1 chain = 20.117 m
1 link = 0.20117 m

CHARLEVILLE PASTORAL LABORATORY

CLE P2 WR SUCCESSION AND SEASONAL DEFOLIATION OF SOME NATIVE PASTURE COMMUNITIES (SOUTH WEST QUEENSLAND)

PROGRESS REPORT 1964-1985

Preamble

There is ample literature detailing the degradation which can occur where excessive numbers of domestic animals or inappropriate management have been impos ed on semi-arid grazing lands (Anon. 1969; Condon et al. 1969; Newman and Condon 1969; Heady 1975). Strong evidence that this was occurring in Australia dates back to 1901 when the Western Lands Inquiry was held in New South Wales. However, little well documented evidence of just what changes were occurring was available, especially to distinguish climatic droughts from man induced feed shortages.

Hence, monitoring sites needed to be set up in South West Queensland to collect this information. Research and submissions to Cabinet could then be done based on sound data. Complementary studies involved:

(a) Monitoring woody species only using belt transects, Cle-P11 and Cle-P12.
(b) Mulga thinning studies, Cle-P1 and Cle-P6.

Objectives

In 1963 (Original Project Proposal) - To follow the seral development and the effect on dry matter production of ground feed in native pasture communities under conditions of total and partial exclosure of stock in order to throw some light on the effects on vegetation of drought, grazing animals and fire.

In 1983 (Revised research experiment preschedule) - To monitor the long term vegetation changes which may be occurring on certain land systems of South West Queensland as a result of grazing with domestic livestock. Particular emphasis is placed on those systems where woody weeds or seedy grasses appear to be increasing.

Motivation

1963 - "In south west Queensland, the grazing industry will for a long time to come, if not for all time, be mainly dependent upon the native vegetation for the production of wool and beef.

Drought, grazing and fire are recognised as the principal factors influencing stability of the vegetation and thus, the welfare of the industry dependent thereon. Uncertainty exists as to which effects are attributable to which factor, factors or combination of factors.

A prerequisite to reclamation and the subsequent improved management or manipulation of native pastures is to know the pattern of seral development (or degradation) of whole communities and the nature and productive capacity of the various stages which may be reached under specific defoliation regimes.

This project comprises a first phase of investigation on the effect of individual factors."

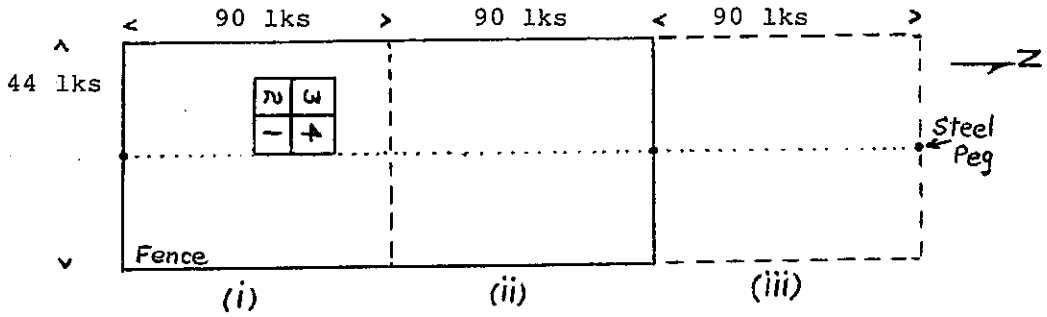
1983 - To maintain our monitoring of vegetation within and outside the exclosures, particularly in view of recent summer droughts and unusually high incidence of wet winters. There is also a need to review the results to date and if necessary, discontinue uninformative sites and modify sampling procedures to get the best information from the effort involved. More of this information is needed to allow succeeding generations of graziers and Government officers to learn from previous generations in the area. Instead of the learning process being by word of mouth or short term memory or (worse still) hearsay, such data will give objective information.

In 1963 proposal - Three types of formations are mainly concerned, namely the Mitchell grass areas, the Mulga areas and areas with enhanced water relations. There were to be 13 sites established on mitchell grass areas, nine on mulga country and four on waterspreaders. Three treatments were to be imposed at each site -

(i) Total exclosure of sheep and kangaroos.
(ii) Total exclosure of sheep and kangaroos, but with a spring burn each year.
(iii) Open to grazing, except for deferment of grazing in alternate years for one month after the break rains.

DESIGN: Unreplicated areas 44 x 270 links, of which two plots (90 x 44 links) are enclosed by a sheep and marsupial-proof fence, and one plot (90 x 44 links) is open to grazing.

LAYOUT:



EVALUATION: Botanical analysis of a permanent belt transect 270 x 4 links down the centre line of the above 270 x 44 link plots.

Quadrants are numbered clockwise, with the four-section (i.e., four 2 link x 2 link) quadrat being placed on the west side of the centre line of the plot.

Recordings were also to include charting of some quadrats, mapping the position of all trees and shrubs and their seedlings, determination of basal area each June, clipping for DM yields and sampling for soil moisture in spring and autumn, but none of these were ever done.

Statistical analysis of yields by means of analysis of variance and of Basal Area by means of the F - test for heterogeniety and by the t - test for between plot differences.

DURATION: Commenced 1963, and is to continue for at least 20 years and preferably indefinitely.

By 1966

Staff changes and financial constraints saw some early modifications to the proposals. The treatments were modified so that only two were used -

(a) Total exclosure of sheep and cattle and most kangaroos.
(b) Normal paddock grazing by domestic and wild animals.

Only 17 exclosures were erected. They covered a range of landsystems and were felt to monitor the six following situations that landholders had expressed concern about.

1. Woody shrub invasion - Sites, Turn Turn, Maxvale, Lanherne, Middleton
2. Aristida invasion - Sites, Airlie, Stirling Downs
3. Mulga loss - Sites, Lesdale, Boatman, Monamby, Wittenburra
4. Cassia invasion - Sites, Koonawalla, Bayswater (potentially)
5. Claypan formation - Sites, Nulla, Boothulla, Willacoora, Wongalea
6. Spinifex degradation - Sites, Wongalea Farm

Background information on each site is given in Table 1.

Data collection was also greatly curtailed so that the only information recorded was species density, i.e., numbers of plants. A fixed strip 4 links wide was recorded up the centre of each plot and continuing for about 88 links beyond the northern end. All plants in this strip, within 2 x 2 link sub-plot areas, are counted and where possible, identified at each recording date. Though the plots are kept fairly free of domestic stock, wild fires burnt some plots at times, namely Turn Turn, Maxvale and Middleton.

