3 DESCRIPTION OF STATEWIDE LAND SYSTEMS OF VICTORIA

INTRODUCTION

These Statewide Land Systems are identified by a systematic and hierarchical nomenclature based on geomorphology, lithology, lithological age, landform and climate, and each contains a consistent, if limited, set of descriptors (dominant soil types, native vegetation, susceptibility to various forms of land degradation and a biomass/productivity index) which together convey the critical features of the land systems. This system has been progressivily developed by Rowan (1982) into the precurser of this document.

The original regional land systems have been produced to a common scale of 1:250 000 by combining the detailed regional studies (see Fig. 3.2), land system studies, various reconnaissance and field surveys with additional mapping to cover those areas not previously described.

The statewide dataset has not significantly altered the concept of land systems, although it has aggregated certain previously described land systems into single entities and, in places, split a land system into two or more entities, particularly where the original land system was spread over a relatively wide range of annual rainfall.

The Statewide Land Systems database consists of over 1 160 separate mapped entities, with a total of more than 6 500 mapped areas. Each land system is described using a coded label and a limited set of other descriptors.

Land systems have traditionally been given local names to assist with local identification. However, a more systematic approach to nomenclature was required for comprehension, and the hierarchical system adopted allows for broad classifications or aggregations to be achieved based on major land features.

Geomorphology was used as the prime discriminant for the Statewide Land System because of the strong control exerted by landform and geomorphic history on the various dependant features, particularly soils. Within each of the geomorphic units, the mapped entities were classified according to the independent features of landform, lithology, lithological age and climate (dominantly but not exclusively represented by annual rainfall).

The dependant variables of soils and indigenous vegetation for each land system are then listed. Where the 'statewide' land system has been derived from those land systems mapped in previous studies, the original land survey and land system(s) are identified, and more details of the land can then be extracted from the relevant survey reports. (Land systems not derived from information from previous surveys are also identified.)

Further discrimination was necessary to separate areas of land that were know to be quite different but, on the basis of the major discriminates of geomorphology, landform, lithology lihological age and climate, had not been separated. A suffix was therefore added to the land system code.

Statewide Land System Descriptions

The nomenclature is made up of the following factors and expressed in the order shown.

Factor	Example	
Geomorphic Unit	1.1	Eastern Victorian Dissected Uplands
Landform	M	Mountain
Lithology	s	Sedimentary rock
Lithological Age	P	Palaeozoic
Climate	6	600-700 mm mean annual rainfall
Suffix	7	Specifc marker

This would be expressed as 1.1 Ms P6-7

GEOMORPHIC UNITS

As previously described, Victoria has been subdivided into six, then nine and then twenty-seven geomorphic divisions or units (this system is under review), and these have been used as one basis for separating land types. However it should be noted that there have been minor changes made to the order and nomenclature as listed by Jenkin (1991). adapted by Jenkin and Rowan with twenty nine geomorphic units.

Each land system label or code commences with the geomorphic unit identification, for example, **1.1**MgP6-7 falls within the Dissected Uplands/East Victorian Uplands unit (see Table 3.1).

Table 3.1 Codes for Geomorphic Units.

GEOMORPHIC UNIT		
	1.1	East Victorian Dissected Uplands
	1.2	Uplands Dissected Plateau - Wellington Uplands
	1.3	High Plains - Dargo, Bogong, etc.
CENTRAL VICTORIAN	2.1	West Victorian Dissected Uplands - Midlands
UPLANDS	2.2	Uplands Prominent Ridges - Grampians
	2.3	Dissected Tablelands - Dundas Tablelands
	2.4	Dissected Tablelands - Merino Tablelands
	3.1	Dissected Fault Block - Otway Range
SOUTH VICTORIAN	3.2	Moderately Dissected Fault Block - Barrabool Hills
UPLANDS	3.3	Moderate Ridge - Mornington Peninsula
	3.4	Dissected Fault block - South Gippsland Ranges
	3.5	Dissected Outlier - Wilsons Promontory
	4.1	Riverine Plain Present Floodplain - Murray Valley
	4.2	Older Alluvium - Shepparton
MURRAY BASIN	5.1	Mallee Dunefield Low Calcareous Dunes - Ouyen
PLAINS	5.2	High Siliceous Dunes - Big Desert, Sunset Desert
	6.1	Clay Plains - Nhill
	6.2	Wimmera Plains Ridges and Flats - Goroke
	6.3	Low Siliceous Dunes - Little Desert
WESTERN VICTORIAN	7.1	Undulating Plains - Western District
VOLCANIC PLAINS	7.2	Stony Undulating Plains - Western District
	8.1	Ridges and Flats - Follet
SOUTH VICTORIAN	8.2	Dissected Plains - Port Campbell
COASTAL PLAINS	8.3	Sand and Clay Plains - Moorabbin
	8.4	*Fans* and Terraces - Western Port
	8.5	Barrier Complexes - Discovery Bay, Gippsland Lakes
SOUTH VICTORIAN	9.1	Present Flood Plain - Gippsland
RIVERINE PLAINS	9.2	Intermediate Terraces - Gippsland
	9.3	Higher Terraces and Fans - Gippsland

