PART V
ACKNOWLEDGEMENTS, REFERENCES, AND APPENDICES

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REFERENCES

Beavis, F. C. (1962).-The geology of the Kiewa area. Proc. Roy. Soc. Vic. (N.S.) 75 :349-410

Bowman, F. T. (1956).-" Citrus-growing in Australia " (Angus and Robertson: Sydney)

Central Planning Authority (1951).-" Resources Survey, Upper Goulburn Region" (Central Planning Authority: Melbourne)

Downes, R. G. (1949).-Soil, Land-use and Erosion Survey around Dookie, Victoria. C.S.I.R.O., Aust. Bull. 243

Dunin, F. X. (1965).-The effect of vegetative changes on parameters for estimating runoff near Bacchus Marsh, Victoria. Civil Eng. Trans. Inst. *Eng.* Aust. Paper No. 1854 April 1965.

Gibbons, F. R. and Downes, R. G. (1964).-" A Study of the Land in South-Western Victoria" T.C.3 (Soil Conservation Authority: Melbourne)

Rowe, R. K. (1967).-" A Study of the Land in the Victorian Catchment of Lake Hume " T.C.5 (Soil Conservation Authority: Melbourne)

Rowe, R. K. (1972).-" A Study of the Land in the Catchment to the Kiewa River " T.C. 8 (Soil Conservation Authority: Melbourne)

Specht, R. L. (1970).-" Vegetation," in " Australian Environment " 4th Ed. G. W. Leeper (C.S.I.R.O. Aust. & Melb. University Press)

State Rivers and Water Supply Commission (1964).-" Victorian River Gaugings to 1960 " (State Rivers and Water Supply Commission: Melbourne)

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APPENDIX I

Determination of Relative Plant-growth Potential

The starting point in the calculation of relative plant growth potential is a curve representing available light. No correction is available for differences caused by cloud cover or elevation, but these effects are unlikely to be serious compared with other factors, particularly low temperatures, which will usually be limiting in winter when cloud cover is most prevalent. The basic curve then represents hours of effective daylight, and the assumption is made that, when other factors are not limiting, pasture production is directly related to the hours of sunlight available for photosynthesis. This is also an oversimplification because incident solar energy is not the same in each hour through the day. On the graphs 100 per cent represents growth for a fifteen-hour day with other growth factors non-limiting.

The smooth curve based on variation of daylight hours through the year is next reduced proportionately for temperature effects. The growth response has been interpolated from graphs of the temperature responses of perennial rye grass, cocksfoot, and white and subterranean clovers (Gibbons unpublished data). Using a mixed pasture as the basis for estimation, pasture production may be expected to fall by about 9 per cent for each 1^0C fall in average monthly temperature, in the range just below the optimum. The optimum for most species typical of cooler climates is about 18^0C, but perennial rye grass with an optimum nearer 13^0C is a striking exception which must be allowed for. At temperatures less than 5^0C growth is negligible with each species. It is worth noting that average summer temperatures at Benalla are higher than the optimum and potential growth estimates are accordingly reduced.

This combination of light and temperature gives the basic potential growth curve at each site. The estimate must be further modified, however, by allowances for deficiencies in soil moisture and for frost.

An additional complication is that a limited amount of water held by the soil may be available for plant use during periods of rainfall deficit. In Figs. 13 and 14 two examples have been considered, one for 50 mm and the other for 100 mm of available soil moisture, and the different growth responses of annuals and perennials are considered.

On the diagrams (Figs. 13, 14 and 15) the limit of growth controlled by the availability of soil-water is shown by a sloping line, to indicate that growth diminishes as water stress increases over a period of, say, two weeks. In practice this limit would probably also be a curve, but these details make little difference to the conclusions to be drawn from the growing season charts. Also the commencement of growth in autumn is depicted by a straight line whereas it would actually be exponential in the early stages.

APPENDIX II A

METHODS OF SOIL ANALYSIS

All results are expressed in terms of the oven-dry soil passing a 2 mm. sieve (fine earth) except that of gravel, which is expressed as a percentage of the air-dry field sample.

Particle size analysis: The plummet balance method of Hutton (1956) was employed, with organic matter and carbonate removal where necessary. The hand decantation method of Piper (1942) was used to separate the sand from the finer fractions.

Electrical conductivity (E.C. **250C.): A 1:** 5 soil-water suspension was shaken for one hour, and the conductivity was measured with a Philips conductivity bridge and dip cell.

Soil reaction (pH): *The* above suspension was used with measurements being made with a glass electrode pH meter.

Chloride (Cl-): *The* electrometric silver nitrate titration technique of R. J. Best was used, as detailed in Piper (1942).

Organic carbon **(Org. C.):** The method used was the wet combustion technique of Walkley and Black, as in Piper (1942). No recovery factor has been applied to the results listed. Carbon/nitrogen ratios should be calculated by use of the factor 1. 3 C/N.

Total nitrogen **(N):** Nitrogen was determined by the semi-micro method described by Metson (1956), in which a finely-ground sample of soil weighing 0.2 to 0.5 g. is digested in concentrated sulphuric acid, and the ammonia recovered by distillation of the digest in a Markharn still.

