PIPERS
REPORT

LAND CAPABILITY SURVEY OF TASMANIA

K E NOBLE
1990

PIPERS REPORT
and accompanying 1:100 000 scale map

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CONTENTS

1. Introduction

The Department of Primary Industry in 1989 commenced a Land Capability Survey of Tasmania at a scale of 1:100 000. The primary aim of the survey is to identify and map the location and extent of different classes of agricultural land, in order to provide an effective base for land use planning decisions. In addition, the aim is to ensure that the long-term productivity of the land is maintained, through the promotion of compatible land uses and management practices. A land capability classification system has been developed specifically for Tasmania comprising seven classes, and is based on the capability of the land to support a range of agricultural uses on a long-term sustainable basis.

The basis of soil conservation is the proper use and management of the land - that is, using and managing land within its capability. The conservation and correct management of Tasmania's most important agricultural asset, the soil, is vital for sustained productivity. However, much of the land in Tasmania has limitations that restrict the land for agricultural use. The system of land capability recognises these limitations, and classifies the land accordingly.

This report and associated map describes and depicts the land capability of the Pipers map (1:100 000 scale Tasmap series). It is the first to be produced in a series of land capability maps and reports for Tasmania. All 1:100 000 maps of the Tasmap series that contain privately owned land will be mapped. Only Private Freehold and Leased Crown Land will be mapped at 1:100 000 scale, with some selected high priority areas remapped at larger scales.

2. Summary

This map and report describes and classifies the land capability of all privately owned land and leased Crown land on the Pipers map. The map covers the area between Maitland Bay and Waterhouse Beach in the north, to south of Launceston City in the south. Major towns in the area include Bridport, Lilydale and Legana.

The land capability system is based on the capability of the land to produce agricultural goods without impairing the long-term, sustainable productive potential of the land. A land capability classification system has been developed specifically for Tasmania, and categorises the land into seven land capability classes.

The land capability data and boundaries have been determined by a combination of field work and aerial photo-interpretation.

The major constraints which have determined the land capability classes are: slope, erosion hazard, inferior soils (poor soil structure, low fertility soils), and rockiness.

A summary of the areas of the land capability classes mapped on the Pipers map are shown in Table 1.

Class	Area (ha)	% of land area on Pipers map
1	-	-
2	910	0.4
3	2 895	1.3
4	62 975	27.5
5	41 890	18.3
6	39 490	17.3
7	4 700	2.0
Exclusion areas	75 925	33.2
TOTAL	228 785	100

Table 1: Summary of areas on Pipers map.

3. Acknowledgements

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4. How to use this Map and Report

It is important that the land capability maps be used in conjunction with the accompanying report. Special attention needs to be given to reading and understanding the principles of the land capability classification system, outlined in Sections 6 and 7 of this report. By referring to the map, and locating the area of interest, the land capability class assigned to that area can be determined. This is given by a number (1 to 7) which corresponds to the land capability class. Descriptions of the land capability classes are given on the side legend of the map, and detailed in Section 8. Further detail about each of the land capability classes occurring on the Pipers map is given in Sections 9 and 10, including explanatory diagrams showing the sequence of land capability classes on different rock types.

4.1 Limitations of Scale

Special attention needs to be given to the limitations imposed by the scale of mapping.

It is important that the map be used at the scale at which it is published. **DO NOT ENLARGE THE MAP.**

Errors in interpretation will occur if the map is enlarged and there will be a reduction in credibility of the information, as small areas would be delineated separately at a larger mapping scale. If more detail is required, the area of interest should be mapped at a larger scale rather than enlarge the smaller scale map.

Regardless of the mapping scale used, there are always some areas which are too small to delineate accurately.

At the map scale used in this survey, 1:100 000, the minimum area which can be adequately depicted on the map represents approximately 64 ha on the ground. Minimum widths of map units are approximately 300 m at this scale of mapping. However in some instances where it was felt important to highlight areas of higher land capability classes, or in areas where the lack of existing detail allowed separating out smaller areas, map units much smaller in size than 64 ha have been delineated.

The areas of land capability classes shown on the maps are rarely made up entirely of the land capability class indicated. They almost invariably contain areas of other land capability classes, too small to depict at the scale of the map. In complex areas, it is not possible to delineate these smaller areas of other land capability classes. In such circumstances the land is assigned to the dominant class, but up to 30% of land of other classes may be included. In the majority of cases, the land capability classes are estimated to be at least 80% pure, with more uniform areas having inclusions of other classes limited to about 10%.