LANDFORM

Landform was an important determinant in the definition and description of the original land systems, and its use has been continued in this dataset.

The landform type here is assessed predominantly on relief classes following the Australian standard approach as found in the Australian Soil and Land Field Handbook. McDonald *et al.* (1990). The relative relief differences give an indication of the erosion potential and some associated indication of slope. Landform is important in that the shape of the land is an important determinant of the uses that can be made of the land, for example, slope alone may effectively directly preclude certain activities such as ploughing using conventional machinery, or it may be a factor in a high erosion hazard rendering the land unsuitable to a use such as cropping.

Knowledge of the landform transmits information on the history of an area and allows some assessment to be made of likely performance of the land for some uses.

Ten landform categories are used in this dataset, always denoted by one or more upper case letters (Table 3.2). A number of mixed classes exist where the original land system also was a mixed class and it would have been misleading or unreasonable to have ignored the lesser landforms, for example 5.1DPRQfc2-1 occurs in the Mallee where there are many (east-west) dunes on a plain above flood level overlying a number of stranded beach ridges. The first mentioned landform is always the dominant one with subsequent entries indicating the decreasing abundance of each.

Table 3.2 Codes for landform.

CODE	LANDFORM
C	Coastal (dune) complex (Barrier complexes)
D	Dune, other (Inland dunes)
F	Present flood plain
H	Hill (relative relief 90-300m)
L	Low hill (relative relief 30-90m)
M	Mountain (relative relief >300m)
P	Plain above flood level (relative relief <9m)
R	Rise (including stranded beach ridge, usually trending NNW-SSE) (relative relief 9-30m)
S	Swamp, lunette/water body complex
U	Urban or unmapped/undifferentiated

LITHOLOGY

Lithology, or rock/parent material type, is used in the classification of land systems as this is also an important determinant of the soil types and the landforms present, for example, soils developed from granitic rocks are typically of the form of a coarse sandy topsoil over a yellowish clay subsoil in drier environments, and of the form of deep strongly structured reddish gradational soils in moist environments.

Nine lithologies are recognised in the dataset, always denoted by one or more lower case letters (Table 3.3). A number of mixed classes exist where the original land system also was a mixed class and it would have been misleading or unreasonable to have ignored the lesser lithologies, for example, land system 5.1DPRfcQ2-1 occurs in the Mallee and comprises a predictable mixture of fine and coarse unconsolidated sediments (forming plain/interdune corridors and dunes respectively). Again the dominant form is the first mentioned one, subsequent entries are in decreasing abundance. In this edition, volcanic rocks have been divided into acidic and basic sub groups and metamorphic (non-gneissic) rocks have been highlighted either as aureoles or regional mertamorphic masses.

Table 3.3 Codes for lithology.

CODE	LITHOLOGY
c	Coarse textured unconsolidated deposits
f	Fine textured unconsolidated deposits
g	Granites or gneisses
l	Limestone
s	Sedimentary rocks i.e. sandstone, mudstone
m	Metamorphic rocks i.e. schist
v	Volcanic rocks: acidic i.e. rhyolite
b	Volcanic rocks: basic i.e. basalt
z	Saline, fine textured deposits

LITHOLOGICAL AGE

The lithological age is a new factor in the key for the Statewide Land Systems and provides a broad indication of the age of material underlying the regolith. Different aged material of similar composition may behave differently, being subject to greater or lesser weathering. More recently deposited material has been given greater differentiation due its influence on land behaviour. This factor helps differentiate otherwise similar land systems and provides a framework for further differentiation at greater resolution such as the contributing studies and/or their components.

The code C is used as a general category where there is insufficient information to separate out either the parent material as Tertiary (T) age or the younger Quaternary (Q) period.

The example of 5.1 DPRfcQ2-1 has parent material with a Lithological Age of the Quaternary (Q) period.

Table 3.4 Codes for lithological age.