Hydrochloric acid extract: The extract was prepared by boiling 4 g. of soil with 20 ml concentrated hydrochloric acid for four hours with refluxing, with subsequent filtration and dilution to 200 ml. Phosphorus was determined on an aliquot of this extract by a colorimetric method (molybdenum blue) with ascorbic acid as the reducing agent (Hutton et. al., priv. comm.). Absorbance measurements were made with a "Unicam" SP600 spectro-photometer at wavelength 825 mm. Potassium was determined by flaming a portion of the extract, suitably diluted, in a "Lange" flame photometer.

Free iron oxide **(Fe, Q,):** The method of Haldane (1956) was employed, in which a ground sample of soil is extracted with an oxalic acid-ammonium oxalate buffer and powdered zinc, and the ferrous iron in the treated extract titrated with potassium dichromate.

Exchangeable cations: Samples were treated by the proposed method of Hutton and Bond (unpublished data), in which N11 ammonium chloride is used as the leaching agent for the individual cations, and cation exchange capacity is determined by subsequent leaching of the ammonium-ion saturated soils with N11 sodium sulphate.

Sodium and potassium were determined by direct flaming of the ammonium chloride leachate in the "Lange" flame photometer, and calcium and magnesium by titration with E.D.T.A. with Eriochrome Black T as a visual indicator for calcium plus magnesium, and Murexide as indicator in the colorimetric titration for calcium, in an "Eel Titrator". Ammonium ion in the sodium sulphate leachate was determined by the Nessler method, and chloride ion by electro-metric titration. The difference between these two gave the cation exchange capacity.