In some areas, two land capability classes may be mapped as a complex, where it has been impossible at the scale of mapping to separate them, and they both occupy between 40 and 60% of the area. In this case both land capability class numbers are included on the map (e.g. 4 + 5).

The accuracy of the land capability boundaries depends on a number of factors including the complexity of the terrain and geology. In some cases the class boundaries may be well defined, such as with abrupt changes in geology or topography. Alternatively, changes may be gradual and more difficult to assess such as with a change in soil depth, soil type, slope, or extent of rockiness. In these cases the boundary is transitional and therefore is less precisely plotted.

4.2 Interpretation of the Land Capability Information

The slope and range of applications of the land capability information depends on the scale at which the land capability surveys are carried out. 1: 5 000 or 10 000 is suitable for whole farm planning purposes, used to plan form layouts, identify appropriate land uses and soil conservation and land management practices. A scale of 1:25 000 is suitable for catchment planning and 1:50 000 or 1:100 000 scales for district and regional planning.

One of the major uses of this map series at 1:100 000 scale will be for local government, regional and state land use planning decisions. The information at this scale is not intended to be used to make planning decisions at catchment or farm levels.

Examples of other potential uses of the land capability information would be:

- Rational planning of urban and rural subdivisions
- Identifying areas for new crops, enterprises or major developments
- identifying areas for expansion for particular land uses
- Identifing areas of prime agricultural land (Classes 1 to 3) for retention for agricultural use
- Planning for new routes for highways, railways, transmission lines etc.
- Identifying areas of land degradation, flooding of areas that may require special conservation treatment
- Identifying areas of potential erosion hazard

The interpretation, manipulation and dissemination of the land capability information will be greatly enhanced with the aid of a GIS (Geographic Information System) database.

The applications of the land capability information do not depend solely on the maps themselves, but also on the implementation framework - legislation and administration, which are responsible for putting land use policies into practice. The land capability maps do not purport to have any legal standing as documents in their own right, nor should they attempt to stand alone in planning decisions without being supported by other relevant land resource, economic or social or conservation considerations.

4.3 Copyright

Both the maps and reports in this series are copyright, and the data is solely owned by the Department of Primary Industry, Tasmania.

Anyone wishing to use any of the information contained in this report or accompanying map should seek permission from the Secretary, Department of Primary Industry, Hobart.

5. Methodology

5.1 Mapping Technique

The land capability maps are produced from a combination of both field work and aerial photo-interpretation. Extensive field work along major roads has been carried out over the survey area to check soil types, soil depths, geological boundaries etc, and to assess the land capability classes. Slopes were measured in the field with an inclinometer to determine critical slopes for different soil types. Soil profiles were examined by augering or by examination of exposures along road cuttings and banks to determine depth of soil horizons and their properties. Exposures were also used to examine the underlying geology. Local agricultural advisory officers were taken in the field to assist with cropping and agricultural information. Land capability class boundaries were transferred onto aerial photographs where possible in the field, using the technique of stereoscopic interpretation. In areas where access was not possible land capability boundaries were drawn after interpretation of aerial photos and other relevant available information (geology and soils maps). The land capability boundaries were then transferred onto the relevant topographic base map. Extensive field checking of the area has been carried out to check the accuracy of boundaries and the land capability assessment assigned to each unit.

5.2 Aerial Photography

Aerial photos used for this map have been 1981/1982 Tamar and North East surveys, at 1:42 000 scale.

5.3 Exclusion Areas

Only Private Freehold and Leased Crown Land has been mapped (as shown on the TASMAP 1:100 000 series). All other areas such as State Forests, State Reserves, Conservation Areas and Crown Land etc., have been excluded from the mapping program.

These excluded areas are indicated on the map by the letter E.

6. Land Capability Classification

Land capability classification is an internationally recognised means of land classification, used to evaluate the capability of land to support a range of land uses, on a long-term sustainable basis.

For the Tasmanian classification, agricultural land uses only are covered, and are defined as broadscale grazing and cropping uses. Land capability ratings for specific land uses are not evaluated, nor is the capability of land for forestry use incorporated into the classification system.