CODE	LITHOLOGICAL AGE (million years ago)
P	Palaeozoic material >250my
M	Mesozoic material 65-250my
C	Cainozoic (undifferentiated) material <65my
T	Tertiary material 1.4-65my
Q	Quaternary material <1.4my

CLIMATE

The moisture regime of an area is known to be a powerful land-forming agent through influences on the weathering of rocks, the control of vegetative growth, and the erosional/depositional cycle. The temperature regime of an area is also a strong determinant of vegetative growth characteristics.

In this dataset, temperature and mean annual rainfall are combined in three classes, and five classes are defined by mean annual rainfall alone (this assumes an essentially consistent temperature regime across these latter classes) (Table 3.5). Each class is represented by a single digit; mixed classes do not occur.

Boundaries between land systems where the discriminant is climate (i.e. the land systems are of the same geomorphic unit, landform and lithology) may be dashed on printed maps to indicate a degree of imprecision in defining and locating the boundary.

The example of 5.1 DPRfcQ2-1 has a climate factor of 2 which means an annual average rainfall of 200-300 mm.

Table 3.5 Codes for climate.

CODE	RAINFALL/TEMPERATURE REGIME
2	200 - 300 mm/year
3	300 - 400 mm/year
4	400 - 500 mm/year
5	500 - 600 mm/year
6	600 - 700 mm/year
7	> 700 mm/year; temperate. Mean annual temp >12°C
8	> 700 mm/year; montane. Mean annual temp 9-12°C
9	> 700 mm/year; sub-alpine. Mean annual temp <9°C

SUFFIX

Unlike other elements of the code, the suffix carries no inherent meaning, serving only to separate otherwise similar areas of land within each of the combinations of geomorphology, landform, lithology and climate. However soil and vegetation types are often major discriminants at this level and relate to the original regional studies.

In some instances, there is only a single entry (-1) as the suffix (eg. 3.3HsM7-1); at the other end of the scale there are twenty variants of the 1.1MgP8 land system (i.e. 1.1MgP8-1, 1.1MgP8-2, 1.1MgP8-3 to 1.1MgP8-20).

NATIVE VEGETATION

There are known to be close correlations between the nature of the land and the native vegetation. While the activities of society have substantially modified the vegetation now on the land, remnants of the original vegetation (particularly the overstorey) are sufficiently numerous to enable identification of both the structure and general communities of native vegetation for each land system.

The dominant forms and communities of the native vegetation for each of the land systems have been included in the dataset for three reasons:

1. There are known close associations between some vegetation types and soil types.

2. To assist with assessments of likely performance of the land for certain uses; vegetation has been used in the assessment of potential productive capacity.

3. To assist in the location of a land system on the ground - where native vegetation is a clear diagnostic feature (and this is not always the case), knowledge of the native vegetation of a land system assists with determining its boundaries in the field.

The native vegetation is listed in two parts, the structure (broadly following the schema of Specht (1970) and the dominant species of overstorey. Eight structural classes are recognised:

Forest (F)	Heathland (H)
Mallee scrub (M)	Rushland (R)
Scrub (Sc)	Sedgeland (Se)
Shrubland (Sh)	Woodland (W).

Species nomenclature broadly follows that of Willis (1988).

For example, the native vegetation of land system *4.2PfQ6.2* is a combination of forest dominated by grey box (*Eucalyptus microcarpa*) and forest dominated by yellow box (*E. melliodora*), while the native vegetation of land system *4.2PfcQ2.1* is shrubland, without an indication of the dominant species. The information in Chapter 6 gives the dominant vegetation form and type. Similar Statewide units may be differentrated by subscript which may be due to different vegetation form and type.

This entry is, by necessity, brief and clearly cannot cover all vegetation communities present in each land system. Aggregation of land systems would provide a poor map of structural vegetation, and a totally inadequate map of vegetation floristics. Where particular information on vegetation is required, more specific sources of information should be consulted.

DOMINANT SOILS

The soil is a major determinant of the ability of the land to support a variety of activities. However soil varies markedly across environments and even across quite short distances. Accordingly, the dominant soil types have been listed to provide additional information of the nature of the land rather than as a diagnostic feature in the definition of the land systems.

The soil types listed are based on a pre-existing soil classification developed and used within the Soil Conservation Authority prior to the development of consistent classifications for Australian soils.

Duplex - soils with a sharp or clear texture contrast between surface and subsoil in sand over clay.

Earths - gradual texture change with soil depth, may well be clayey at depth.

Loams - consistent medium textured soil with depth; vegetation friendly soil with 20-30% clay, generally well drained.