APPENDIX II B

Analytical Data for Selected Soil Profiles

Soil Group / Profile No. / Location / Parent Material	Horizon	Depth of Sample cm	Field Texture	Particle Size Analysis: Gravel	Coarse Sand	Fine Sand	Silt	Clay	pH	Cl	Org. C	Total N	HCl Extract (Total) P	HCl Extract (Total) K	Free Fe_2O_3	Exchangeable Cations, m. equiv. %: Ca	Mg	K	Na	Cation exch. cap.	Exchangeable Cations, % of C.E.C.: Ca	Mg	K	Na	H
				%	% f.e.	% f.e.	% f.e.	% f.e.		%	%	%	%	%	%										
UNIFORM SOILS																									
Stony loam	A	0–8	SL	25	20	33	17	17	4·9	0·011	7·0	0·51	0·052	0·06	1·9	6·5	4·0	1·1	0·07	22·1	26	16	4	<1	54
566																									
Molyullah																									
Palaeozoic sedimentary rocks																									
Stony loam	A1	0–5	FSL	36	23	41	15	20	4·5	0·006	5·8	0·32	0·025	0·23	1·7	2·8	1·8	1·0	0·1	19·6	14	9	5	1	72
570	A2	5–10	SL	56	26	43	17	14	4·4	0·008	2·5	0·10	0·018	0·18	1·9	0·4	0·5	0·4	0·07	11·5	3	4	3	1	90
Winton		10–20	SL	49	30	41	15	14	4·5	0·006	..	..	0·015	0·16	1·5	0·2	0·4	0·3	0·04	8·7	2	5	3	<1	90
Palaeozoic sedimentary		20–30	SL	29	26	46	15	13	4·5	0·005	..	..	0·011	0·13	1·4	0·2	0·2	0·2	0·02	4·6	4	4	4	<1	88
rocks	B1	30–50	SL	22	24	47	13	14	4·5	0·004	..	..	0·014	0·14	1·4	0·3	0·1	0·2	0·05	5·5	5	2	4	1	89
Coarse sandy loam	A1	0–5	COSL	21	50	34	8	7	5·6	0·005	1·6	0·098	0·011	0·11	0·4	2·4	0·5	0·2	<0·05	7·5	32	7	3	..	58
396	A2	5–15	COSL	42	45	40	12	4	5·6	0·005	0·4	0·024	0·007	0·07	0·4	1·2	0·2	0·2	<0·05	3·1	39	6	6	..	49
Warby Range		15–30	COSL	40	..	..	..	..	5·1	0·003	0·3	0·024	..	..	0·4	0·6	0·07	0·1	<0·05	2·4	25	3	4	..	68
Granite	B	30–60	COSL	49	44	26	18	9	5·2	0·004	..	..	0·008	0·11	0·8	0·2	1·3	0·2	<0·05	4·3	5	30	5	..	60
		60–90	COSL	47	..	..	..	..	5·4	0·002	..	..	..	..	1·0	0·2	2·3	0·3	0·05	5·2	4	44	6	1	45
	C	90–120	COSL	53	..	..	..	..	5·5	0·003	..	..	..	..	0·7	0·2	2·5	0·4	0·06	4·5	4	56	9	1	30
		120–150	COSL	50	44	26	20	9	5·5	0·003	..	..	..	..	0·8	0·1	3·5	0·4	<0·05	6·1	2	57	7	..	34
		150–180	COSL	30	..	..	..	..	5·6	0·002	..	..	0·006	0·07	0·3	0·2	2·7	0·2	0·05	4·3	5	63	5	1	26
Coarse sandy loam	A1	0–8	COSL	13	47	30	12	10	6·2	0·006	1·5	0·13	0·022	0·20	0·9	6·6	1·2	0·6	<0·05	10·2	65	12	6	..	17
397	A2	8–15	COSL	24	..	..	..	..	6·2	0·002	0·71	0·058	0·016	0·15	0·9	4·7	0·6	0·3	<0·05	7·5	63	8	4	..	25
Taminick		15–30	COSL	27	46	34	12	7	6·4	0·002	0·3	0·033	0·015	0·14	0·9	3·1	0·3	0·2	<0·05	4·5	69	7	4	..	20
Granite	B	30–60	COSL	27	47	33	12	7	6·2	0·002	..	..	0·014	0·14	1·0	2·2	0·2	0·2	<0·05	3·7	59	5	5	..	31
		60–90	COSL	36	50	29	10	7	6·5	0·002	..	..	..	..	1·1	2·5	0·5	0·2	<0·05	2·9	86	17	7	..	..
Grey loam	A1	0–10	L	4	19	38	18	18	4·9	0·004	2·9	0·28	0·030	0·14	0·7	4·5	1·5	0·2	0·07	12·9	35	12	2	<1	51
565	A2	10–20	SL	3	18	40	20	18	4·8	0·002	1·7	0·15	0·023	0·13	0·7	3·2	1·3	0·1	0·04	10·1	32	13	1	<1	54
Molyullah		20–30	SL	3	16	39	22	18	4·7	0·002	1·3	0·11	0·024	0·14	0·7	2·5	1·3	0·1	0·03	9·8	26	13	1	<1	60
Alluvium		30–60	SL	4	19	41	23	15	4·8	0·002	0·8	0·074	0·022	0·13	0·8	2·1	0·8	0·1	0·03	8·8	24	9	1	<1	66
	A3/B	60–80	SL–SiL	4	16	42	24	15	5·0	0·002	..	..	0·022	0·12	0·5	2·5	0·8	0·1	0·04	5·0	50	16	2	1	31
	C	80–100	SL–SiL	5	20	42	22	12	5·2	0·002	..	..	0·021	0·10	0·5	2·3	0·9	0·1	0·04	6·0	38	15	2	1	44
		120–130	SiL	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Calcareous dark structured		0–2	C	45	10	24	22	42	7·9[1]	0·028	3·7	0·37	0·030	0·69	1·0	26·9*	1·3	2·6	0·1	30·9	87	4	8	1	—‡
clay (Gilgai puff)		2–23	C	42	..	..	..	..	8·6[2]	0·012	0·5	0·063	0·010	0·44	0·8	21·3*	1·5	1·0	0·1	23·9	89	6	4	1	—‡