In 1973 a concerted effort was made to adequately describe the sites and have their positions mapped. Every site is now located on an aerial photo, photographed and has a map drawn giving instructions on how to reach the site. Every site has supplied soil samples so that the soil can be broadly described (Table 2).

In 1984-85, the results to date were collated and interpreted. Computer analysis of the raw data was not feasible because of difficulties in species identification in the early years. Hence, the results were broadly collated for the presentation of this report. The base data and first level collation by species x site x year is available for each site in the Charleville files.

Higher level collations into plant groups, e.g., woody weeds, perennial grasses etc., for each site x year are filed at Charleville and in Head Office.

STAFF

The original project was begun by Dr J.P. Ebersehn. Most of the fencing was done by I.F. Beale and W.H. Burrows and they also did most of the early recordings. Thereafter, numerous staff were involved, with supervision passing from W.H. Burrows to R.G. Silcock to currently rest with the Senior Charleville Agriculture Branch Officer. This report is written by R.G. Silcock who did most of the collating of results for this report. Other staff who deserve acknowledgement for their assistance are A.J. Pressland, B.J. Caffrey, P.C. Rowan, F.T. Smith, L.M. Williams, P.S. Bowly and J.R. Day.

HEAD OFFICE FILES

Reports and correspondence relating to this trial have the following Head Office file numbers:-

63/13531
64/29777
65/19565
66/20098
67/15962
70/28885
71/27914
73/15769
74/21282

RESULTS

For the purposes of this report, the results are presented in three forms.

A. Descriptive notes and comments for each site.
B. Tables of higher level results for each site for each year of recording.
C. Species lists for each site plus notes on taxonomy and plant identification inconsistencies.

The content of each table is as follows:-

Table 1 - Exclosure, location, fencing, photo and sampling dates.
Table 2 - Land type, soil and vegetation data.
Table 3 - Mean annual rainfall, maximum and minimum numbers of plants, plant categories and bare quadrats recorded.
Table 4 - Most frequently recorded species and genera.
Table 5 - Total plant numbers recorded - sites x years.
Table 5 - Plant species diversity - sites x years.
Table 7 - Plant density inside the exclosure - sites x years.
Table 8 - Plant density outside the exclosure - sites x years.
Table 9 - Plant numbers inside and outside - sites x recording sequence.
Table 10 - Perennial grass numbers, inside and outside - sites x recording date.
Table 11 - Woody plant numbers, inside and outside - sites x recording date.
Table 12 - Bare 2 x 2 link cells, inside and outside - sites x recording date.
Table 13 - An alphabetical listing of plants identified at each site between 1964 and 1984.

GENERAL

Early researchers had difficulty in identifying many species, especially during dry times. Thus, meaningful computer analysis of the vast amount of data collected has not been possible and manual collation of the results so far has been called for. Considerable effort has been put into standardising plant identifications where possible and into condensing the data into a manageable format. Species or higher groupings, such as genera, have been classified as either, (1) woody plants (2) perennials or annuals, (3) grasses or forbs, (4) sedges, rushes and ferns, or (5) unknown, and a complete list of names compiled. In all, 271 species or higher groupings were found and a listing exists for each site.

For each site on each sampling date, the Charleville file contains a listing of all the species found. Their relative frequency, the five groupings given above, and an indication of the mean plant density inside and outside the exclosure is also given (see Appendix IIIa for the format). The total plant number counted along the transect line, plus the number of species identified at each counting is also given (see Appendix IIIb). This report gives the details of the above data in Appendices IVa-q.

SEASONAL CONDITIONS

Recordings began in some very dry years e.g., 1965, early counts were often low and species hard to identify (particularly by young, inexperienced officers). There were some very wet summers in 1973, 1974, 1975 and 1976, but recordings were only done in 1973 during this period. Then followed a very long period to 1986 when the summers were often very dry, e.g., 1980/81 but the winters exceptionally wet. So, climatically there has been a full range of seasonal conditions during this trial.

Table 3 shows the nominal mean annual rainfall for each site (range 300-500 mm), but no actual figures have been collected for each site. It was not uncommon for some sites to be extremely droughted while others at the same time were enjoying a good season, e.g., in June 1982, the Tambo/Augathella area (site 8, 10 and 14) was having a good season while the Cunnamulla area was in a bad drought (sites 9, 11 and 13). Hence, comparisons at any point in time, between sites with similate vegetation are influenced by local climatic conditions.

Overall antecedent rainfall had a much more obvious effect on botanical composition than exclusion of stock. Both stock and rainfall created obvious differences in standing dry matter and each could produce dramatic differences across the fenceline. The photos in Plates 1, 2 and 3 show this well.

PLANT NUMBERS

Up to 7 870 plants were recorded at any one sampling and these took over seven hours to record. In very dry times, only a few plants could be found at some sites (Table 3). The number of quadrats without any plants in them varied correspondingly, but it was rare never to have some bare quadrats at a site (Table 3) out of about 268 subquadrats.

Most sites did not show enormous changes in plant numbers over time (range <10-fold for 12 sites) and only sites 11 and 4 showed a range greater than 35 times. This was largely due to extremely low figures in 1966 after the 1965 drought (Table 5). Sites 3, 15 and 16 had general low numbers of plants but for very different reasons. Site 3 is under a dense mulga canopy and No. 16 has huge spinifex tussocks on it. Site 15 is a swamp/claypan where most herbaceous plants are regularly killed by flooding with salty water.

PLANT DENSITY

Differences in plant density between inside and outside the exclosure were rarely biologically great (Table 7 compared to Table 8). Seasonal conditions, not unnaturally, had a much bigger effect e.g., sites 4, 17 and 13. However, site 1 had limited changes between recordings, probably due to the times when this site was recorded. The lack of variation at sites 2, 8 and 15 is due to the dominance of trees, shrubs or hummock grasses at these sites which exclude big chances in annual plants, even in good seasons.

Hence, there can be many different, logical reasons put forward to explain site differences in plant density.

SPECIES DIVERSITY

Some sites were always floristically rich (Sites 1, 17 - Table 3) while others were poor (Sites 2, 15 and 16) but most varied considerably depending on antecedent rainfall. Only 210 species were clearly identified out of the 271 categories delimited (Table 4). However, 97 of these (about half) occurred at only one site and only about one quarter were found at two or more sites. Hence, the fact that only about one-third of the species recorded from the region were recorded inthe 17 exclosures indicates that either many other vegetation types exist, or that seasonal conditions affected the comprehensiveness of the samples at the dates chosen. In reality, a range of factors contributed, including the smallness of the exclosures which limited the number of shrub and tree species included. Table 11 shows that woody plants only existed in significant numbers at four sites (6, 7, 8 and 16) and were virtually absent from the five heavy soil sites (10, 9, 13, 11 and 12).