Land capability may be defined as a measure of the ability of land to sustain a range of land uses without degradation of the land resource. It is an interpretive and subjective assessment based on the physical limitations and hazards of the land, potential cropping and pastoral productivity, and the versatility of the land to produce a range of agricultural goods.

Land capability assessment takes into account the physical nature of the land (e.g. geology, soils, slope) plus other factors (e.g. climate, erosion hazard, land management practices) which determine how that land can be used without destroying its long-term potential for sustainable agricultural production. It also takes into account limitations that might affect agricultural use, e.g. stoniness, drainage, salinity or flooding. Land capability assessment is therefore based on the permanent biophysical features of the land (including climate), and does not take into account the economics of agricultural production, distance from markets, or social or political factors.

Land capability assessment should not be confused with land suitability assessment which, in addition to the biophysical features, does take into account economic, social and/or political factors in evaluating the 'best' use of a particular type of land. Land capability classification gives a grading of land for broadscale agricultural uses, whereas land suitability is applied to more specific, clearly defined land uses, such as land 'suitable' for carrots.

The land capability classification system for Tasmania gives an indication of the inherent capability of the land for general agricultural production and does not attempt to portray specific land uses, or rank the value of any particular agricultural land use above another. Neither does it attempt to give an indication of land values.

The system of land capability classifies land into a number of classes according to the land's capability to produce agricultural goods (based on broadscale grazing and cropping uses). The system for Tasmania is based on the USDA (United States Department of Agriculture) approach to land capability.

There are generally three levels to the land capability classification:

- The land capability <u>class</u> - which gives an indication of the general degree of limitation to use

- <u>subclass</u> - which identifies the dominant kind of limitation

- and the <u>unit</u> - which groups land with similar management and conservation requirements.

At the 1:100 000 scale of mapping it is only possible to classify and record at the class level. However the system can be used and applied at more detailed scales by mapping to the subclass and unit level, depending on the purpose of the survey.

The levels of the land capability classification system are shown in Figure 1.