403		23–45	C	39	10	26	18	44	8·7[3]	0·008	0·2	0·031	0·008	0·42	0·9	21·9*	1·2	0·8	0·1	24·0	91	5	3	1	—‡
Winton North																									
Alluvium																									
Calcareous dark structured		0–5	Lt C	tr.	4	26	23	44	5·7	0·015	4·4	0·39	0·025	0·54	1·0	16·1	5·1	1·9	0·1	32·6	49	16	6	<1	29
clay (Gilgai hollow)		5–30	C	..	3	27	31	37	6·2	0·017	1·8	0·13	0·016	0·37	1·1	18·1	2·6	1·2	0·1	25·2	72	10	5	<1	13
404		30–50	C	..	4	36	18	38	6·4	0·011	0·8	0·056	0·009	0·34	1·1	13·1	5·6	0·6	0·2	21·7	60	26	3	1	10
Winton North		50–90	C	..	3	24	11	60	7·3	0·008	0·6	0·050	0·010	0·57	1·5	20·9	12·4	1·0	0·7	37·9	55	33	3	2	7
Alluvium																									
GRADATIONAL SOILS																									
Weakly bleached grada-	A2	0–10	FSL	1	3	50	33	12	4·8	0·002	2·0	0·18	0·019	0·20	0·9	2·4	1·3	0·7	0·03	7·3	33	18	10	<1	39
tional soil	B1	10–20	SC	..	2	20	42	35	5·1	0·002	0·5	0·057	0·022	0·32	1·9	3·4	1·3	0·9	0·04	8·0	43	16	11	1	39
564		20–30	SC	..	..	..	..	..	5·5	0·002	0·4	0·039	0·027	0·35	2·5	3·7	2·4	1·0	0·07	8·4	44	29	12	1	14
Kilfeera		30–40	SC	..	1	31	32	32	5·4	0·002	..	..	0·028	0·33	2·6	3·1	2·7	0·9	0·04	8·7	36	31	10	<1	23
Alluvium	B2	40–50	CL	..	<1	48	26	28	5·3	0·003	..	..	0·026	0·29	2·4	2·4	3·1	0·8	0·03	8·5	28	36	9	<1	27
	B3/C	50–80	SiL	..	<1	50	26	21	5·2	0·003	..	..	0·002	0·25	2·0	2·0	2·5	0·6	0·03	6·8	29	37	9	<1	25
	C/D	100–130	SC	..	12	36	25	26	5·9	0·004	..	..	0·015	0·25	..	3·0	4·3	0·3	0·4	9·4	32	46	3	4	15
Weakly bleached grada-	A1	0–8	FSL	68	16	32	33	15	5·3	0·016	4·9	0·32	0·040	0·50	2·6	6·5	3·6	1·1	0·1	24·5	27	15	4	<1	54
tional soil	A2	8–25	SiL	50	..	..	..	..	4·8	0·008	0·9	0·057	..	..	2·7	0·9	0·3	0·4	<0·05	9·0	10	3	4	..	83
401	B1	25–45	CL	52	11	34	32	21	4·9	0·006	..	..	..	..	3·5	0·5	0·5	0·4	<0·05	8·8	6	6	5	..	83
Glenrowan West	B2	45–60	Lt C	50	8	29	30	30	5·0	0·005	..	..	..	..	3·8	0·3	1·5	0·5	0·1	9·2	3	16	5	1	75
Palaeozoic sedimentary	D	60–100	C	65	10	16	18	53	4·9	0·012	..	..	..	..	4·9	1·3	4·2	0·9	0·2	15·0	9	28	6	1	56
rocks																									
Friable brownish grada-	A1	0–5	Gty L	11	43	25	14	14	6·1	0·001	3·1	0·21	0·023	0·23	1·4	9·1	2·2	1·1	<0·05	17·3	53	13	6	..	28
tional soil	A2	5–10	Gty L	12	..	..	..	..	6·0	0·008	1·6	0·11	0·021	0·23	1·6	6·6	1·8	1·0	<0·05	13·3	50	14	8	..	28
398	A3	10–20	Gty L	17	46	23	13	17	5·7	0·005	0·9	0·073	0·019	0·21	1·6	2·9	1·5	0·7	<0·05	11·7	25	13	6	..	56
Warby Range	B1	20–30	Gty CL	22	..	..	..	..	5·0	0·003	0·7	0·069	..	..	1·8	1·3	1·5	0·6	0·05	7·8	17	19	8	1	55
Granite		30–60	Gty CL	22	40	25	13	20	5·0	0·003	0·5	0·054	0·020	0·20	1·7	0·2	1·0	0·5	<0·05	17·6	1	6	3	..	90
	B2	60–90	Gty Lt C	18	..	..	..	..	4·9	0·003	..	..	..	..	2·0	0·2	1·2	0·4	0·05	7·4	3	16	5	1	75
		90–110	Gty C	23	35	19	12	33	5·0	0·003	..	..	0·027	0·28	2·3	0·1	<0·05	0·1	<0·05	10·4	1	..	1	..	98
Friable brownish grada-	A1	0–5	L	15	14	34	38	14	5·8	0·017	4·4	0·25	0·025	0·14	3·1	9·3	1·8	1·4	0·1	26·6	35	7	5	<1	53
tional soil	A2	5–10	L	18	..	..	..	..	5·6	0·018	3·4	0·19	0·020	0·15	2·9	4·9	1·8	1·3	0·1	22·7	22	8	6	<1	64
406		10–15	L	7	..	..	..	..	5·5	0·019	2·9	0·16	0·019	0·14	3·0	3·4	1·6	1·1	0·1	20·8	16	8	5	<1	71
Upper Ryans Creek	B1	15–30	CL	7	10	28	34	24	5·5	0·011	1·7	0·093	0·017	0·14	3·0	2·4	1·4	0·9	0·1	16·7	14	8	5	1	72
Rhyodacite	B2	30–60	C	7	11	27	19	38	5·5	0·011	0·9	0·051	0·017	0·19	3·7	2·2	1·5	0·8	<0·05	11·0	20	14	7	..	59
		60–90	C	4	2	20	23	56	5·5	0·009	0·3	0·027	0·021	0·21	4·5	2·6	1·4	0·9	0·05	9·8	27	14	9	1	49
	B3/C	90–120	C	8	11	28	15	42	5·3	0·014	..	..	0·025	0·19	5·1	2·3	1·1	1·1	0·06	9·1	25	12	12	1	50