Sands - light textured soils that are consistantly sandy with depth, a restricture layer occasionally occurs at depth but drainage is generally rapid.

Clay - heavy textured soils that are consistently clayey (>35% clay) with depth. Drainage will vary due to soil structure.

These soil types have been correlated with some other soil classifications (Table 3.6) while the Equivalent Land Systems may classify the soil in the systems of Stace (1968), Northcote (1979) and other systems, depending upon the survey. At this level of resolution only a broad correlation with the Australian Soil Classification (Isbell 1996 and Isbell, McDonald and Ashton 1997) has been attempted. A more detailed correlation would require more research particularly into the chemical composition of soils, which may be lacking for many of the existing soil profile descriptions.

Table 3.6 Soil correlations.

Soil Type	Principal Profile Form	Australian Soil Classification
Stony red duplex soils	Dr	Stony red Kurosols, Sodosols
Stony mottled red duplex soils	Dr3, 5; Dy3, 5; Db2, 4; Dd2, 4; Dg3, 5	Stony mottled Kurosols, Sodosols
Yellow duplex soils	Dy	Yellow Sodosols, Chromosols
Yellowish duplex soils	Dy	Yellow Sodosols, Chromosols
Red duplex soils	Dr	Red Sodosols, Kurosols, Chromosols
Stony mottled duplex soils	Dy3.41, .42, Dy3.2	Mottled Kurosols
Mottled duplex soils	Dy3, 5; Dr2, 3, 4, 5; Db2, 4; Dd2, 4; Dg3, 5	Mottled Kurosols
Brown duplex soils	Db	Brown Sodosols, Kurosols, Chromosols
Sandy red duplex soils	Gc, Uc, Dr4	Calcarosols, Sodosols
Sandy mottled duplex soils	Uc	Tenosols
Duplex	D	Sodosols, Kurosols, Chromosols
Reddish brown earths	Gn3, Gn3.74	Red, brown Dermosols
Reddish yellow earths	Gn3	Brown, yellow Dermosols
Red friable earths	Gn4.1, Gn3.1	Red Ferrosols
Red earths	Gn1.1, 2.1, 3.1, 4.1	Red Dermosols
Red shallow earths	Gn, Gc	Red Dermosols, Calcarosls
Stony red earths	Gn3.1, 4.1, 2.1	Stony red Dermosols
Shallow stony earths	Gn	(Shallow stony) Tenosols
Friable earths	Gn3, 4	Dermosols
Brown friable earths	Gn3.2, .3, Gn4.3	Brown Dermosols
Brown earths	Gn3.51,.54, .91	Brown Dermosols
Yellowish brown earths	Gn3.71,.74,.75, .84, .04, Gn4.65	Brown, Yellow Dermosols
Yellow earths	Gn3.7, .8, .9; Gn4.8, .55	Tenosols
Stony yellow earths	Gn2.6, .7; Gn3.6, .7, .8	Stony yellow & grey Dermosols
Grey earths	Gn4.52	Grey Dermosols
Mottled earths	Gn2.4 .5, .6, .7, .8, .9, .0; Gn3.5, .6, .7, .8, .9, .0; Gn4.5, .6, .7, .8	Mottled Dermosols
Dark earths	Gn4.41, 3.41, Um1.44	Black Dermosols
Calcareous earths	Gc	Calcarosols
Red calcareous earths	Gn3.13, Gc2.21	Tenosols, Calcarosols, Dermosols
Brown calcareous earths	Gc2.21	Tenosols
Earths	Gn3.51, 3.91, Um7	Dermosols
Sandy loams	Uc	Rudosols
Stony loams	Um	Tenosols (stony)
Shallow stony loams	Um	Tenosols (shallow stony)
Organic loams	Um7.1	Tenosols
Brown loams	Um	Tenosols
Red loams	Um5.52	Tenosols
Saline loams	Um (saline)	Hypersalic Hydrosols
Loams	Um	Tenosols
Coarse sands	Uc1.21, 1.41, 2.21, 4.13	Rudosols
Brown coarse sands	Uc5.1	Rudosols

Table 3.6 continued on next page.

Table 3.6 (continued).

