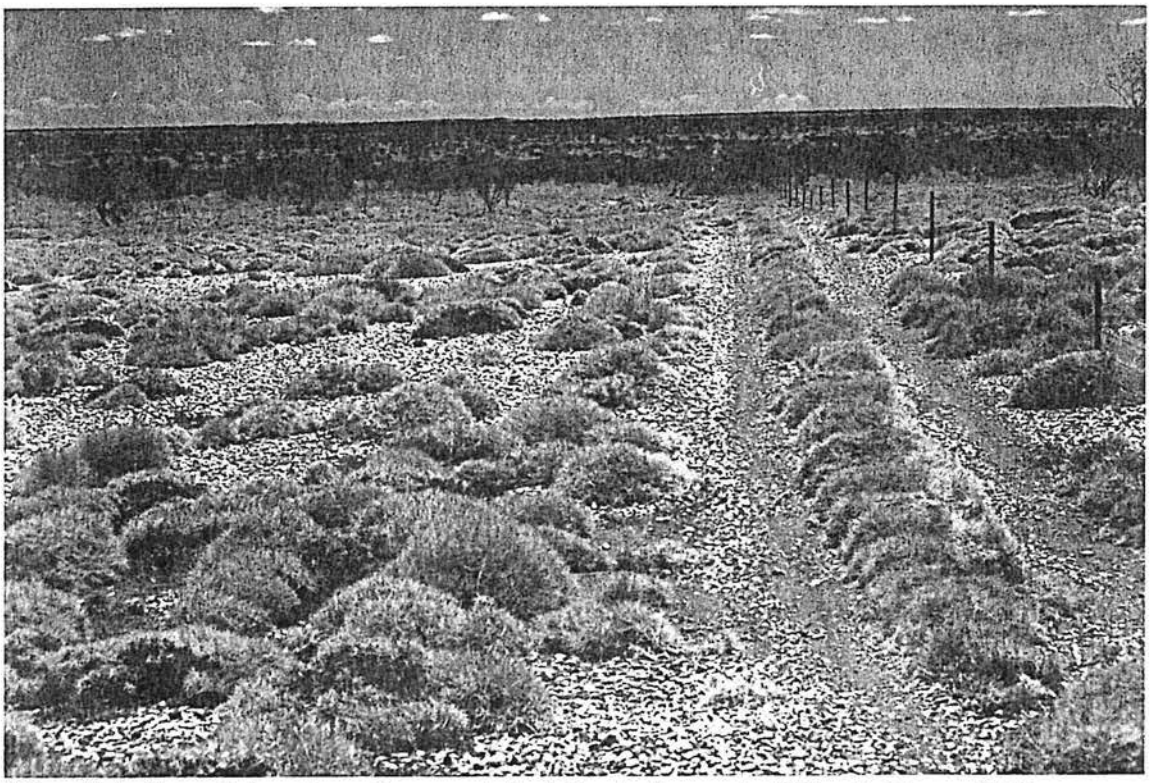
13. Hills of Nanutarra formation sandstones, to the south of Flat Top Bore. These hills rise above unsorted colluvial plains. (1.15).



14. Cork Tree Well, in the south western part of Cane River station. Typical of watering points on the station, it is situated on a flat plain, near minor drainage washes. Stock have had majo impacts for a small area (several hectares) around the mill, but otherwise the condition of the surrounding country is good. (1.16).