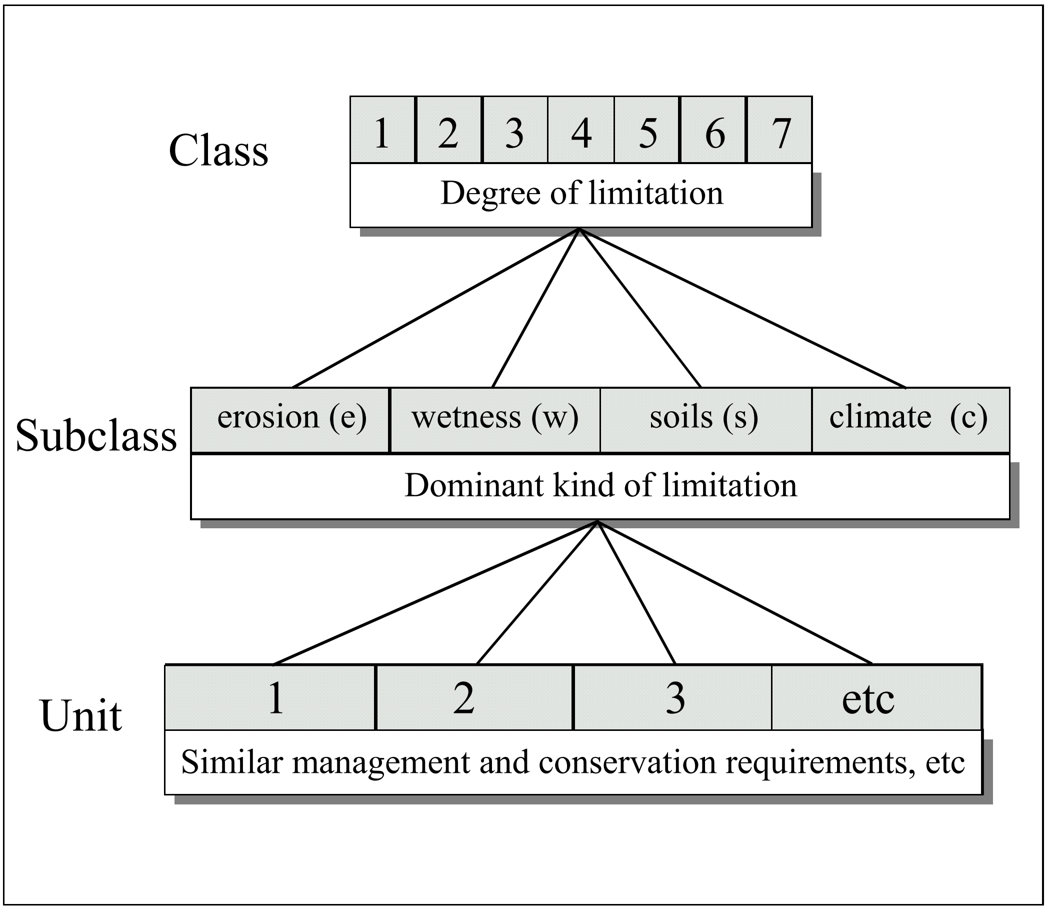

Figure 1: Levels of the land capability classification system. (Adapted from: National Water and Soil Conservation Organisation, 1979, Our Land Resources. (NWASCO), Wellington, New Zealand.)

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Gunn, R.H., Beattie, J.A., Reid, R.E. & van de Graaf, R.H.M., (eds) 1988, Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys. Inkata Press, Melbourne.

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7. Features of the Tasmanian Land Capability Classification System

7.1 The classification is based primarily upon three permanent biophysical features of the landscape - soil, slope and climate, and their interactions. These three factors have a major influence in determining the capability of the land to produce agricultural goods. Other factors which must be taken into account are rock type, erosion hazard, range of crops that can be grown, management practices, soil conservation treatment, risk of flooding and past land use history.

7.2 The classification comprises seven classes ranked in order of increasing degree of limitations to use, and in decreasing order of versatility of use.

7.3 This survey only subdivides land to the class level. Further subdivision of land below the class level would be possible at more detailed scales of mapping, and would group together similar types of land requiring the same kind of management, the same kind and intensity of conservation treatments, and which occur on soils which are adapted to the same kinds of crops, with similar potential yields.

7.4 The system is hierarchical. Class 1 land can produce a wider variety of crops and pastures at higher levels of production with lower costs, or with less risk of damage to the land, than any of the other classes of land. Class 2 land is similarly superior to classes 3 to 7, and so on.

7.5 The system assesses the versatility of the land to produce a range of agricultural goods that are considered typical for Tasmania, and not just those that are more specific or suited to localised areas. For example, the range of crops that can be grown on classes 1 and 2 land would be wider than the range of crops grown on classes 3 and 4 land; and would include vegetable and allied crops, orchards as well as cereals, essential oils and forage crops.

7.6 The classification takes into account physical limitations the land may have. Limitations may be defined as physical factors or constraints which affect the versatility of the land and determine its capability for long-term sustainable agricultural production. The capability class takes into account the kind and degree of limitations present.

Examples of different kinds of limitations are: erosion hazard, slope, climate, flooding, stoniness, rock outcrops, salinity, poor soil structure, poor internal drainage, low fertility and low soil moisture holding capacity. There may be one or a number of limitations present at any one site, but it is the overall degree of limitation present that determines the capability class.

Physical limitations can be classified as either permanent, or able to be removed or modified. Permanent limitations include slope and effects of climate. Removable or modifiable limitations include flooding, poor drainage, and the presence of stones. The feasibility of the removal of a limitation depends largely on the severity of the limitation, and also on economics. Guidelines are therefore necessary to differentiate between limitations that can be reasonably removed and those that cannot.

Although economics do not feature in land capability assessments, they are a significant consideration when the removal of limitations is contemplated. The following key words: reasonable, feasible, and economic, are considered when deciding if limitations could be modified or removed. Limitations that are assumed to be removable using existing technology on an individual farm basis include poor drainage, stoniness, and low fertility. Where the necessary technology is not a practical proposition, or beyond the capabilities of an individual farmer and requires a catchment or community scheme, the land is classified according to the nature of its present limitations. If in time such schemes become operative, the land can be reclassified (if appropriate) into a higher land capability class.