[1] 11 % $CaCo_3$ [2] 33 % $CaCo_3$ [3] 25 % $CaCo_3$ * Ca^{++} by difference. ‡ Assumed C.E.C. saturated.

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Analytical Data for Selected Soil Profiles—*continued*

Soil Group / Profile No. / Location / Parent Material	Horizon	Depth of Sample	Field Texture	Particle Size Analysis					pH	Cl	Org. C	Total N	HCl Extract		Free Fe_2O_3	Exchangeable Cations: m. equiv. %					Exchangeable Cations: % of C.E.C.				
				Gravel	Coarse Sand	Fine Sand	Silt	Clay					(Total) P	(Total) K		Ca	Mg	K	Na	Cation exch. cap.	Ca	Mg	K	Na	H
		cm		%	% f.e.	% f.e.	% f.e.	% f.e.		‰	%	%	%	%	%										
GRADATIONAL SOILS—*continued*																									
Friable brownish grada-	A1	0–10	SCL	11	18	33	24	21	5·1	0·006	3·8	0·18	0·017	0·15	2·4	2·9	2·5	0·9	0·07	15·6	19	16	6	<1	59
tional soil		10–15	SCL	8	16	35	24	23	5·2	0·005	3·2	0·16	0·017	0·14	2·4	1·8	1·9	0·9	0·09	13·4	13	14	7	1	65
572	A2/B1	15–25	SCL	9	18	35	24	21	5·2	0·004	1·8	0·098	0·014	0·14	2·4	1·1	1·1	0·8	0·08	9·1	12	12	9	<1	67
Tatong–Tolmie Road	B2	25–40	SCL	7	16	35	24	26	5·2	0·004	1·2	0·065	0·012	0·14	2·4	0·6	1·1	0·9	0·1	9·6	6	12	9	1	72
Rhyodacite	B2	60–80	SCL	7	13	30	20	36	5·2	0·004	..	..	0·013	0·18	3·2	0·4	1·9	1·0	0·08	8·8	5	22	11	1	61
		100–120	SCL	6	15	33	19	32	5·0	0·004	..	..	0·016	0·19	3·4	0·5	1·7	0·7	0·08	8·1	6	21	9	1	63
Friable reddish gradational	A1	0–5	L–CL	5	7	28	38	26	5·7	0·021	3·9	0·26	0·087	0·24	5·3	11·6	3·7	1·5	0·1	30·6	38	12	5	<1	45
soil, with well structured	A2	5–10	CL	14	6	28	28	30	5·7	0·016	2·7	0·19	0·081	0·16	5·6	8·2	4·3	1·1	0·1	27·0	30	16	4	<1	50
subsoil	A3/B1	10–15	Lt C	16	4	20	29	41	5·5	0·018	2·1	0·14	0·063	0·18	6·4	8·2	2·2	0·9	0·1	25·2	33	9	4	<1	54
405	B2	15–30	C	tr.	3	17	23	54	5·1	0·013	1·3	0·11	0·058	0·18	5·6	2·6	3·2	0·6	0·09	18·0	14	18	3	1	64
Tiger Hill		30–60	C	tr.	2	20	23	56	5·0	0·017	0·9	0·076	0·051	0·16	5·6	2·3	2·2	0·3	0·2	21·0	11	10	1	1	77
Basalt		60–90	C	..	3	15	18	59	5·3	0·013	..	..	0·052	0·22	6·2	2·9	3·6	0·3	0·2	15·8	18	23	2	1	56
Friable reddish gradational	A1	0–10	CL	13	11	31	32	23	5·5	0·010	4·7	0·30	0·042	0·10	6·2	15·1	4·9	0·5	0·1	23·7	64	21	2	<1	13
soil, with well structured	A2/B1	10–20	CL–LtC	13	13	32	38	17	5·5	0·006	2·3	0·14	0·035	0·060	6·4	8·2	3·2	0·3	0·1	16·5	50	20	2	<1	28
subsoil	B2	20–30	C	10	12	28	28	32	5·6	0·005	1·1	0·082	0·042	0·060	6·8	5·9	3·6	0·2	0·1	13·6	43	26	1	<1	30
571	B3	30–50	C	6	7	20	15	58	5·6	0·006	..	..	0·043	0·10	5·9	6·0	5·0	0·2	0·2	14·4	42	35	1	1	21
Wrightley		60–80	C	7	7	17	11	65	5·3	0·006	..	..	0·048	0·11	6·0	4·3	4·9	0·2	0·2	14·8	29	33	1	1	36
Cambrian diabase	B4/C	100–120	CL	31	6	16	11	68	4·8	0·021	..	..	0·049	0·11	5·5	2·0	4·7	0·2	0·3	12·5	16	38	2	2	42