The common species and genera, found at over five sites are as follows:-

TREES	Acacia aneura
SHRUBS	Nil
FERNS and SEDGES	Cheilanthes sieberi, Fimbristylis spp.
FORBS (18)	Alternanthera nodiflora, Abutilon spp., Boerhavia diffusa, Convolvulus erubescens, Evolvulus alsinoides, Erodium crinitum, Euphorbia drummondii, Goodenia spp., Malvastrum americanum, Maireana spp., Phyllanthus spp., Portulaca oleracea, Plantago varians, Pentatropis atropurpureus, Ptilotus spp., Sclerolaena spp., Sida spp., and Velleia spp.
GRASSES (19)	Aristida contorta, Aristida jerichoensis, Aristida spp., Chloris spp., Digitaria brownii, Digitaria ammophila, Dichanthium sericeum, Dactyloctenium radulans, Enneapogon spp., Eragrostis lacunaria, Eragrostis spp., Monachather paradoxa, Panicum decompositum, Panicum effusum, Sporobolus caroli, Sporobolus actinocladus, Thyridolepis mitchelliana, Tripogon loliiformis and Tragus australianus.

Of the 18 forbs, very few are really perennial (only Pentatropis and Sida) while in the grasses, five are strongly perennial and only three are true annuals. So the grasses are the widespread dominant herbaceous perennials - not unexpectedly.

Table 4 also emphasises that each soil type has a different suite of adapted perennial plants. Only in good seasons will common annual or short-lived perennials such as those listed above, be found on a wide range of soil types.

INSIDE vs OUTSIDE EXCLOSURES

When the data in Tables 7 and 8 are examined, it is seen that at only a few sites was plant density inside the exclosure more than double that outside where regular grazing occurred. By the 1980s, after nearly 20 years exclosure, the range was 0.5 to 13 times, but only at site 15 was the value >5. At 4 sites, the plant density outside was greater than that inside, so

exclusion of domestic animals does not automatically lead to a greater long-term plant density. Even when the perennial grass data are analysed, a similar story emerges.

Exclosure seems to favour the woody plants (Table 11), particularly the Eremophila and Acacia species. So removal of animals is not the answer to problems caused by those species. There are indications that numbers of woody plants may be decreasing inside the fence at sites 17 and 6, but this may be just temporary or due to spatial rearrangement of the shrubs.

OTHER OBSERVATIONS

These are largely covered in Appendix V by the notes made on each site.

A fire burnt through the Maxvale plot (site 6) in the late 1970s, but we have no idea of when as it was very localised and may be deliberately lit. A deliberate attempt was made in late 1979 to burn the shrubs in the paddock where site 5 is located. It appeared that it was only a cool burn at the site and little damage was done to the shrubs. However, the Eragrostis eriopoda was well burnt and in the ensuing drought, their crowns very badly exposed and pedestalled by wind erosion of the surface sand.

The Middleton (site 8) fire was very hot and burnt all Eremophila bowmanii plants back to the ground and killed most small mulgas. However, a big storm on the evening of the fire ensured most Erbo bushes resprouted quickly. The nett effect was a singing of Eucalypts, death of most mulgas and no effect on the Erbo problem which was supposed to have arisen only after a fire in the 1950s.

Other comments on specific species are contained in Appendix VI.

CONCLUSIONS

1. Generally, the exclosures are giving no useful analysable information about woody plants because they are too small. The exceptions are the turkey bushes (Eremophila gilesii and E. bowmanii) and possibly mulga.

2. For annual species, the recordings have not been frequent enough to do more than itemise species presence. No good indication is given of their regularity of germination or their potential to contribute fodder.

3. Useful site-specific information is given on major perennial grasses and their population fluctuations.

4. The data is too poorly identified to make general computer analysis meaningful. However, some major species at a site may be amenable to computer analysis.

5. The data for Cheilanthes, Tripogon, Cyperaceae, Marsilea and some Convolvulaceae and Goodenia spp., is only useable as presence or absence, i.e., frequency, because the numbers are usually too dense to count and individual plants hard to delineate because the plants are rhizomatous.

6. Seasonal conditions have a far greater impact on species composition and plant density of the pastures (as they existed by the mid-1960s) compared to the effects of grazing management. Management has had its greatest effect on the biomass of feed available and its feed value (via selective grazing).

7. The data does give useable plant density data but the value of this for extension and research is small.

8. The photographs are probably as useful on this scale as the objective data. Unfortunately, none were taken in 1964-67 when the plots were established.

9. The following species would justify further ecophysiological study in future, based on their frequency of occurrence at the exclosure sites. (? indicates doubtful value on other agronomic grounds).

Alternanthera nodiflora?
Digitaria brownii
Euphorbia drummondii?
Sida sp.
Panicum effusum
Enneapogon polyphyllus?
Eriochloa sp.
Erodium crinitum
Convolvulus erubescens
Chloris sp. e.g., C. divaricata
Evolvulus alsinoides

10. Exclosure per se has not led to an improvement in botanical composition, but does produce more feed in the short term. Grey and green turkey bush (Eremophila bowmannii and E. gilesii, respectively), show no signs of thinning out where grass competition is potentially greater.

11. Mulga (Acacia aneura) regenerates quite well on all sites where stock are removed from red earth soils.

12. Whitespear (Aristida leptopoda) and feathertop (A. latifolia) have not declined on mitchell grass areas when grazing has been curtailed. On site 10, the mitchell grasses (Astrebla spp.) are in fact, doing worse in the absence of regular grazing.

13. Scalds and claypans will not gradually return to productive land just by removing grazing animals. Some form of mechanical alteration of the soil surface is also needed.

Many other specific pieces of information have been gleaned from these exclosures. These are contained in the individual site summaries retained at the Charleville Laboratory. Such information has enabled advice or explanation to be given on many previously unexplained or poorly documented phonomena in the region. The data on specific species or sites can be readily accessed in the future from such files by anybody interested in that particular information.

RECOMMENDATIONS

In future, only 11 of the sites should be retained. Sites 1,2,3,14,15 and perhaps 17 should be discontinued. Some need only have specific plant groups recorded in future, e.g., woody weeds, and notes to this effect are made in the individual site notes (Appendix V).

The sites and the effort needed to record them periodically serve as useful training for new staff and as a revision exercise for older staff. The senior Agriculture Branch Officer should be responsible for the continuation of the 11 sites indicated. Recordings and photos should be done at least every five years.