Many areas have the potential to attain an improved land capability ranking through the application of irrigation. The extent of the beneficial effects of irrigation on land capability will vary considerably, depending upon such factors as available water and economics, which require individual assessment on a property basis. However it is not possible to provide a uniform system of classification of land capability based on irrigation potential on an on-farm basis, so this has not been included in the assessment of capability. In addition, areas within regional irrigation schemes (such as Cressy/Longford, Winnaleah and Coal River) may have a higher land capability ranking than that shown on the map. However because the effect of an irrigation scheme on land capability depends on a number of factors including economics, availability of water and type of irrigation used, the fact that an area falls within the boundary of a designated irrigation scheme has not influenced its capability in this study. Therefore land capability has been assessed assuming no irrigation potential.

With drainage, the land capability is considered assuming that drainage techniques that are currently available within the scope of an 'average' farmer to install, have been installed. These would include maintenance of existing drainage lines, on individual properties, and installation of basic drainage measures to remove excess surface water. The installation of a large scale drainage scheme or extensive underground drainage, is not considered to be within the scope of individual farmers.

The land capability of areas that fall within Drainage Trust Schemes (e.g. Dairy Plains, King Island, Flinders Island, Mowbray Swamp and Circular Head) has been assessed according to the present condition of the land. In other words, the fact that an area of land falls within the boundary of a Drainage Trust Scheme has not influenced the land capability ranking. This is mainly because not all areas of land within Drainage Trusts are capable of the same increased land capability ranking, and not all areas within the Trust boundaries have been effectively drained to date.

Maps of both Irrigation Scheme areas and Drainage Trust areas will be incorporated into the relevant reports.

Climate is one of the major permanent limitations that restrict the versatility of the land (particularly for cropping), and together with soil and slope, has a major influence in determining the land capability class.

For a land capability survey at this scale (1:100 000) only generalised statements and boundaries relating to climate can be made. At more detailed scales of mapping, climatic boundaries (as they affect land capability) can be more clearly defined. These would be based on more localised effects of topography (including aspect), reliability of rainfall, availability of irrigation water, and more detailed records of rainfall, frosts, wind, etc.

Some of the major climatic constraints to agricultural use in Tasmania are:

- Uneven rainfall distribution (associated with topography, altitude and time of year)

- Unreliable rainfall n certain areas

- Increasing frost hazard and shorter growing seasons in areas away from the coastal maritime influence

- Effect of wind in exposed areas

- Extremes of both summer and winter temperatures affecting evaporation and length of growing season.

Section 9 deals more fully with the available relevant climatic information pertinent to each map sheet.

7.7 The system is based on agricultural production (cropping and pastoral productivity) and does not take into account forestry productivity. It is based on cultivation of the land for cropping purposes and not other land use systems which can sustain 'crops' on steeper land with longer rotations, and less risk of erosion (e.g. perennial horticulture, tree crops, minimum tillage crops). Indicators of stocking rates are incorporated where possible to support the grazing potential of the land.

7.8 The system considers degradation of the soil resource and does not take into account the possible effects of agricultural land use on water quality, aesthetics, wildlife, etc.

7.9 As with most land classification systems certain assumptions are necessary. These are:

(a) The land capability classification is an interpretive classification based on the permanent biophysical characteristics of the land.

(b) A moderately high level of management is being applied to the land.

(c) Appropriate soil conservation measures have been applied.

(d) Where it is reasonable and feasible for an individual farmer to remove or modify physical limitations (e.g. high water tables, stoniness, low fertility) the land is assessed assuming the improvements have been made.

(e) Land capability assessments of an area can be changed by major schemes that permanently change the nature and extent of the limitations (e.g. drainage schemes, irrigation or flood control schemes).

(f) The land capability classification is not a productivity rating for specific crops, although the ratio of inputs to outputs may help to determine the land capability class.

(g) Land capability does not take into account economic, social or political factors and is not influenced by such factors as location, distance from markets, land ownership, or skill of individual farmers.

(h) Present and past uses of the land (or similar land elsewhere) are guides to potential, in that they can indicate the limits of the capability of the land. Present land use and vegetation cover are not always good indicators of land capability class. The system of land capability is aimed at assessing the potential sustainable productivity of land rather than current productivity.

(i) Assessments are based on the capability of the land for sustained agricultural productivity, since use of the land beyond its capability can lead to land degradation and permanent damage.