Friable reddish gradational	A1	0–10	SL	4	37	23	18	19	5·0	0·005	4·7	0·22	0·025	0·18	1·9	4·4	2·1	0·6	0·06	18·3	24	11	3	<1	62
soil, with weakly	A2/B1	10–20	SCL	2	36	23	18	20	4·9	0·003	1·5	0·11	0·020	0·20	2·1	1·0	1·0	0·5	0·05	13·3	8	8	4	<1	80
structured subsoil	B2	20–30	SCL SC	2	33	23	14	27	4·9	0·004	1·1	0·071	0·019	0·33	2·4	0·6	0·9	0·6	0·07	13·2	5	7	5	<1	83
569		30–50	SC	2	36	20	13	30	4·8	0·004	..	..	0·018	0·25	3·3	0·3	0·4	0·5	0·03	11·1	3	4	5	<1	88
Blue Range plateau		60–80	SC	2	35	20	12	31	4·8	0·002	..	..	0·020	0·29	2·2	0·2	0·7	0·5	0·04	9·7	2	7	5	<1	88
Granite		80–100	SC	4	37	17	11	36	4·8	0·003	..	..	0·019	0·24	2·0	0·2	0·6	0·5	0·04	9·5	2	6	5	<1	87
Reddish gradational soil	A1	0–10	L	..	4	43	36	12	5·3	0·004	2·0	0·19	0·029	0·19	1·1	4·4	1·9	0·6	0·03	10·8	41	18	6	<1	35
on alluvium	A2	10–20	L	..	2	49	35	12	5·5	0·003	0·5	0·066	0·024	0·20	1·2	2·5	1·1	0·4	0·03	5·1	49	22	8	<1	21
568	A3/B1	20–30	SiL	..	2	48	34	15	5·8	0·002	0·3	0·041	0·029	0·24	1·2	2·5	1·6	0·5	0·04	5·9	42	27	8	<1	23
Kilfeera	B2	30–40	SiL–CL	..	1	46	29	23	6·1	0·002	..	..	0·044	0·35	1·7	3·1	2·5	0·8	0·06	6·7	46	37	12	1	4
Alluvium		60–80	SiL	..	<1	52	21	24	5·3	0·003	..	..	0·043	0·37	2·2	2·5	2·7	0·6	0·1	7·9	32	34	8	1	25
	B3/C	110–130	FSL	..	2	68	10	18	5·3	0·011	..	..	0·027	0·26	..	3·1	2·6	0·2	0·3	7·6	41	34	3	4	18
Yellowish-brown grada-	A1	0–10	COSL	5	40	33	17	8	5·2	0·004	1·2	0·10	0·035	0·16	1·0	2·1	1·2	0·4	0·02	6·3	33	19	6	<1	42
tional soil		10–20	COSL	8	40	34	21	5	5·4	0·002	0·5	0·038	0·033	0·13	1·0	1·9	0·7	0·3	0·02	4·2	45	17	7	<1	31
567	A2	20–30	COSL	11	43	30	20	6	5·8	0·002	0·3	0·020	0·039	0·16	1·1	1·8	0·6	0·3	0·03	3·8	47	16	8	1	28
Molyullah	B1	30–50	CL	3	15	24	37	21	6·1	0·003	0·2	0·023	0·036	0·30	2·1	4·7	1·4	0·5	0·1	8·0	53	18	6	1	22
Alluvium	B2	60–80	C	..	2	32	34	28	5·4	0·035	..	..	0·038	0·30	2·7	5·7	1·4	0·5	0·2	8·6	62	16	6	2	14
	B3	100–120	FSCL	..	12	53	17	15	5·6	0·019	..	..	0·033	0·22	1·9	3·3	1·3	0·3	0·1	5·3	62	24	6	2	6
	C	130–150	LS	..	21	56	13	9	5·8	0·004	..	..	0·025	0·14	..	2·1	0·8	0·2	0·05	3·2	66	26	6	2	0
DUPLEX SOILS																									
Yellowish duplex soil	A1	0–5	Gty L	5	23	46	18	10	5·3	0·009	1·3	0·088	0·016	0·12	1·1	1·4	0·4	0·4	<0·05	7·2	20	6	6	..	68
399	A2	5–13	Gty L	6	..	..	..	..	5·1	0·009	0·6	0·045	0·011	0·10	1·1	0·8	0·1	0·3	<0·05	4·6	17	2	7	..	74
Lima South		13–25	Gty L	5	22	40	19	18	5·2	0·009	0·4	0·032	0·010	0·13	1·4	1·0	0·4	0·3	<0·05	4·9	20	8	6	..	66
Granitic detritus	B1	25–40	C	3	12	19	10	55	5·1	0·010	..	..	0·021	0·39	4·6	1·8	3·2	0·9	0·1	14·1	13	23	6	1	57
	B2	40–75	C	3	9	19	11	60	5·0	0·010	..	..	0·024	0·45	6·8	0·8	3·7	1·0	0·2	15·7	5	24	6	1	64
Yellowish duplex soil	A1	0–8	L	tr.	10	55	23	9	4·6	0·010	1·2	0·099	0·013	0·14	0·8	0·6	0·6	0·4	<0·05	7·4	8	8	5	..	79