Soil Type	Principal Profile Form	Australian Soil Classification
Shallow stony sands	Uc1.23	Rudosols
Pale sands	Uc4, Uc1	Rudosols, Podosols
Yellow sands	Uc1.1; Uc4.1, .2	Podosols
Black sands	Uc1.21	Rudosols
Grey sands	Uc1.21	Rudosols
Reddish yellow sands	Uc1.12, .13	Sandy Calcarosols
Red sands	Uc1, Uc	Rudosols, Tenosols
Pale calcareous sands	Uc1.1	Rudosols
Calcareous sands	Uc1.1	Rudosols
Peaty sands	O	Organosols, Tenosols
Sands	Uc	Rudosols, Podosols, Tenosols
Black friable clays	Ug5.1, .2, .3	Vertosols
Brown calcareous clays	Ug5.1, .2, .3	Vertosols
Brown clays	Ug5.1, .2, .3	Vertosols
Calcareous clays	Ug5.1, .2, .3	Vertosols
Dark clays	Ug5.1, .2, .3	Vertosols
Grey clays	Ug5.24, Ug5.25, Ug5.28	Epicalcareous Endohypersodic Grey Sodosol, Vertosol
Grey gypseous clays	Ug5.4, Ug5.5	Vertosols On old lacustrine deposits
Red clays	Ug5.3	Epicalcareous Endohypersodic self mulching Vertosols
Red brown clays	Uf6	Tenosols, Dermosols
Shallow stony clays	Uf6	Tenosols, Dermosols
Yellow clays	Ug5.28	Vertosols
Peaty clays	Uf6.42	Hydrosols, Tenosols, Organosols
Clays	Uf, Ug	Vertosols, Hydrosols, Dermosols
Gravels	-	
Peats	O	Organosols
Saline soils	Um1, Uf1, Dy1, Db0, Dr1, Gn	Hypersalic Hydrosols

REGIONAL LAND SYSTEMS

While the Statewide Land Systems dataset contains only limited information of the land, the links with more detailed information from which the dataset was developed have been retained. These links are in the form of Equivalent Land Systems or the original regional land system - the source of the information for each individual Statewide Land System.

The Equivalent Land System entry is in the form of Survey:Land System - for example **Gippsland Lakes:Wellington** (the Wellington land system identified and described by Aldrick *et al.* (1988, 1992), is the Equivalent Land System for Statewide Land System 1.2HsP8-2, 1.2LsP8.2. In some cases, the Equivalent Land System is listed as **U**, indicating that the description and boundaries of the land system were derived from interpretations of limited data sources by the author rather than from existing survey information (see Figure 3.2).