PUBLICATIONS ARISING

Directly

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Indirectly

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Pressland, A.J. (1984). Productivity and management of western Queensland's rangelands. Aust. Rangeld J. 6: 26-45.

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Table 1

Location, fencing and sampling dates, and reasons for setting up each of the 17 exclosures (Cle-P2-WR)

No.	Exclosure Name	National 1:250 000 Map Reference	Date Fenced	Reason for picking this site	Dates Vegetation Recorded	Dates Photographed
1	Lesdale	SG55-10(72.3/45.4)	16.ii.65	Mulga regeneration?	1966, 26.iii.73, 8.vi.82	iii.73, vi. 82
2	Boatman	SG55-14(61.9/50.6)	7.vii.64	Mulga regeneration	27.viii.64, 21.iv.66, 15.viii.67, 3.vii.70, 27.iii.73, 28. vi. 82	iii.73, vi. 82
3	Monamby	SG55-9(69.2/33.3)	30.viii.64	Mulga/turkey bush regeneration	12.x.64, 30.iii.66, 21.vii.70, 11.iv.73, 16.vi.82	iv.73, vi.82
4	Wittenburra	SH55-1(46.8/26)	3.iii.66	Mulga regeneration	19.v.66, 29.viii.67, 23.vii.73, 23.vi.82	vii.73,iii.74 iv.80, vi.82
5	Turn Turn	SH55-1(46.7/27.2)	15.ii.66	Woody weed increase	19.v.66, 24.viii.67, 9.xii.70, 23.vii.73, 23.vi.82	vii.73, iv.80, vi.82
6	Maxvale	SG55-10(73.6/40.5)	15.ii.65	Dense green turkey bush	15.iii.66, 25.v.67, 26.viii.70, 18.iii.73, 8.vi.82	iii.73, vi.82
7	Lanherne	SG55-9(68.3/30)	31.viii.64	Dense green turkey bush	16.x.64, 23.vi.66, 17.viii.67, 18.xi.70, 15.v.73, 16.vi.82	v.73, vi.82
8	Middleton	SG55-6(78.5/39.9)	7.iii.64	Dense grey turkey bush	6.vii.64, 1966?, 12.vii.73, 9.vi.82	vii.73, vi.82
9	Airlie	SG55-14(60.6/40.1)	27.i.65	Feathertop infestation	v.66, 16.viii.67, 27.iii.73, 6.iii.84	iii.73, vi.82 iii.84
10	Stirling	SG55-6(87.9/41)	18.ii.65	White spear, feathertop infestation	5.v.66, 19.vi.68, 13.vii.73, 18.i.80, 22.vi.82	vii.73, vi.82
11	Nulla	SG55-14(53.6/36.3)	16.ii.66	Claypan regeneration	19.v.66, 31.viii.67, 28.iii.73, 6.iii.84	111.73, vi.82 iii.84
12	Boothulla	SG55-9(72.3/31.8)	11.iii.66	Mitchell grass regeneration on claypans	3.vi.66, 18.viii.67, 16.v.73, 11.vi.82	v.73, vi.82

Table 1 con't

No.	Exclosure Name	National 1:250 000 Map Reference	Date Fenced	Reason for picking this site	Dates Vegetation Recorded	Dates Photographed
13	Willacoora	SH55-2(48.1/38.3)	17.ii.66	Mitchell grass regeneration on scalded area	19.v.66, 29.viii.67 29.iii.73, 24.vi.82	iii.73, vi.82
14	Bayswater	SG55-6(83.4/35.4)	10.iii.66	Waterspreader	31.v.66, 21.viii.67, 26.vi.68, 2.ix.74	vii.73, vi.82
15	Wongalee	SG55-14(60.8/46.9)	5.iii.65	Yarran swamp vegetation	20.iv.66, 16.viii.67, 3.vii.70, 18.vi.82	iii.73, vi.82
16	Wongalee Farm	SG55-14(62.4/46.8)	26.i.65	Heath and spinifex dynamics	20.iv.66, 1967, 3.vii.70, 13.ix.73, 18.vi.82	vi.74, vi.82
17	Koonawalla	SG55-9(75.3/18.8)	11.iii.65	Mitchell grass regeneration and shrubs on mulga soil	21.vi.66, 22.viii.67, 22.v.73, 21.vi.82	v.73, vi.82

Table 2

Soil and Vegetation data for each of the 17 exclosures (Cle-P2-WR)

No.	Exclosure Name	Land Type WARLUS Category	Land Type Local description	Soil Type	Soil Characteristics (mean of 6 holes) pH (1:5H_2O) 0-15 cm	pH (1:5H_2O) 30-45 cm	BSES avail P(ppm) 0-15 cm	BSES avail P(ppm) 30-45 cm	Total N 0-15 cm
1	Lesdale	M1(M07 WARLUS III)	Arabella mulga	shallow greyish red earth on a slope	5.3	5.3	9	7	0.05
2	Boatman	H3(H02 WARLUS III)	Nebine mulga	mulga red sandy clay loam	5.1	5.1	6	5	0.05
3	Monamby	M4(Unit 49 WARLUS I)	Cooladdi mulga	shallow red earth	5.1	4.7	14	12	0.08
4	Wittenburra	H2(Unit 52 WARLUS I)	Eulo mulga	shallow red earth	4.8	5.0	5	2	0.06
5	Turn Turn	S2(Unit 61 WARLUS I)	Eulo sandplain	sandy red earth	5.7	6.2	11	3	0.04
6	Maxvale	M3(M15 WARLUS III)	Mulga/box flat	loamy red earth	5.4	5.2	13	5	0.05
7	Lanherne	M3(Unit 81 WARLUS I)	Mulga/box flat	silty red clay loam	5.1	5.3	12	5	0.06
8	Middleton	M1(Unit 52 WARLUS IV)	Tableland mulga	shallow red earth	4.5	4.5	5	<5	0.06
9	Airlie	A2(A16 WARLUS III)	Treeless mitchell grass	cracking grey clay (no scalding)	8.5	8.9	13	10	0.05
10	Stirling	F1(Unit 1 WARLUS IV)	Tambo open mitchell grass downs	cracking grey clay (no scalding)	8.0	8.5	79	74	0.07
11	Nulla	G2(A03 WARLUS III)	Brown claypan	scalded brown clay claypen	7.4	8.1	20	26	0.14
12	Boothulla	A3(Unit 31 WARLUS I)	Scalded river frontage	scalded grey clay claypan	5.5	6.6	16	15	0.06
13	Willacoora	G2(A29 WARLUS III)	Scalded mitchell grass	scalded brown sandy clay	7.4	7.7	15	16	0.04
14	Bayswater	W3(Unit 71 WARLUS II)	Alluvial flat	massive brown clay	5.9	7.6	7	<5	0.07
15	Wongalee	L1(L02 WARLUS III)	Seasonal yarran swamp	massive, saline grey loam (swamp)	7.5	6.8	7	6	N.A.
16	Wongalee Farm	N1(T01 WARLUS III)	Spinifex heathland	sandy yellowish earth	4.7	4.6	<5	<5	0.02
17	Koonawalla	W6(Units 34/51 WARLUS I)	Junction of mulga and mitchell grass country	red earth/cracking grey clay transition zone	6.6	7.8	7	6	0.05