407	A2	8–15	SiL	tr.	..	..	..	..	4·9	0·007	0·6	0·043	..	..	0·7	1·0	0·7	0·2	<0·05	3·8	26	18	5	..	51
Swanpool		15–23	SiL	tr.	3	48	32	13	5·4	0·006	0·5	0·032	..	..	1·0	1·4	0·7	0·2	<0·05	3·5	40	20	6	..	34
Alluvium		23–30	SiL	tr.	7	46	25	19	5·3	0·010	..	..	..	..	1·6	1·6	1·8	0·3	<0·05	3·9	27	31	5	..	37
	B1	30–60	C	..	2	19	12	66	5·5	0·004	..	..	0·017	0·59	4·9	3·5	3·8	0·8	0·2	19·2	18	20	4	1	57
		60–90	C	..	6	27	12	54	5·7	0·004	..	..	0·013	0·57	3·9	0·9	4·9	0·7	0·2	16·9	5	29	4	1	61
Yellowish duplex soil	A1	0–5	L	tr.	9	60	21	8	5·6	0·004	0·9	0·064	0·012	0·19	1·5	1·4	0·2	0·3	<0·05	6·0	23	3	5	..	69
402	A2	5–15	L	9	10	59	19	9	5·2	0·004	0·4	0·028	..	..	1·5	1·0	0·2	0·4	<0·05	3·2	31	6	12	..	51
Glenrowan West		15–30	L	25	10	55	21	12	5·1	0·004	0·3	0·025	..	..	2·0	0·7	0·3	0·1	<0·05	3·0	23	10	3	..	64
Palaeozoic sedimentary	B1	30–45	Lt C	47	13	48	20	18	5·7	0·003	..	..	..	..	2·5	0·6	1·1	0·2	<0·05	4·1	15	27	5	..	53
rocks	B2	45–60	C	6	5	42	17	33	6·6	0·005	..	..	..	..	3·2	0·8	3·0	0·3	0·3	9·7	8	31	3	3	55
Yellowish duplex soils	A1	0–5	Gty L	22	49	25	12	8	4·7	0·007	3·2	0·14	0·011	0·11	0·6	1·6	0·7	0·6	<0·05	14·6	11	5	4	<1	80
400	A2	5–23	Gty L	32	..	..	..	..	4·8	0·007	0·8	0·042	0·007	0·09	0·6	0·1	0·3	0·3	<0·05	7·6	1	4	4	<1	91
Warby Range	Bi	23–40	Gty CL	25	43	26	15	14	5·0	0·002	..	..	0·006	0·10	0·7	0·2	0·3	0·2	<0·05	3·2	6	9	6	<1	79
Granite	B2	40–60	Gty C	33	26	14	12	44	5·0	0·006	..	..	0·008	0·17	2·0	0·1	1·1	0·3	0·14	7·9	1	14	2	2	79
Reddish duplex soil	A2	0–10	SL	3	13	61	18	9	5·6	0·002	0·4	0·039	0·009	0·18	0·7	1·2	0·5	0·3	0·3	11·4	11	4	3	3	79
573		10–20	SL	2	11	61	18	10	5·4	0·002	0·2	0·021	0·008	0·20	0·7	0·8	0·4	0·2	0·4	2·2	36	18	9	18	19
South Benalla	A3/B1	20–27	FSL	1	8	58	22	14	5·3	0·001	..	..	0·009	0·28	0·9	1·4	0·7	0·3	0·3	2·9	48	24	10	10	8
Alluvium	B2	30–50	C	<1	2	36	22	40	5·6	0·004	..	..	0·16	0·58	3·2	4·3	3·2	0·7	0·5	9·1	47	35	8	5	5
	B3	60–80	SiL	3	7	58	15	20	6·3	0·003	..	..	0·14	0·40	2·1	2·4	2·5	0·5	0·8	6·2	39	40	8	13	<1
		80–95	SL	2	20	57	11	12	6·5	0·003	..	..	0·10	0·30	1·1	1·3	1·6	0·3	0·4	3·6	36	45	8	11	<1
	C	100–120	COS	30	67	23	5	4	6·5	0·002	..	..	0·07	0·20	..	..	..	..	..	..	..	..	..	..	..
Reddish duplex soil	A2	0–10	Gty L	44	19	45	23	13	4·7	0·003	2·2	0·094	0·013	0·24	1·7	0·6	0·5	0·3	0·2	8·6	7	6	3	2	82
574		10–20	Gty L	37	19	42	24	15	4·7	0·002	0·9	0·052	0·010	0·24	1·7	0·1	0·3	0·2	0·1	5·0	2	6	4	2	86
Reef Hills	A3/B1	25–30	Lt C	2	9	34	26	31	4·9	0·002	..	..	0·011	0·36	1·8	0·1	0·5	0·2	0·6	4·3	2	12	5	14	67
Palaeozoic sedimentary	B2	35–50	C	1	1	12	18	70	5·1	0·003	..	..	0·012	0·63	4·2	0·1	2·6	0·3	0·4	10·6	1	25	3	4	67
rocks	B3	75–80	C	5	2	10	17	71	5·6	0·020	..	..	0·009	0·76	4·5	0·1	7·9	0·2	1·4	13·0	1	61	2	11	25
	B4	85–100	C	5	1	14	22	65	5·9	0 034	..	..	0·009	0·75	..	0·1	9·0	0·1	2·8	12·0	1	75	1	23	<1

