

# **A LAND CAPABILITY STUDY FOR THE SHIRE OF BROADFORD**

**February 1994**

**CENTRE FOR LAND PROTECTION RESEARCH**

**Technical Report No. 9**

**E.J. Bryant, M.R. Bluml, G. Boyle and E. Jones**

**ISBN No.                   0 7306 2678 4**

**ISSN No.                   1038 216X**

**Land Protection Branch  
Department of Conservation and Natural Resources**

## **Further Information**

This report has been prepared to assist broad scale planning in the Shire of Broadford. The information in the report has been derived from air photo interpretation and a limited number of representative field sites. The scale of mapping adopted has necessitated some generalisations from the site information collected. While the ratings indicate the likely performance of the various types of land for a specific use, site specific information may be required for on-site planning. The precision of mapped boundaries is affected by the scale of the map. Any enlargement of the map will distort information and is unlikely to improve its accuracy.

Any queries in relation to the Land Capability Assessment process may be directed to the Centre for Land Protection Research, Bendigo, phone (054) 44 6777.

Bryant, E. (Emma)  
A land capability study for the Shire of Broadford

Bibliography.  
Includes index  
ISBN 0 7306 2678 4.

I. Land Use - Victoria - Broadford (Shire). I. Bluml, Martin. II. Victoria Land Protection Branch. III. Centre for Land Protection Research. IV. Broadford (Vic Shire). V. Title.(Series : Technical report (Centre for Land Protection Research (Vic)) ; no.9).

333.7317099453

## CONTENTS

PREFACE.....	v
SUMMARY.....	v
1. INTRODUCTION	
1.1 Introduction .....	1
1.2 Location .....	1
1.3 Purpose of study .....	2
1.4 Objectives.....	2
2. LAND CAPABILITY ASSESSMENT	
2.1 Philosophy and principles .....	2
2.2 Land resource mapping: methodology and constraints .....	3
2.3 Assessment procedure .....	3
2.4 Land capability rating tables .....	4
3. LAND MANAGEMENT GUIDELINES	
3.1 Management of land characteristics that influence land use .....	12
3.1.1 Soil texture .....	12
3.1.2 Boulders and rock outcrop.....	12
3.1.3 Depth to hard rock.....	12
3.1.4 Depth of top soil.....	12
3.1.5 Depth to watertable (seasonal, perched, permanent) .....	12
3.1.6 Dispersible clays .....	13
3.1.7 Flooding .....	13
3.1.8 Organic matter.....	13
3.1.9 Permeability .....	13
3.1.10 Plasticity index .....	14
3.1.11 Linear shrinkage (shrink-swell potential).....	14
3.1.12 Site drainage.....	14
3.1.13 Slope.....	14
3.1.14 Soil reaction .....	14
3.1.15 Stones and gravel .....	14
4. DETAILED MAP UNIT DESCRIPTIONS AND CAPABILITY RATINGS .....	15
5. DESCRIPTION OF THE ENVIRONMENT	
5.1 Geology and Geomorphology .....	69
5.1.1 Sedimentary undulating low hills/ undulating hills .....	69
5.1.2 Sedimentary steep hills/rolling hills .....	71
5.1.3 Granite/Granodiorite steep hills/rolling hills .....	71
5.1.4 Basalt gently undulating rises/undulating low hills/rolling low hills/rolling hills.....	71
5.1.5 Tertiary fans undulating low hills/rolling low hills/rolling hills.....	74
5.1.6 Alluvial floodplain and terraces .....	74
5.2 Soils .....	75
5.2.1 Sedimentary undulating hills/low hills/steep hills/rolling hills .....	75
5.2.2 Granite/Granodiorite rolling/steep hills.....	75
5.2.3 Basalt Gently Undulating Rises/Undulating Low Hills/Rolling Low Hills/ Rolling Hills .....	76
5.2.4 Colluvial Fans Undulating Low Hills/Rolling Low Hills/Rolling Hills .....	76
5.2.5 Alluvial Floodplains and Terraces.....	77

5.3	Land Systems.....	87
5.4	Existing land uses .....	88
5.4.1	Public Land .....	88
5.4.2	Forestry .....	88
5.4.3	Mining.....	88
5.4.4	Grazing .....	88
5.4.5	Recreation.....	88
5.4.6	Residential Development .....	88
5.5	Land degradation: incidence and susceptibility .....	88
5.5.1	Dryland Salinity .....	88
5.5.2	Sheet Erosion .....	89
5.5.3	Gully Erosion.....	89
5.5.4	Mass Movement.....	89
5.5.5	Wind Erosion .....	89
5.5.6	Soil Structure Decline .....	90
5.5.7	Soil Acidification.....	90
5.6	Climate .....	91
5.6.1	Rainfall .....	91
5.6.2	Temperature .....	91
5.6.3	Frost .....	91
5.6.4	Wind .....	92
5.6.5	Length of Growing Season .....	92
5.7	Native vegetation .....	93
5.7.1	Sedimentary Gently Undulating Rises/Undulating Rises/Rolling Low Hills.....	93
5.7.2	Sedimentary Steep Hills.....	93
5.7.3	Granite/Granodiorite Steep Hills/Rolling Hills.....	94
5.7.4	Basalt Basalt Gently Undulating Rises/Undulating Low Hills .....	94
5.7.5	Colluvial Fans/Undulating Low Hills/Rolling Low Hills/Rolling Hills.....	94
5.7.6	Alluvial Terraces.....	94
6.	ACKNOWLEDGEMENTS.....	94
7.	REFERENCES .....	94
	APPENDIX A Notes to accompany land capability tables.....	96
A.1	Total amount of water available to plants.....	96
A.2	Bearing capacity .....	96
A.3	Coarse fragment sizes .....	96
A.4	Linear Shrinkage.....	96
A.5	Condition of the top soil .....	96
A.6	Depth to hard rock or impermeable layer .....	97
A.7	Depth to seasonal watertable .....	96
A.8	Depth of top soil .....	98
A.9	Dispersibility .....	98
A.10	Drainage .....	98
A.11	Electrical conductivity ( $\mu\text{S cm}^{-1}$ ).....	98
A.12	Flooding risk.....	99
A.13	Length of the growing season .....	99
A.14	No. of months/yr when average daily rainfall > $K_{\text{sat}}$ .....	99
A.15	Permeability of a soil profile ( $K_{\text{sat}}$ ).....	99
A.16	Index for permeability - rainfall.....	99
A.17	Rock outcrop.....	100