7.10 The system is consistent across the State.

8. The Land Capability Classes

The land capability class is the broadest grouping of the land capability classification and gives an indication of the general degree of limitation to use.

There are seven classes, arranged from Class 1 to Class 7 in order of increasing degree of limitations or hazards to use, and decreasing degree of versatility (refer to Tables 2 and 3).

Increasing Limitations to Use ↓

Decreasing Versatility ↓

<table>
<tr><th>CLASS</th><th>CROPPING SUITABILITY</th><th>PASTORAL SUITABILITY</th></tr>
<tr><td>1</td><td rowspan="2">High</td><td rowspan="4">High</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Medium</td></tr>
<tr><td>4</td><td>Low</td></tr>
<tr><td>5</td><td rowspan="3">Unsuitable</td><td>Medium</td></tr>
<tr><td>6</td><td>Low</td></tr>
<tr><td>7</td><td>Unsuitable</td></tr>
</table>

Table 2: Suitability of different land uses for land capability classes.
(Adapted from: National Water and Soil Conservation Organisation, 1979, Our Land Resources. (NWASCO), Wellington, New Zealand.)

CLASS		LIMITATIONS	CHOICE OF CROPS	CONSERVATION PRACTICES
1	Under cultivation	very minor	any	very minor
2	Under cultivation	slight	slightly reduced	minor
3	Under cultivation	moderate	reduced	major
4	Under cultivation	severe	restricted	
5	Under pastoral use	slight to severe	grazing	major + careful management
6	Under pastoral use	severe	grazing	
7	Under pastoral use	very severe to extreme	No, or very minor, agricultural value	

Table 3: Features of land capability classes.

The criteria used to define the classes are based on observation and experience only, and not on experimental work. Where necessary, certain criteria (in particular relating to soil physical and chemical characteristics) have been tested in a laboratory situation.

In time, it may be necessary to refine or modify the criteria for the different classes to incorporate changes in technology and increased understanding about the interactions between soils, farming practices and the natural environment. It is anticipated that the guidelines to the classes will be revised, where relevant, to incorporate this new information.

8.1 Class Definitions

CLASS 1

Multiple use land with virtually no limitations to intensive cropping and grazing. It occurs on flat land with deep, well drained soils, and in a climate that favours a wide variety of crops. It is capable of being cropped eight to nine years out of ten in a rotation with pasture or equivalent.

CLASS 2

Land suitable for intensive cropping and grazing. Limitations to use are slight, and these can be readily overcome by management and minor conservation practices. Limitations reduce the length of the cropping phase to five to eight years out of ten in a rotation with pasture or equivalent.

CLASS 3

Land suitable for cropping and intensive grazing. Cultivation for cropping should be limited to two to five successive crops in a rotation with pasture or equivalent. Soil conservation practices and sound management are needed to overcome the moderate limitations to cropping use. The range of crops able to be grown is generally more restricted than on Class 1 or 2 land.

CLASS 4

Land marginally suitable for cropping because of limitations which restrict the range of crops that can be grown, and/or make major conservation treatment and careful management necessary. Cropping rotations should be restricted to one to two years out of ten in a rotation with pasture or equivalent. This land is well suited to intensive grazing.

CLASS 5

Land with slight to moderate limitations to pastoral use. This land is unsuitable for cropping, although some areas on easier slopes may be cultivated for pasture establishment or renewal. The effects of limitations on the grazing potential may be reduced by applying appropriate soil conservation measures and land management practices.

CLASS 6

Land marginally suitable for grazing because of severe limitations. This land has low levels of production, high risk of erosion, low natural fertility or other limitations that severely restrict agricultural use.

CLASS 7

Land with very severe to extreme limitations which make it unsuitable for agricultural use.

8.2 Guides for Identifying the Land Capability Classes

Class 1 land has most or all of the following features :

. land is level or very gently sloping with slopes less than 5%,
. soils are deep, well drained and have good water holding capacity,
. surface drainage is adequate,

- soils can be maintained in good tilth and productivity,
- productivity is high for a wide range of crops,
- erosion hazard is nil to slight,
- soils are able to withstand frequent cultivation and irrigation without serious damage under sound, average management,
- soil physical and chemical deficiencies can be corrected economically,
  extremes of climate do not seriously affect productivity,
- soils do not have high sand or clay contents.