APPENDIX III A

SPECIES LIST

Eucalyptus

E. albens Benth.	White box
E. bicostata M. Bl. & S. Syn. E. St. Johnii R. T. Baker	Blue gum
E. Blakelyi Maiden	Red gum (Blakely's red gum)
E. bridgesiana R. T. Baker	Apple box (but but)
E. camaldulensis Delmh.	Red gum (river red gum)
E. camphora R. T. Baker	Mountain swamp gum
E. dalrympleana Maiden	Mountain gum (kindlingbark)
E. delegatensis R. T. Baker	Alpine ash (woollybutt)
E. dives Schauer	Broad-leaf peppermint
E. goniocalyx F. Muell. ex Miq.	Long-leaf box (bundy)
E. macrorhyncha F. Muell. ex Benth.	Red stringybark
E. melliodora A. Cunn. ex Schau.	Yellow box
E. microcarpa Maiden	Grey box
E. obliqua L'Herit	Messmate stringybark
E. pauciflora Sieber ex Spreng.	Snow gum (white sallee)
E. polyanthemos Schauer	Red box
E. radiata Sieber *ex* DC.	Narrow-leaf peppermint
E. rubida H. Deane & Maiden	Candlebark gum
E. sideroxylon A. Cunn. ex W. Woolls	Red ironbark
E. stellulata Sieber ex DC.	Black sallee
E. viminalis Labill.	Manna gum.

Grasses

Danthonia spp.	Wallaby grasses
D. pallida R. Br.	Silvertop, wallaby grass
Poa australis sp. agg.	Tussock grass
Stipa spp.	Spear grasses.

Other

Acacia dealbata Link.	Silver wattle
A. melanoxylon, R. Br.	Blackwood
A. pycnantha Benth.	Golden wattle
A. rubida A. Cunn.	Red-stem wattle
A. triptera	Spar-wing wattle
Bedfordia salicina (Labill.) DC.	Blanket-leaf
Callitris sp.	Cypress pine
Cassinia aculeata (Labill.) R. Br,	Common cassinia (dogwood)
Casuarina stricia Dryland.	Drooping sheoak
Cheilanthes tenuifolia (Burm, F.) Swartz	Rock fern
Dicksonia antarctica Labill.	Soft tree-fern
Dillwynia sericea A. Cunn.	Showy parrot-pea
Exocarpus cupressiformis Labill.	Native cherry (cherry ballart)
Grevillea lanigera A. Cunn. ex R. Br.	Woolly grevillea
Hibbertia obtusifolia DC.	Showy guinea-flower
H. stricta (DC.) F. Muell.	Erect guinea-flower
Olearia spp.	Daisy-bushes
0. argophylla (Labill.) Benth.	Musk daisy-bush
Pomaderris aspera Sieber ex DC.	Hazel pornaderris
Xanthorrhoea australis R. Br.	Austral grass-tree
X. minor R. Br.	Small grass-tree

APPENDIX IIIB

VEGETATION CLASSIFICATION

1. PEPPERMINT-GUM FORESTS *(E. radiata-E. dives-E. rubida* alliance)

a. Wet peppermint-gum open-forests *(E. radiata-E. rubida* sub-alliance)

Associations :

E. radiata-E. rubida
E. radiata
E. rubida
E. viminalis
E. radiata-E. obliqua
E. obliqua
E. camphora
E. radiata-E. bicostata
E. bicostata
E. dalrympleana
E. pauciflora

b. Dry peppermint-gum open-forests *(E. dives-E. rubida* sub-alliance)

Associations :

E. dives-E. rubida
E. dives
E. rubida
E. bicostata
E. camphora
E. dives-E. rubida-E. radiata
E. pauciflora

c. Stringybark-peppermint open-forests *(E. macrorhyncha-E. dives* sub-alliance)

Associations

E. macrorhyncha-E. dives
E. macrorhyncha-E. polyanthemos-E. dives
E. dives-E. goniocalyx

2. BOX-IRONBARK FORESTS *(E. polyanthemos-E. sideroxylon* alliance)

a. Red box-long-leaf box open-forests *(E. Polyanthemos-E. goniocalyx* sub-alliance)

Associations

E. polyanthemos-E. macrorhyncha
E. polyanthemos-E. goniocalyx
E. polyanthemos-E, microcarpa-E. albens
E. goniocalyx
E. melliodora

b. Grey box-ironbark open-forests *(E. microcai4pa-E. sideroxylon* sub-alliance)

Associations

E. microcarpa-E. albens-E. sideroxylon E. macrorhyncha-E. polyanthemos-E. microcarpa-E. albens E. sideroxylon E. goniocalyx

3. BOX-RED GUM WOODLANDS *(E. polyanthemos-E. microcarpa-E. blakelyi* alliance)

a. Grey box-redgum woodlands *(E. microcarpa-E. blakelyi* sub-alliance)

Associations

E. microcarpa-E. blakelyi1E. camaldulensis-E. melliodora E. microcarpa E. blakelyi1E. camaldulensis E. microcarpa-E. albens E. goniocalyx-E. microcarpa-E. albens

b. Red box-red gum woodlands *(E. polyanthemos-E. blakelyi* sub-alliance)

Associations :

E. blakelyi-E. polyanthemos-E. macrorhyncha E. blakelyi-E. goniocalyx E. blakelyi E nolvanthe os