Table 3

Cle-P2-WR Summary

Plot	Times Recorded	Plants Counted Max.	Plants Counted Min.	Plant Categories Max.	Plant Categories Min.	Bare Sub-Quads Max.	Bare Sub-Quads Min.	MAR (mm) in area
1	3	1 598	1 103	49	24	83	28	500
2	6	1 525	351	18	5	86	47	450
3	5	793	201	23	16	168	109	400
4	4	3 554	3	34	2	266	8	300
5	5	2 601	119	27	6	190	54	300
6	5	2 216	406	41	16	146	33	375
7	6	3 541	374	37	10	113	1	350
8	4	1 170	549	27	15	65	24	475
9	4	5 136	281	35	13	90	0	400
10	5	2 597	456	35	19	46	0	450
11	4	2 563	1	23	1	259	5	325
12	4	2 905	591	28	14	137	19	350
13	4	5 800	261	24	12	150	4	325
14	4	2 607	405	38	17	98	1	500
15	4	326	119	7	5	227	170	450
16	5	338	75	11	8	207	112	450
17	4	7 871	930	45	30	43	0	300
Range	MA 6	7 871	1 103	49	30	266	170	
	MI 3	326	1	7	1	43	0	

Table 4

Cle-P2-WR Summary

Indications of the species and genera frequently encountered in the pastures.

Note: All capital letters means a family name while genera have only the first 2 letters in capitals and species have only the first letter a capital. e.g., CYPE = Cyperaceae, CYpe = Cyperus spp. and Cybi = Cyperus bifax

First letter of category name	Total No. of categories beginning with this letter	No. occurring at only 1 site	No. at 2 sites	No. at 3-5 sites	No. and names at 6-10 sites	No. and names where found at >10 sites
A	27	11	2	8	4 Acan, Alno, Arco, Arje	2 ARis, ABut
B	13	4	3	5	1 Bodi	
C	37	22	7	3	5 Chsi, COMP, Coer, CYPE, CHlo	
D	14	6	1	2	4 DICO, Dibr, Diam, Dise	1 Dara
E	37	14	7	9	5 Eval, ENne, Enpo, Erlac, Ercri	2 Eudr, ERag
F	3	1	1	0	1 FImb	
G	10	6	2	0	2 GOod, GRAM	
H	12	7	3	2		
I	2	1	0	1		
J	0					
K	0					
L	6	5	0	0	1 LILI	
M	15	8	3	1	3 Maam, Mopa, MAir	
N	3	0	3			
O	1	0	0	1		
P	31	10	6	7	8 Pade, PHyl, POrt, Pool, Plva, Peat, Paef, PTil	
Q	0					
R	2	1	1			
S	35	10	10	11	3 Spca, SCle, Spac	1 SIda
T	13	4	3	3	1 Thmi	2 Trlo, Trau
U	1	0	1			
V	7	4	1	1	1 VEll	
W	2	0	1	1		
X	0					
Y	0					
Z	0					
TOTAL	271	114	55	55	39	8

Table 5

Cle-P2-WR Exclosures

Total Plant Numbers

Name	Site No.	Year 1964	1966	1967	1968	1970	1973	1974	1980	1982	1984	Range (Times)	Min.
S/DNS	10		1 160		985		2 597		456	715		5.7	456
AIRL	9		281	969			5 136				1 982	18.3	281
WILC	13		3 222	4 080			5 800			261		22.2	261
NULLA	11		1	936			1 676				(2 563)	2 563.0	1
BOOTH	12		696	591			2 905			(1 820)		4.9	591
BAYS	14		405	(542)	1 749			2 607				6.4	405
KOON	17		1 157	1 746			7 871			930		8.5	930
LANH	7	(675)	1 362	1 048		371	3 541			2 246		9.5	371
MAXV	6		627	1 919		406	2 216			993		5.5	406
LESD	1		1 103				1 508			1 598		1.4	1 103
MIDDL.	8	549	1 042				1 170			1 121		2.1	549
MON	3	201	667			346	793			234		3.9	201
T/T	5		119	3 999		306	2 601			314		33.6	119
WITT.	4		3	234			3 554			315		1 184.7	3
BOAT	2	351	470	368		470	1 525			419		4.3	351
WON	15		119	188		121				326		2.7	119
WON(F)	16		182	269		169	338			75		4.5	75

( ) = incomplete counts

Cle-P2-WR Exclosures

Plant Species Diversity

Table 6

Name	Site No.	1964	1966	1967	1968	1970	1973	1974	1980	1982	1984	Max.
S/DNS	10		32		23		35		19	26		35
AIRL	9		14	13			26				35	35
WILC.	13		12	24			16			20		24
NULLA	11		1	23			7				21	23
BOOTH	12		14	19			28			25		28
BAYS	14		17	25	28			38				38
KOON	17		31	30			43			45		45
LANH.	7	10	17	20		10	37			27		37
MAXV.	6		23	26		16	33			41		41
LESD.	1		24				36			49		49
MIDDL.	8	15	15				19			27		27
MON	3	16	23			21	21			20		23
T/T	5		6	19		11	27			9		27
WITT.	4		2	26			34			33		34
BOAT	2	5	16	17		10	18			16		18
WON	15		5	7		6				6		7
WON(F)	16	8	9			10	11			10		11

Cle-P2-WR Exclosures

Plant Density m^{-2} (Inside exclosure)