Class 2 land has most or all of the following features:

- slopes may range up to 12%,
- soils have a deep rooting depth for plants and are well drained,
- soils have a moderate to high capacity to withstand frequent cultivation and irrigation without serious damage under sound, average management,
- minor conservation measures may be required,
- soils can be maintained in good tilth and productivity,
- productivity is high to moderately high for a range of crops,
- adverse soil characteristics can be improved economically,
- the risk of flooding is low.

Class 3 land has most or all of the following features:

- slopes may range up to 18%,
- high to moderately high levels of productivity under improved pasture species and crops,
- the range of crops is generally more restricted than on classes 1 or 2 land,
- soil depth and drainage can be variable,
- conservation measures are necessary under cropping,
- soil physical features and/or slope restrict the amount of cultivation the land will tolerate between pasture phases.

In addition they may have a range of limitations from among the following:

- slope,
- erosion hazard,
- soil physical handicaps (e.g. stoniness, internal drainage, soil structure, nutrient deficiencies),
- salinity hazard,
- periodic flooding.

Class 4 land has a similar set of limitations to those described above for Class 3 but the limitations are more severe so that only occasional cropping is possible. Slopes may range up to 30%. Major soil conservation practices may be necessary under cropping.

Class 5 land has many of the following features:

- slopes can range up to around 40%,
- land may be broken by gullies and surface irregularities,
- the degree of stoniness, wetness or other physical limitations prevents the cultivation of the soil for cropping,
- erosion hazard may be moderate to severe,
- nutrient deficiency, acidity or salinity may depress but not prevent plant growth.

Class 6 land is often very steep, rocky or wetlands.

The land may have either a single very severe limitation or a combination of several severe limitations from among the following:

- slope,
- stoniness or rockiness,
- erosion hazard,
- soil physical limitations,
- salinity,
- surface water, flooding,
- nutrient deficiency,
- climate, altitude.

These limitations make this class of land unsuitable to be cleared for grazing and steeper areas should be left under a vegetative cover, because of the potential erosion hazard and low productivity. Conservation measures including revegetation or retention of existing vegetation cover should be adopted.

Class 7 land has a similar set of limitations to those described for Class 6 but the limitations are very severe to extreme, making this land unsuitable for agricultural use.

Note:

1. Slope ranges given are the maximum slopes for the most stable soils in Tasmania (i.e. soils on basalt). Other less stable soils will have slope ranges lower than these for each capability class (see Section 10).

2. The cropping rotations indicated are a guide to ensure that soil structure is maintained or improved, thereby preventing degradation of the soil resource under cropping regimes.

9. Description of Area Mapped

9.1 Topography

The topography of the Pipers map is variable and is often influenced by the underlying geological formations (refer to Section 9.4).

Altitude ranges from sea level at the coast to over 1 400 m at Mount Barrow.

The majority of the area mapped consists of rolling to steep hills, which occur on the dolerite, sandstone and granodiorite rocks. Flatter areas are found along the river valleys and on the coastal sandplains, which are extensive along the northern coastline.

The southern half of the map is mainly rolling to steep with large areas of dolerite and sandstone hill country. Low terraces and river flats extend along the Tamar River and St. Patricks River.

The south eastern part of the map is generally steeper and of higher elevation than the northern and western areas. Included in this area are the highest points of the Sideling Range, Mount Arthur, Eaglehawk Tier, Foons Hill and Mount Barrow (all in exclusion areas of Forestry Commission Land).

9.2 Climate

The area experiences a generally mild to cool maritime climate, favourable for agricultural production. This maritime influence decreases with distance inland from the coast, and with an increase in altitude. Average monthly and annual maximum and minimum temperatures for selected stations in the region are shown in Table 4. More seasonal variation in temperature is evident inland than nearer the coast. Summers are generally mild to warm, and winters cool to cold. Frosts can be a limiting factor for cropping in some areas, especially inland, and at higher altitudes. Frost information for selected stations is shown in Table 5.

Average annual rainfall varies from about 800 mm at the coast, to between 1 400 and 1 600 mm around Mount Barrow. The influence of the higher ranges (Mount Arthur, Mount Barrow, Sideling Range) result in a rain shadow effect and subsequent higher rainfalls around these localities (see Figure 2 and Table 6). Localised flooding is common during winter along the major river systems, in particular the North Esk and Pipers Rivers.