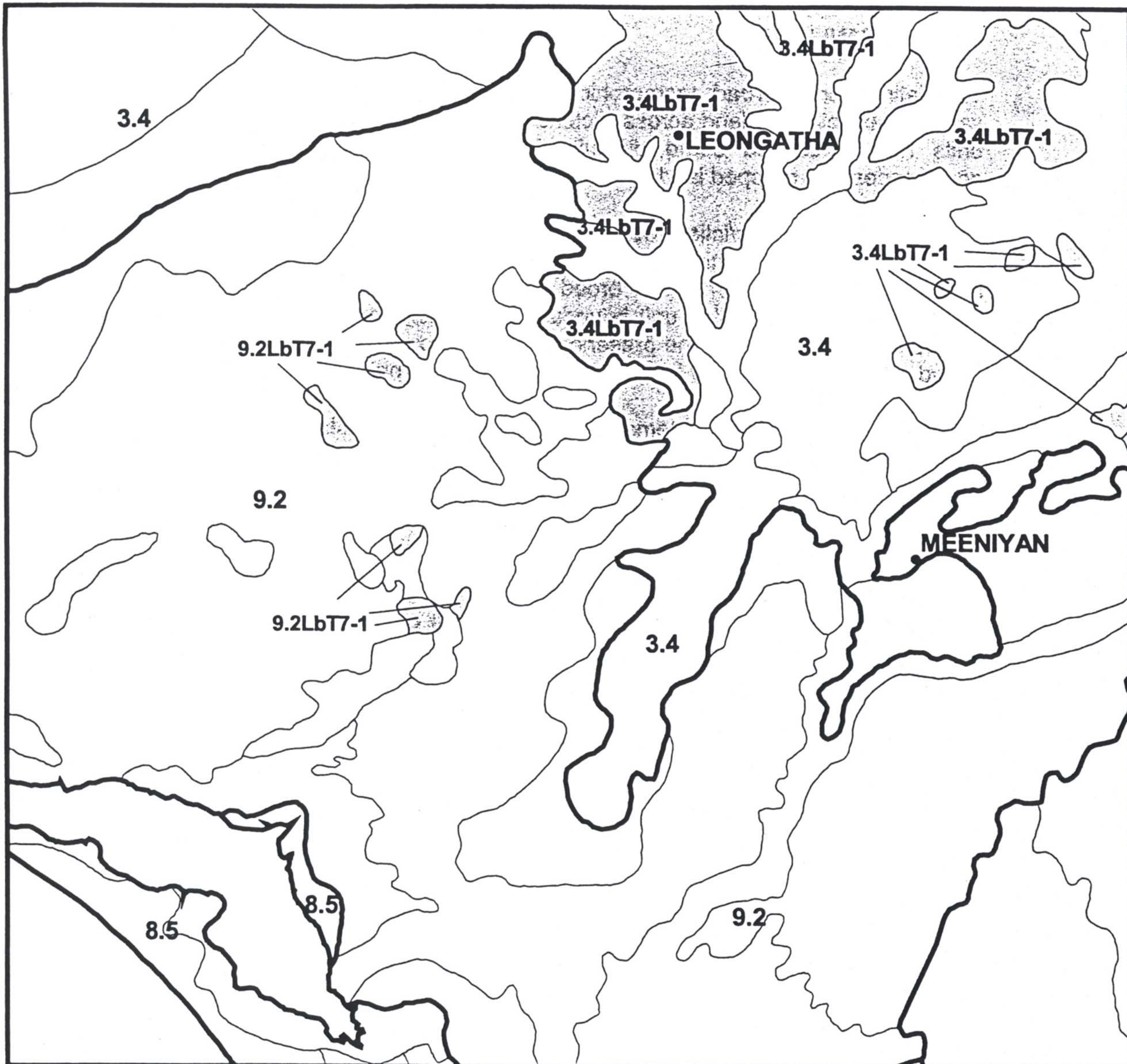
OUTLIERS/INLIERS

The delineation of broad geomorphic units has substantially simplified the vast array of variation exhibited by land across Victoria. At the same time, the concept of geomorphic units has introduced some difficulty in accommodating small and often isolated occurrences of a mapped land system outside its geomorphic unit.

The concept of outliers/inliers was therefore adopted, rather than place every occurrence of every land system within its 'correct' geomorphic unit. This latter approach would have risked rendering the concept of broad geomorphic units meaningless by requiring the delineation of very detailed unit boundaries with many small outlying pockets (outliers). (Inliers are the converse - the presence within a geomorphic unit of small occurrences of a land system that correctly lies within another geomorphic unit.)

There are over 150 land systems in the dataset that are outliers/inliers. In all cases, the outlier has the same landform/lithology/climate code. In most, but not all, cases it also has the same subscript. The database identifies those land systems that are outliers/inliers, and the identity of the 'home' land system.

The Equivalent Land System **Tbr** from the south Gippland LCC Study falls primarily in the **Geomorphic Unit 3.4** (South Victorian Uplands - Dissected falult block) labeleed as **3.4LbT7-1.** However there are small occurrences of **Tbr** within **Geomorphic Unit 9.2** (Southern Victorian Riverine Plains - Intermediate Terraces) which are treated as outliers and labelled as **9.2LbT7-1.** See Figure 3.1.