Table 7

Site Name	Site No.	Recording Sequence						Range
		1	2	3	4	5	6	
STIRLING DNS	10	26.3	19.0	63.6	8.9	12.8		9-64
AIRLIE	9	6.8	29.5	130.0	52.3			7-130
WILLACOORA	13	65.1	93.2	149.3	6.9			7-149
NULLA	11	0.03	18.9	37.4	74.9			0-75
BOOTHULLA	12	16.0	19.6	86.6	54.3			16-87
BAYSWATER	14	12.8	27.9	38.1	71.8			13-72
KOONAWALLA	17	35.0	44.2	237.2	27.9			28-237
LANHERNE	7	94.8	30.6	29.0	11.1	91.4	64.1	11-95
MAXVALE	6	20.5	60.3	13.3	60.3	23.3		13-60
LESDALE	1	14.7	31.6	33.4				15-33
MIDDLETON	8	12.9	28.8	30.7	28.9			13-31
MONAMBY	3	3.2	9.9	8.5	13.6	4.4		3-14
TURN TURN	5	2.6	9.1	6.7	51.0	8.1		3-51
WITTENBURRA	4	0.06	6.1	74.3	5.1			0-74
BOATMAN	2	8.6	14.5	11.0	13.9	48.3	11.3	9-48
WONGALEE	15	3.6	5.1	3.8	10.7			4-11
W/FARM	16	4.1	5.9	4.1	7.2	2.3		2-7

Cle-P2-WR Exclosures

Plant Density m^{-2} (Outside exclosure)

Table 8

Site Name	Site No.	Recording Sequence 1	2	3	4	5	6	Range
STIRLING DNS	10	27.6	30.2	49.6	13.5	23.1		13-50
AIRLIE	9	6.1	7.6	98.5	30.5			6-98
WILLACOORA	13	93.0	100.2	111.4	3.8			4-111
NULLA	11	0.0	27.8	39.3	25.0			0-39
BOOTHULLA	12	16.1	1.4	24.3	15.0			1-24
BAYSWATER	14	2.2	-	44.9	40.5			2-45
KOONAWALLA	17	9.7	32.1	296.5	7.3			7-296
LANHERNE	7	-	32.9	14.3	3.2	64.6	25.5	3-65
MAXVALE	6	3.9	7.4	0.3	35.0	20.5		0-20
LESDALE	1	49.6	41.5	43.9				41-50
MIDDLETON	8	11.7	15.9	17.5	26.5			12-26
MONAMBY	3	7.7	26.2	6.5	27.2	7.2		6-27
TURN TURN	5	3.0	9.4	7.3	72.6	5.0		3-73
WITTENBURRA	4	0.0	4.1	96.6	11.4			0-97
BOATMAN	2	7.4	4.1	3.2	4.6	7.1	6.0	4-7
WONGALEE	15	1.0	2.6	0.6	0.8			1-3
W/FARM	16	4.3	6.5	3.4	8.7	0.5		1-9

Cle-P2-WR Exclosures

Table 9

Total plant numbers, Inside (outside) the fence at each recording time.
Note: The area recorded inside the fence (44 quadrats) was about twice that done outside (22).

Name	Site No.	Recording Sequence 1	2	3	4	5	6	Total
STIR	10	767 (393)	555 (430)	1 875 (722)	259 (197)	378 (337)		5 913
AIRL	9	194 (87)	860 (109)	3 829 (1 307)	1 532 (450)			8 368
WILL	13	1 897 (1 325)	2 717 (1 363)	4 375 (1 425)	203 (58)			13 363
NULL	11	1 (0)	540 (396)	1 103 (573)	2 207 (356)			5 176
BOOT	12	467 (229)	571 (20)	2 551 (354)	1 601 (219)			
BAYS	14	373 (32)	542 (-)	1 109 (640)	1 860 (747)			
KOON	17	1 019 (138)	1 289 (457)	6 911 (960)	823 (107)			
LANH	7	675 (-)	893 (469)	844 (204)	326 (45)	2 662 (879)	1 879 (367)	
MAXV	6	571 (56)	1 816 (103)	402 (4)	1 717 (499)	687 (306)	bare area outside	
LESD	1	428 (675)	930 (578)	972 (626)	termite mound inside			
MIDD	8	379 (170)	836 (206)	904 (266)	843 (378)			3 982
MONA	3	91 (110)	294 (373)	253 (93)	388 (405)	130 (104)		
TURN	5	76 (43)	265 (134)	200 (106)	1 520 (1 081)	241 (73)		
WITT	4	3 (0)	178 (56)	2 116 (1 438)	145 (170)			
BOAT	2	246 (105)	412 (58)	321 (47)	405 (65)	1 422 (103)	329 (90)	
WONG	15	104 (15)	149 (39)	112 (9)	315 (11)			
W/FRM	16	121 (61)	177 (92)	121 (48)	214 (124)	68 (7)		1 033

Cle-P2-WR Exclosures

Table 10

Perennial grass numbers, Inside (Outside) the fence at each recording time.
Note: The area recorded inside the fence (44 quadrats) was about twice that done outside (22).

Name	Site No.	Recording Sequence 1	2	3	4	5	6	Total	Percentage of all plants
STIR	10	546 (344)	411 (155)	1 242 (196)	190 (179)	156 (166)		3 585	61
AIRL	9	71 (47)	475 (65)	778 (322)	876 (112)			2 746	33
WILL	13	491 (182)	752 (752)	1 824 (1 055)	68 (43)			5 167	39
NULL	11	0 (0)	9 (65)	0 (15)	163 (86)			338	6
BOOT	12	338 (177)	190 (4)	113 (10)	7 (2)				14
BAYS	14	95 (13)	167 (-)	281 (348)	773 (264)				37
KOON	17	379 (1)	262 (37)	1 130 (7)	132 (10)				17
LANH	7	199 (-)	513 (395)	524 (105)	111 (1)	1 537 (51)	1 268 (103)		52
MAXV	6	246 (22)	792 (17)	349 (0)	940 (103)	228 (28)			44
LESD	1	152 (133)	184 (106)	637 (283)					35
MIDD	8	197 (82)	587 (125)	655 (113)	497 (234)			2 490	62
MONA	3	10 (33)	181 (247)	104 (40)	192 (130)	53 (45)			46
TURN	5	69 (41)	158 (80)	105 (61)	1 196 (979)	182 (46)			76
WITT	4	0 (0)	35 (10)	215 (30)	80 (116)				12
BOAT	2	105 (74)	104 (24)	122 (4)	257 (35)	1 112 (70)	75 (29)		56
WONG	15	0 (0)	0 (0)	0 (0)	0 (0)			0	0
W/FRM	16	86 (51)	137 (68)	96 (43)	96 (42)	39 (2)		660	64

Cle-P2-WR Exclosures

Table 11.

Woody Plants, Inside (Outside) the fence at each recording time.
Note: The area recorded inside the fence (44 quadrats) was about twice that done outside (22).