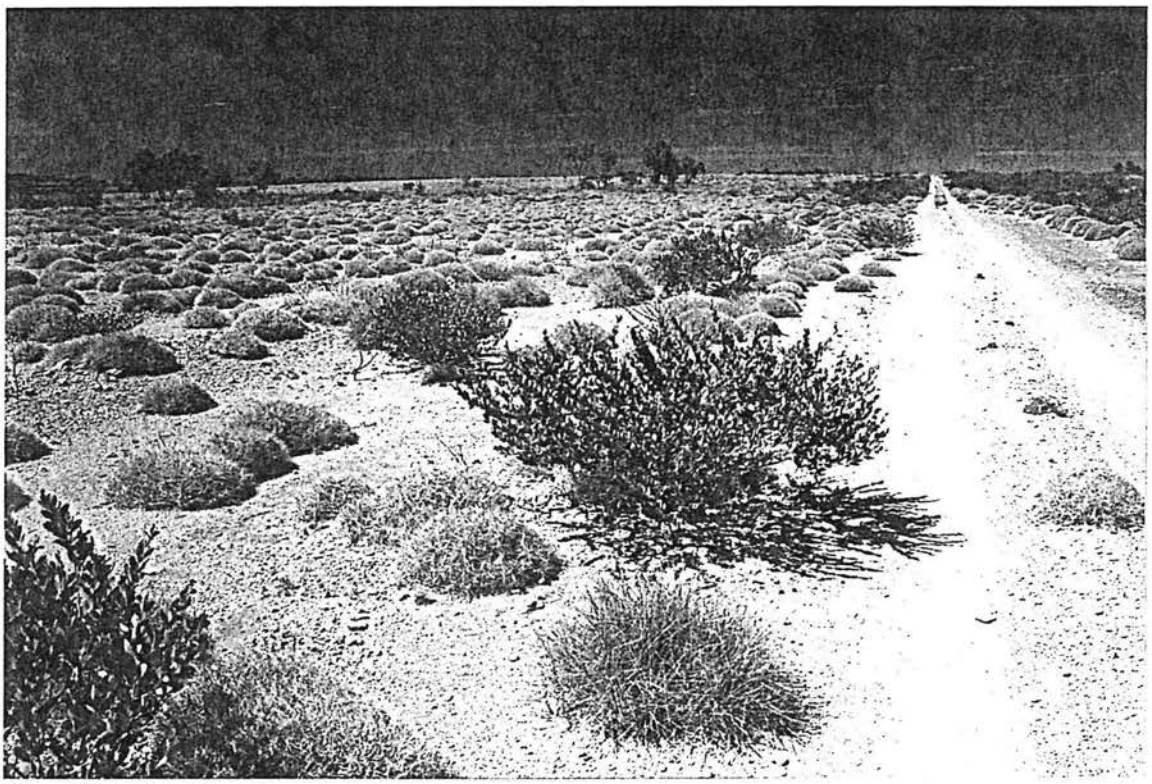


15. Granite outcrop, west of Cork Tree Bore. A number of these features occur in the south western part of the lease, although several are just outside the currently recognised management boundary of the station. (1.19).