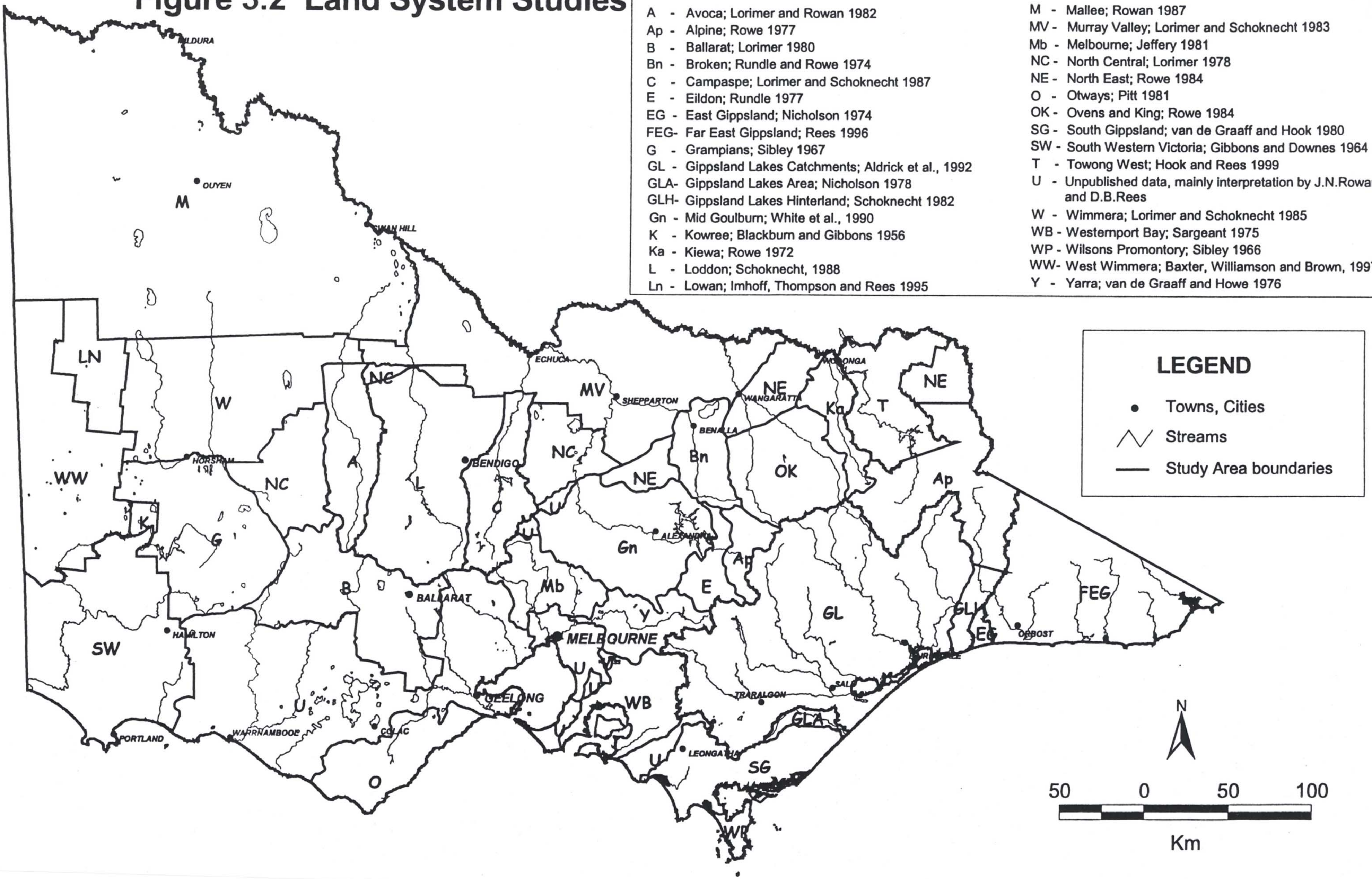


3.4LbT7-1
3.4
3.4LbT7-1
LEONGATHA
3.4LbT7-1
3.4LbT7-1
3.4LbT7-1
3.4LbT7-1
9.2LbT7-1
3.4
9.2
MEENIYAN
9.2LbT7-1
3.4
8.5
8.5
9.2

SOURCES OF INFORMATION

The compilation of the dataset has been possible because of a variety of studies of the land undertaken over the last forty years. While these studies have varied in their methodology, scale, spatial coverage and intent, they have resulted in broadly comparable data that has been generalised to provide a statewide coverage at a consistent scale and level of detail. These studies are listed in Table 3.7 and their spatial coverage already indicated in Figure 3.2.

Figure 3.2 Land System Studies



Key to Land System Studies

A - Avoca; Lorimer and Rowan 1982
Ap - Alpine; Rowe 1977
B - Ballarat; Lorimer 1980
Bn - Broken; Rundle and Rowe 1974
C - Campaspe; Lorimer and Schoknecht 1987
E - Eildon; Rundle 1977
EG - East Gippsland; Nicholson 1974
FEG- Far East Gippsland; Rees 1996
G - Grampians; Sibley 1967
GL - Gippsland Lakes Catchments; Aldrick et al., 1992
GLA- Gippsland Lakes Area; Nicholson 1978
GLH- Gippsland Lakes Hinterland; Schoknecht 1982
Gn - Mid Goulburn; White et al., 1990
K - Kowree; Blackburn and Gibbons 1956
Ka - Kiewa; Rowe 1972
L - Loddon; Schoknecht, 1988
Ln - Lowan; Imhoff, Thompson and Rees 1995
M - Mallee; Rowan 1987
MV - Murray Valley; Lorimer and Schoknecht 1983
Mb - Melbourne; Jeffery 1981
NC - North Central; Lorimer 1978
NE - North East; Rowe 1984
O - Otways; Pitt 1981
OK - Ovens and King; Rowe 1984
SG - South Gippsland; van de Graaff and Hook 1980
SW - South Western Victoria; Gibbons and Downes 1964
T - Towong West; Hook and Rees 1999
U - Unpublished data, mainly interpretation by J.N.Rowan and D.B.Rees
W - Wimmera; Lorimer and Schoknecht 1985
WB - Westernport Bay; Sargeant 1975
WP - Wilsons Promontory; Sibley 1966
WW- West Wimmera; Baxter, Williamson and Brown, 1997
Y - Yarra; van de Graaff and Howe 1976

Table 3.7 Contributing land studies.