Name	Site No.	Recording Sequence 1	2	3	4	5	6
STIR	10	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
AIRL	9	0 (0)	0 (0)	0 (0)	2 (0)		
WILL	13	0 (0)	0 (0)	0 (0)	0 (0)		
NULL	11	0 (0)	0 (0)	0 (0)	0 (0)		
BOOT	12	0 (0)	0 (0)	0 (0)	1 (0)		
BAYS	14	6 (0)	19 (-)	4 (0)	19 (13)		
KOON	17	16 (0)	26 (1)	11 (0)	3 (0)		
LANH	7	89 (-)	128 (43)	142 (35)	159 (39)	73 (13)	478 (224)
MAXV	6	64 (0)	108 (2)	36 (2)	23 (2)	24 (2)	
LESD	1	2 (2)	2 (2)	5 (2)			
MIDD	8	59 (40)	71 (35)	81 (45)	28 (35)		
MONA	3	8 (5)	4 (2)	5 (3)	5 (3)	5 (3)	
TURN	5	3 (0)	8 (4)	3 (2)	7 (4)	13 (15)	
WITT	4	0 (0)	1 (0)	3 (0)	3 (0)		
BOAT	2	9 (7)	12 (2)	4 (3)	6 (7)	3 (6)	5 (5)
WONG	15	2 (0)	2 (0)	1 (0)	2 (0)		
W/FRM	16	22 (3)	21 (4)	21 (5)	59 (9)	25 (4)	

Table 12

Cle-P2-WR Exclosures

Bare Cells, Inside (Outside) the fence at each recording time. Each quadrat had 4 equal cells.
Note: The area recorded inside the fence (44 quadrats) was about twice that done outside (22).

Name	Site No.	Recording Sequence 1	2	3	4	5	6
STIR	10	2 (3)	1 (0)	0 (0)	43 (3)	25 (1)	
AIRL	9	57 (33)	8 (24)	0 (0)	0 (0)		
WILL	13	35 (0)	3 (1)	4 (9)	90 (60)		
NULL	11	179 (80)	29 (12)	5 (34)	0 (5)		
BOOT	12	39 (20)	57 (80)	16 (55)	1 (18)		
BAYS	14	31 (67)	4 (-)	1 (0)	0 (1)		
KOON	17	14 (29)	12 (4)	0 (0)	4 (33)		
LANH	7	1 (-)	15 (16)	11 (30)	54 (59)	0 (2')	3 (21)
MAXV	6	48 (67)	21 (50)	59 (87)	23 (23)	22 (11)	
LESD	1	80 (3)	60 (3)	23 (5)			
MIDD	8	41 (24)	31 (20)	30 (16)	16 (8)		
MONA	3	112 (22)	108 (18)	117 (51)	89 (20)	99 (26)	
TURN	5	133 (57)	70 (30)	88 (38)	47 (7)	82 (44)	
WITT	4	174 (92)	124 (56)	7 (1)	93 (32)		
BOAT	2	29 (48)	20 (49)	37 (49)	29 (51)	21 (48)	4 (43)
WONG	15	130 (85)	102 (68)	111 (80)	142 (85)		
W/FRM	16	99 (50)	80 (32)	106 (52)	95 (37)	123 (84)	

APPENDIX V.

LESDALE NOTES (1)

1. Cassia has not increased, but never in big numbers originally.
2. Plenty of Dibr at this site.
3. Mopa seems to do well inside where limited grazing.
4. The country N of the exclosure is much better than that S of exclosure, partly because of a huge termite mound on the S fenceline.
5. No real change in Aristida.
6. Annual grasses quite common.
7. Galvanized burr regularly present in small numbers.
8. This site is of doubtful value given the amount of data held on other mulga country like this. Abandon?
9. The mintbush further up the ridge has not invaded this site.
10. This exclosure, like others, is too small for woody weed monitoring - too many microsite effects missed.

BOATMAN NOTES (2)

1. No change in Acan.
2. Aristida only present in good seasons.
3. Plenty of Diam at this site, also Chsi.
4. Few perennial forbs.
5. Too small for monitoring mulga and too little of most other species.
6. Exclosure effects show up well on density of annual forbs.
7. Abandon because limited data on species for which we already have lots of data, e.g. Haod, Ero.cr, Mopa, Thmi.

MONAMBY NOTES (3)

1. No change in Acan and Erbo.
2. Aristida goes out in drought times.
3. Sidas have gone back badly in the late 1970's.
4. Themeda australis establishes in good seasons inside the exclosure.
5. Seasons have a bigger effect on plant populations than fences.
6. Little more data that is useful can be gleaned from this small plot.
7. Abandon.
8. Fence always in good shape.

WITTENBURRA NOTES (4) (made Dec. 1984 - like all others)

1. Mulga regenerating in the plot slowly.
2. A wide range of perennial grasses exist but none grow very large.
3. Exclosure seems only to assist regeneration in very good years.
4. Aristida common, but not dominant.
5. Very few burrs or woody weeds.
6. Wide range of annual forbs in good seasons.
7. I think this plot has value to show changes on areas with fair soil fertility, but poor water holding and infiltration capacity. Retain, but only record perennials.
8. Termites still very active and important role as judged by 1980 notes.

TURN TURN NOTES (5)

1. Eragrostis eriopoda consistently present in large numbers and always as dense outside as inside.
2. Eremophila sturtii not regenerating and an adult plant always present.
3. Ergi population always fluctuating with deaths and recruitment.
4. Negligible hopbush (Dodonaea) at this site.
5. Sccon seems to have relatively high densities in recent years on both sides of the fence.
6. Very few perennial grasses, especially Aristida spp.
7. Plenty of annuals in good seasons.
8. Tripogon very sparse outside the exclosure.
9. No mulga on the line.
10. Retain this exclosure, mainly because only one of its type in a delicately balanced vegetation.

MAXVALE NOTES (6)

1. The ground outside the N end of the exclosure is very atypical and bare. There has been some disturbance here before.
2. Turkey bush (Ergi) has declined in this exclosure.
3. Plenty of perennial grasses exist at the site.
4. Aristida is not increasing.
5. A species-rich site.
6. Retain this site, but change the position of outside recordings so that the atypically bare area is avoided, e.g. continue on for 22 quadrats from the outside post or run beside the main plot.

LANHERNE NOTES (7)

1. Ergi always present in large numbers and is regenerating regularly.
2. Exclosure may be allowing better Ergi populations to grow inside the fence.
3. This site regularly has Themeda australis on it, indicating better soil and moisture relations than normal. It is a run-on area so this could be anticipated.
4. No mulga regeneration along the line, but there is some within the exclosure.
5. Aristida common, but not getting a stranglehold on the area.
6. Species rich area after good rains.
7. Fence in good order usually.
8. Retain this site for woody plants and perennial species, especially grasses (except Trlo).