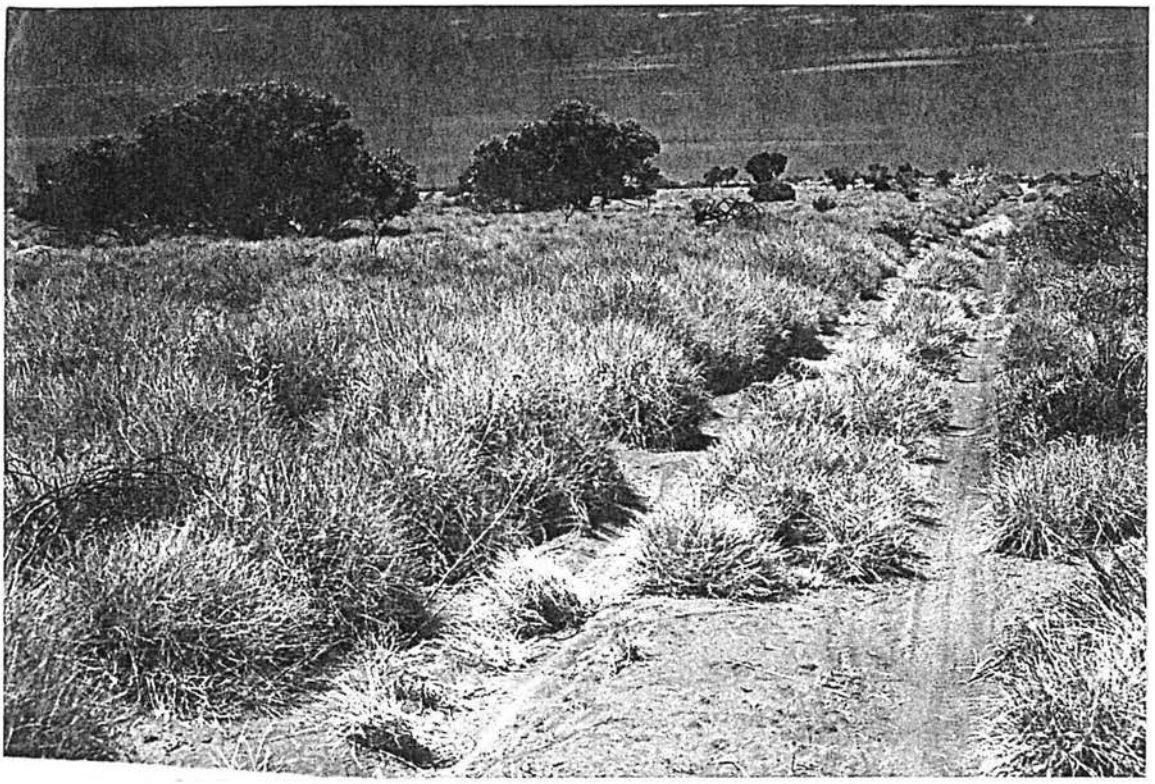


16. *Triodia* and *Acacia* on low quartzite hills, to the west of Quartz Bore. (2.1)

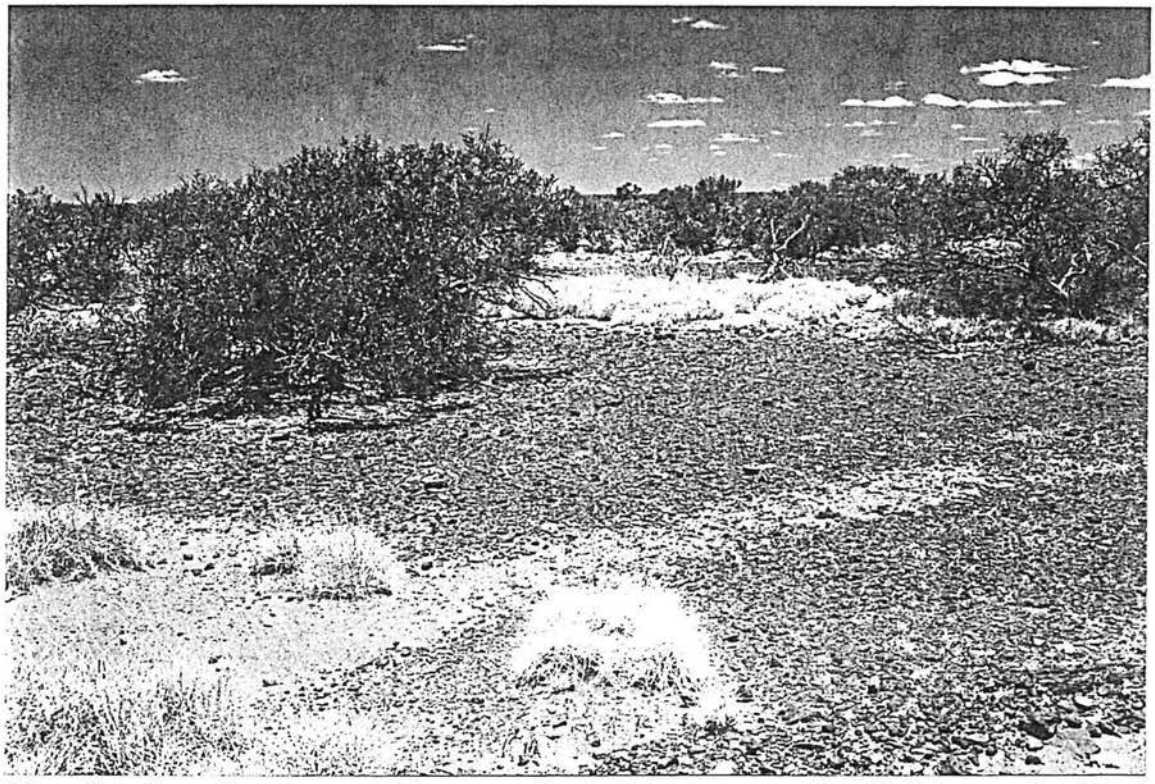
17. *Triodia* and *Acacia* on low, dark gravelly hills, adjacent to North West Coastal Highway, near the Cane River turn-off. (3.1).