Map Symbol	Reference
A	Lorimer, M.S., and Rowan., J.N. (1982). **A Study of the Land in the Catchment of the Avoca River.** Technical Communication No. 15. Soil Conservation Authority, Victoria.
Ap	Rowe, R.K. (1977). **Land Systems. Report on the Alpine Study Area**. Land Conservation Council.
B	Lorimer, M.S. (1980). **Land Systems. Report on the Ballarat Area**. Land Conservation Council.
Bn	Rundle, A.S., and Rowe, R.K. (1974). **A Study of the Land in the Catchment of the Broken River.** Technical Communication No. 9. Soil Conservation Authority, Victoria.
C	Lorimer, M.S. and Schoknecht, N.R. (1987). **A Study of the Land in the Campaspe River Catchment.** Technical Communication No. 18. Land Protection Division, Department of Conservation, Forests and Lands, Victoria.
E	Rundle, A.S. (1977). **A Study of the Land in the Catchment of Lake Eildon.** Technical Communication No. 11. Soil Conservation Authority, Victoria.
EG	Nicholson, B.M. (1974). **Land Systems. Report on the East Gippsland Area.** Land Conservation Council.
FEG	Rees ,D.B. (1996). **Land Inventory in East Gippsland - A Reconnaisance Study**. Technical Report No. 23. Centre for Land Protection Research, Department of Natural Resources and Environment, Victoria.
G	Sibley, G.T. (1967). **A Study of the Land in the Grampians Area.** Technical Communication No. 4. Soil Conservation Authority, Victoria.
GL	Aldrick, J.M, Hook, R.A,, van de Graaff, R.M, Nicholson, B.M, O'Beirne, D.A. and Schoknecht, N.R. (1988). **A Study of the Land in the Catchment to the Gippsland Lakes, Volume 1.** Technical Communication No. 17. Land Protection Division, Department of Conservation, Forests and Lands, Victoria. Aldrick, J.M, Hook, R.A, van de Graaff, R.H.M, Nicholson, B.M, O'Beirne, D.A and Schoknecht, N.R (1992). **A Study of the Land in the Catchment to the Gippsland Lakes, Volume 2.** Technical Communication No. 17. Land and Catchment Protection Branch, Department of Conservation and Natural Resources.
GLA	Nicholson, B.M. (1978). **A Study of the Land in the Gippsland Lakes Area.** Technical Communication No. 12. Soil Conservation Authority, Victoria.
GLH	Schoknecht, N.R. (1982). **Land Systems. Report on the Gippsland Lakes Hinterland Area.** Land Conservation Council.
Gn	White, L.A, Gigliotti, F. and Cook, P.D. (*Eds.*) (1990). **A Reconnaissance Survey of the Catchment of the Middle Reaches of the Goulburn River.** Land Protection Division, Department of Conservation, Forests and Lands.
K	Blackburn, G, and Gibbons, F.R. (1956). **A Reconnaissance Survey of the Soils of the Shire of Kowree.** Soils and Land Use Series No. 17. CSIRO Division of Soils.
Ka	Rowe, R.K. (1972). **A Study of the Land in the Catchment of the Kiewa River.** Technical Communication No. 8. Soil Conservation Authority
L	Schoknecht, N.R. (1988). **Land Inventory of the Loddon River Catchment - a Reconnaissance Survey.** National Soil Conservation Program, Land Protection Division, Department of Conservation, Forests and Lands, Department of Primary Industry.

Table 3.7 continued on next page.

Table 3.7 Contibuting land studies (continued).

Map Symbol	Reference
Ln	Imhof, M., Thompson, S. and Rees, D. B. (1995) Major Agricultural Soils in the Shire of Lowan Stage One Interim Report **Department of Agriculture and Department of Conservation and Natural Resources, Victoria**
M	Rowan, J.N, and Downes, R.G. (1963). **A Study of the Land in North-Western Victoria.** Technical Communication No. 2. Soil Conservation Authority, Victoria.
Mb	Jeffrey, P.J. (1981). **A Study of the Land in the Catchments to the North of Melbourne.** Soil Conservation Authority, Victoria.
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