MIDDLETON NOTES (8)

1. This is quite a good exclosure, but access to it is difficult.
2. It is the only one with grey turkey bush (E. bowmannii).
3. The 1978 fire did nothing to reduce the Erbo density outside.
4. Mulga mitchell is a consistent component, as is mulga oats (M. paradoxa).
5. The Erbo inside declined significantly between 1973 and 1982.
6. Evolvulus and Cheilanthes are regular components.
7. Mulga is not regenerating at a great rate.
8. This Erbo is typical of the species in the Aguathella top-rock country, but not of the Quilpie and western Paroo areas, e.g. Humeburn. Erbo is continually regenerating in the whole area.

8(a) Perennial grasses dominate the herbaceous layer.

9. This exclosure should be retained.

AIRLIE NOTES (9)

1. Feathertop (Arla) comes and goes with seasonal fluctuations.
2. Dise commonly dominant in good summers.
3. Erse a common minor component outside and inside the fence.
4. Astrebla not as affected by exclosure here as at Stirling Downs - probably because no Arle to continually keep a top hamper of old dead grass.
5. As at Koonawalla, there are some little herbs which occur only outside the exclosure where the vegetation is more sparse.
6. Enchylaena tomentosa is the only woody plant and it has taken years to produce a few plants inside the fence.
7. Retain this exclosure.

STIRLING DOWNS NOTES (10)

1. Aristida leptopoda (Arle) is consistently present in numbers >20% of all plants.
3. This is the only site with Arle.
4. Dise also consistently well represented especially in wet seasons.
5. Paqu regularly present, but not always in large numbers.
6. Woody plants have been consistently absent.
7. The accummulated dead hamper inside the plot is strongly influencing the botanical composition, in particular lowering Astrebla to negligible amounts.
8. The area has not been burnt since a fire on 26 December, 1962.
9. Arla comes and goes with seasonal fluctuations.
10. There is a good range of native legumes on this site — Glfa, Rhmi, CRot, NEpt, Pste, Glto.
11. This site should be burnt.
12. This site should be retained.

NULLA NOTES (11)

1. Long-lived perennial grasses have not invaded when stock were excluded.
2. Very barren in dry years.
3. Sand accumulation against the fence is the best way of reclaiming this scalded country.
4. Sclerolaena species and Calotis spp. common.
5. It seems sharp seeds or seeds of very small size (Dara, SPor), or those with mucilaginous coats are needed to colonise this claypan.
6. No woody plants.
7. Species composition strongly determined by time when rain caused germination.
8. Little species composition difference due to fencing, except that Aristida anthoxanthoides appears to prefer outside.
9. Soil levels taken in 1982 for the first time.
10. Retain this exclosure, but only record woody plants and perennial grasses and take photos and soil levels.

BOOTHULLA NOTES (12)

1. Originally plenty of Aristida plants both sides of the fence, but these almost disappeared between 1973 and 1982. By comparison Sclerolaena spp. increased greatly between 1973 and 1982.
2. There were a large number of plants in 1966 and 1967 which were never identified, even as to grass or burr or whatever.
3. Despite the relatively dry conditions of 1982 this area has less open bare ground now than in 1966-67.
4. Malvaceae are common.
5. Astrebla seems to have declined, especially outside the fence.
6. Woody plants are virtually non-existent.
7. It looks like Astrebla has almost gone from this scalded soil and only saltweeds and burrs will be found in most years.
8. The high counts of Sclerolaena may just reflect the excellent winters of 1978 and 1981 and the lack of grasses may be due to poor summers since 1976/77.
9. Iseilema is present in almost all years.
10. Plant density is now considerably greater inside than in 1966 due largely to a fall outside.
11. Species diversity is fair (14-28 categories at a sampling).
12. Keep this exclosure at least until there have been some good summers, to see if the perennial grasses can come back. I doubt that they will.

WILLACORA NOTES (13)

0. No sign of Astrebla species.

1. Well maintained fence.

2. Saltweeds and Portulaca very common.

3. An unidentified Chloris species is always present.

4. Tripogon very prominent as is an unidentified Eragrostis species.

5. Retain this site, but record only major perennials. Take photos and soil levels.

BAYSWATER NOTES (14)

1. The fence around this plot is regularly badly damaged by floods.
2. Wide range of useful perennial grasses, but many do not grow very well because of soil type.
3. Acacia farnesiana has not increased significatnly in density yet, despite a sizeable presence since 1969.
4. Iseilema grows here.
5. Astrebla not dying out.
6. Plenty of Cyperaceae and also Nardoo (Marsilea) here.
7. Eremophila maculosa always present around the wire fences, but none outside where stock graze.
8. This site abandoned because fence could not be maintained. There will always be fence problems on waterspreader or frontage areas. This can be overcome with much larger plots and special fencing.

WONGALEE - (SWAMP) NOTES (15)

1. A very unusual site for the region and the swamp effect is confounded by having the bore drain tailings running into it.
3. Diplachne is probably the grass recorded regularly.
4. Haloragis glauca and a Swainsona sp. also occur regularly.
5. The Yarran has died out badly after a good regeneration years ago - salt?
6. Soil analyses in 1982 did not indicate significant salinity problems but the steel posts were badly corroded.
7. Abandon this site.

WONGALEE - (SPINIFEX) NOTES (16)

1. Owner ripped and planted a small strip of oats in S end of plot in about 1981. Some damage to recording strip.
2. Spinifex consistently present as is Aristida.
3. Low species diversity.
4. Spinifex outside the exclosure has died, apparently as a result of grazing pressure, but death inside also.
5. This plot's fence has been commonly breeched by roos and combined with partial fire and oat sowing is pretty messy now.
6. Exclosure hasn't affected woody weed regrowth.
7. Retain this site, but only to monitor spinifex and woody weeds. Note presence or absence of living Trma cover in each plot cell, as well as live crowns.

KOONAWALLA COMMENTS (17)

1. Maybe Portulaca and Calandrinia have been used interchangeably.
2. Ca in 1966 maybe Chloris acicularis.
3. M almost certainly means 'Mimosa' which would be Neptunia sp. in reality.
4. Cassia certainly not increasing, but neither is mulga.
5. The few Eremophila sturtii bushes about have not produced seedlings in the exclosure.
6. This is a very poorly sited plot. I think it should only be monitored in future for woody weeds and then at both ends outside the exclosure.
7. The soil type varies too dramatically along the length of the plot to allow meaningful data to be collected.
8. Exclusion of stock had a bigger effect on the grasses than on the forbs (both annual and perennial).
9. A wide range of species grow in this interzone area.
10. Cassia's come and go, but individual identification is impossible from these records. To mark specific plants is also almost pointless unless recordings are taken at least every 2 years.