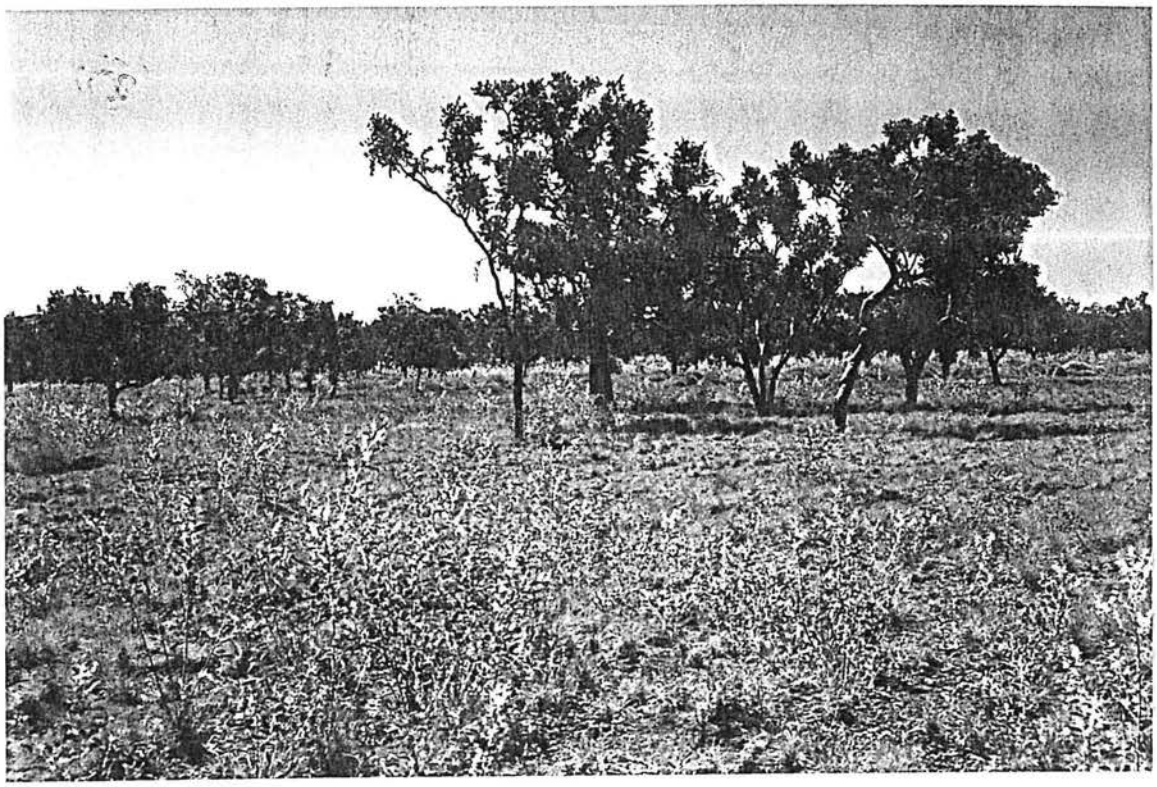
18. *Triodia, Eucalyptus* and *Acacia* on calcrete plains, to the south of the Cane River Homestead. (2.16).



19. *Triodia* and snakewood (*Acacia xiphophylla*) on sandy plains over calcrete, near Wanrey Bore, south of the Cane River homestead. (2.14).



20. *Triodia* and snakewood (*Acacia xiphophylla*) on stony colluvial plains, north of Cork Tree Bore, along the North West Shelf Gas Pipeline. (1.25).