A.18	Slope.....	100
A.19	Susceptibility to gully erosion.....	100
A.20	Susceptibility to slope failure .....	101
A.21	Susceptibility to sheet/rill erosion by water .....	102
A.22	Susceptibility of subsoil .....	102
A.23	Susceptibility to erosion by wind .....	104
A.24	Transpiration beds .....	104
	<b>APPENDIX B Working tables for land capability ratings.....</b>	<b>105</b>
B.1	Farm dams.....	105
B.2	Secondary roads .....	106
B.3	Effluent disposal.....	107
B.4	Building foundations .....	108
B.5	Agriculture .....	109
B.6	Rural residential .....	110
	<b>APPENDIX C Specific methodology .....</b>	<b>111</b>
C.1	Map unit determination .....	111
C.2	Field observations .....	111
C.3	Field Tests .....	111
	C.3.1 Saturated hydraulic conductivity .....	111
C.4	Laboratory analysis .....	111
	C.4.1 Physical properties.....	111
	C.4.2 Chemical properties.....	112
	<b>APPENDIX D Physical and chemical laboratory results.....</b>	<b>116</b>
	<b>APPENDIX E Criteria used for establishing recharge values.....</b>	<b>119</b>
	<b>GLOSSARY .....</b>	<b>120</b>

## Figures

Figure 1.1	Location Map.....	1
Figure 5.1	Sedimentary low hills .....	70
Figure 5.2	Sedimentary steep hills .....	71
Figure 5.3	Granite steep hills .....	72
Figure 5.4	Basalt cone at Round Hill .....	72
Figure 5.5	Basalt gently undulating rises .....	73
Figure 5.6	Colluvial fans of the Three Sisters metamorphic aureole .....	73
Figure 5.7	Alluvial floodplain at King Parrot Creek .....	74
Figure 5.8	Gully erosion in sedimentary undulating hills .....	90
Figure 5.9	Average monthly rainfall and evapotranspiration for Seymour .....	93

## Tables

Table 1.1	Summary of land capability ratings .....	vii
Table 2.1	Land Capability Classes.....	5
Table 2.2	Land capability assessment for agriculture .....	6
Table 2.3	Land capability assessment for on-site effluent disposal .....	8
Table 2.4	Land capability assessment for earthen dams .....	9
Table 2.5	Land capability assessment for secondary roads .....	10
Table 2.6	Land capability assessment for rural residential and hobby farms.....	11

Table 5.1	Geological history .....	69
Table 5.2	Simple types of erosion landform pattern characterised by relief and modal slope .....	70
Table 5.3	Comparisons of scale and detail in land inventory studies.....	87
Table 5.4	Mean monthly and yearly rainfall (mm) and number of rain days.....	91
Table 5.5	The mean maximum, minimum and average monthly temperatures for Seymour.....	92
Table 5.6	The average number. of frost days (<2 <sup>0</sup> C) per month in Seymour.....	92
Table A.1	Available Water Capacity .....	96
Table A.2	Rating for top soil condition.....	97
Table A.3	The effects of soil salting on plant growth .....	100
Table A.4	Permeability characteristics of a soil profile .....	100
Table A.5	Index for permeability/rainfall .....	100
Table A.6	Susceptibility to gully erosion.....	101
Table A.7	Susceptibility to slope failure.....	102
Table A.8	Suitability of subsoil for earthen dams .....	102
Table A.9	Erodibility of top soils.....	103
Table A.10	Susceptibility of sheet/rill erosion.....	104
Table A.11	Soil erodibility.....	104
Table C.1	Field description sheet.....	114

## **Plates**

Plate 1	Yellow duplex soil (Dy3.41).....	79
Plate 2	Light grey gradational soil (Gn2.94).....	79
Plate 3	Uniform fine sandy loam (Uc2.21) .....	79
Plate 4	Yellow duplex soil (Dy3.42).....	79
Plate 5	Uniform coarse sand (Uc2.21) .....	81
Plate 6	Red gradational soil (Gn3.12).....	81
Plate 7	Dark uniform clay (Ug6.1).....	81
Plate 8	Yellow duplex soil (Dy3.13).....	81
Plate 9	Yellow duplex soil (Dy3.42).....	83
Plate 10	Yellow duplex soil (Dy3.42).....	83
Plate 11	Dark duplex soil (Dd2.42).....	83
Plate 12	Uniform gravelly loam (Um) .....	83
Plate 13	Uniform silty loam (Um).....	85
Plate 14	Yellowish brown gradational soil (Gn4.66) .....	85
Plate 15	Yellow brown gradational soil (Gn4.64).....	85
Plate 16	Uniform fine sandy loam (Uc2.21) .....	85