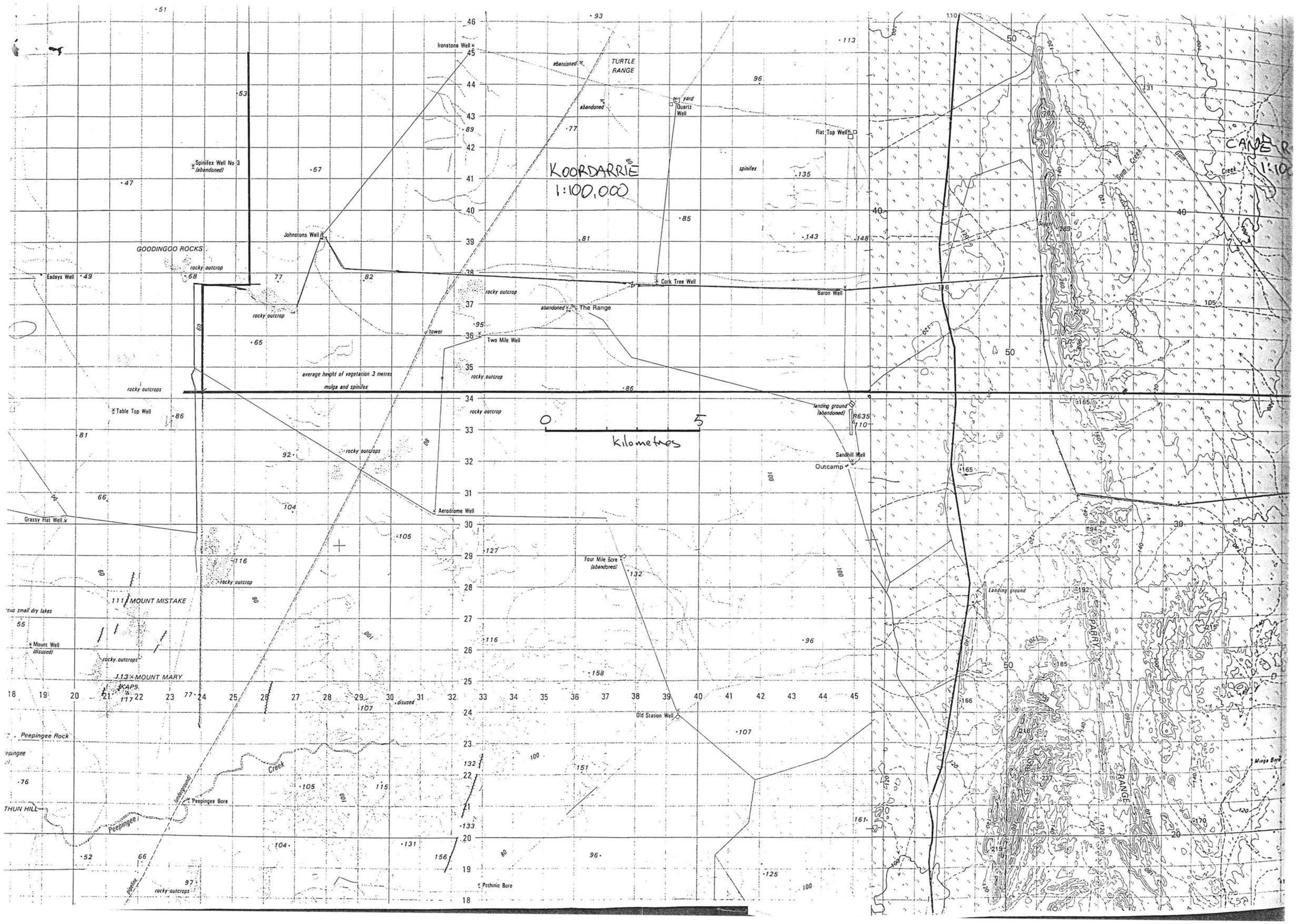


21. *Eucalyptus deserticola* over *Triodia*, on the flood-out of the Cane River, south of Cane River homestead. (2.17).

22. Minor gully erosion along the northern boundary fenceline, east of Cattle Pool. Vegetation has begun to stabilise the area. (3.3).

CANE RIVER
1:100,000

Flat Top Well
Baron Well
Sandhill Well
Outcamp
Landing ground (abandoned)
Landing ground
Gum Creek
Paris Hills Bore
Davis Crk B
Deep Corner Bore
Mount Amy Bore
Minga Bore
Deep Bore
Snake Well
Timbuck Well
PARRY RANGE


KOORDARRIE
1:100,000
0 5
kilometres
CANE R
1:10
TURTLE RANGE
GOODINGOO ROCKS
Ironstone Well
Spinifex Well No 3 (abandoned)
Johnstons Well
Eadeys Well
Cork Tree Well
Baron Well
Quartz Well
yard
Flat Top Well
The Range
Two Mile Well
tower
rocky outcrop
rocky outcrops
average height of vegetation 3 metres
mulga and spinifex
Table Top Well
landing ground (abandoned)
R635
Sandhill Well
Outcamp
Aerodrome Well
Grassy Flat Well
Four Mile Bore (abandoned)
MOUNT MISTAKE
Mount Well (disused)
MOUNT MARY
KAP9
Old Station Well
Peepingee Rock
Peepingee Bore
Peepingee Creek
pipeline (underground)
THUN HILL
Pethinic Bore
Landing ground
PARRY RANGE
Gum Creek
Creek
abandoned
spinifex
disused
Mulga Bore

: 1 000 000

Fig 1

24

Gascoyne

ONSLOW 12 km

ROEBOURNE 201 km

114°

115°

116°

117°

TROPIC OF CAPRICORN 23°26'30"