Prevailing winds are generally from the west and northwest sectors, although variations do occur depending on the time of year. Figure 3 shows wind rose information for George Town and Launceston.

The area experiences a summer dry period, and summer irrigation is a common practice where possible, especially in cropping and dairying areas.

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Station	Alitude (m)	Distance from Coast (km)	Max Min	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bridport 1965-73	10	0	Max	21.7	22.9	21.3	18.8	14.1	14.0	13.1	13.7	14.6	16.4	18.6	20.1	17.4
			Min	11.9	12.3	9.6	8.8	6.9	4.4	2.8	4.9	5.7	7.5	9.9	11.2	8.0
Launceston Airport 1939-84	200	60	Max	23.1	23.1	20.8	17.2	13.8	11.3	10.8	11.9	14.0	16.4	18.6	21.0	16.8
			Min	10.0	10.0	9.0	6.5	4.6	2.9	2.2	3.0	4.1	5.4	7.1	8.7	6.1
Launceston Elphin	50	50	Max	23.9	25.4	22.1	18.8	15.8	12.6	12.3	13.7	15.5	18.2	19.6	22.3	18.3
			Min	11.2	12.1	9.6	7.5	4.7	1.7	2.7	2.7	5.5	6.7	8.7	10.4	7.0
Launceston Pumping Station 1885-1956			Max	24.3	24.6	22.2	18.6	15.2	12.5	12.0	13.4	15.6	17.9	20.5	22.8	18.3
			Min	11.2	11.4	9.8	7.3	5.1	3.3	2.6	3.5	5.1	6.8	8.4	10.1	7.1
Scottsdale 1953-84	200	18	Max	22.2	22.5	20.4	17.3	14.1	12.2	11.4	12.1	13.7	16.0	17.8	19.8	16.6
			Min	10.3	11.0	9.6	7.3	5.3	3.6	2.7	3.4	4.2	5.7	7.3	8.9	6.6

Table 4: Average maximum and minimum temperatures for selected stations (^{o}C).
(Source: 1. Australia, Bureau of Meteorology, 1975, and1986, Mean Maximum and Minimum Temperatures, Selected TasmanianStations. Commonwealth Bureau of Meteorology, Hobart, (unpublished).2. Australia, Bureau of Meteorology, 1980, Climatic Survey, Tasmania. Region 3, Northern. Australian Government Publishing Service, Canberra.)

Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bridport	(a)	8	8	8	8	7	8	8	9	9	9	9	9	
1963-72	(b)	0.3	0.4	1.6	2.6	3.0	7.6	10.7	7.7	4.8	2.3	1.2	0.3	42.5
	(c)	na	0.3	0.5	1.1	1.1	4.7	7.3	3.1	1.2	0.3	0.2	0.1	19.6
Launceston	(a)	30	30	30	29	30	29	30	30	30	30	30	30	
Airport	(b)	na	0.1	0.7	2.9	9.0	13.6	15.4	14.5	9.0	4.7	1.7	0.5	72.1
1939-84	(c)	na	na	0.1	0.7	3.1	6.4	8.4	6.1	2.3	0.6	0.1	0.1	27.9
Launceston	(a)	11	12	12	12	11	12	13	13	13	13	13	13	
Pumping Station	(b)	na	na	0.3	2.9	9.1	12.2	16.8	13.5	8.4	3.3	0.8	0.2	67.5
1885-1956	(c)	na	na	na	0.7	3.8	8.3	10.3	6.9	2.4	0.6	0.1	na	33.1
Scottsdale	(a)	18	18	16	19	19	19	19	19	19	18	19	18	
1953-84	(b)	0.3	0.2	0.4	2.1	6.9	11.3	13.6	11.7	8.5	4.1	2.3	0.3	61.7
	(c)	0.1	na	na	0.2	2.1	4.5	7.6	4.7	3.1	1.1	0.3	0.1	23.8

(a) Number of months of records
(b) Air temperature equal to or less than 2oC(lightfrost)
(c) Air temperature equal to or less than 0oC (heavy frost)

na = not available

TABLE 5: Average frequency of frost (days per month).
(Source: Australia, Bureau of Meteorology, 1980, Climatic Survey,Tasmania. Region 3, Northern. Australian Government Publishing Service, Canberra)

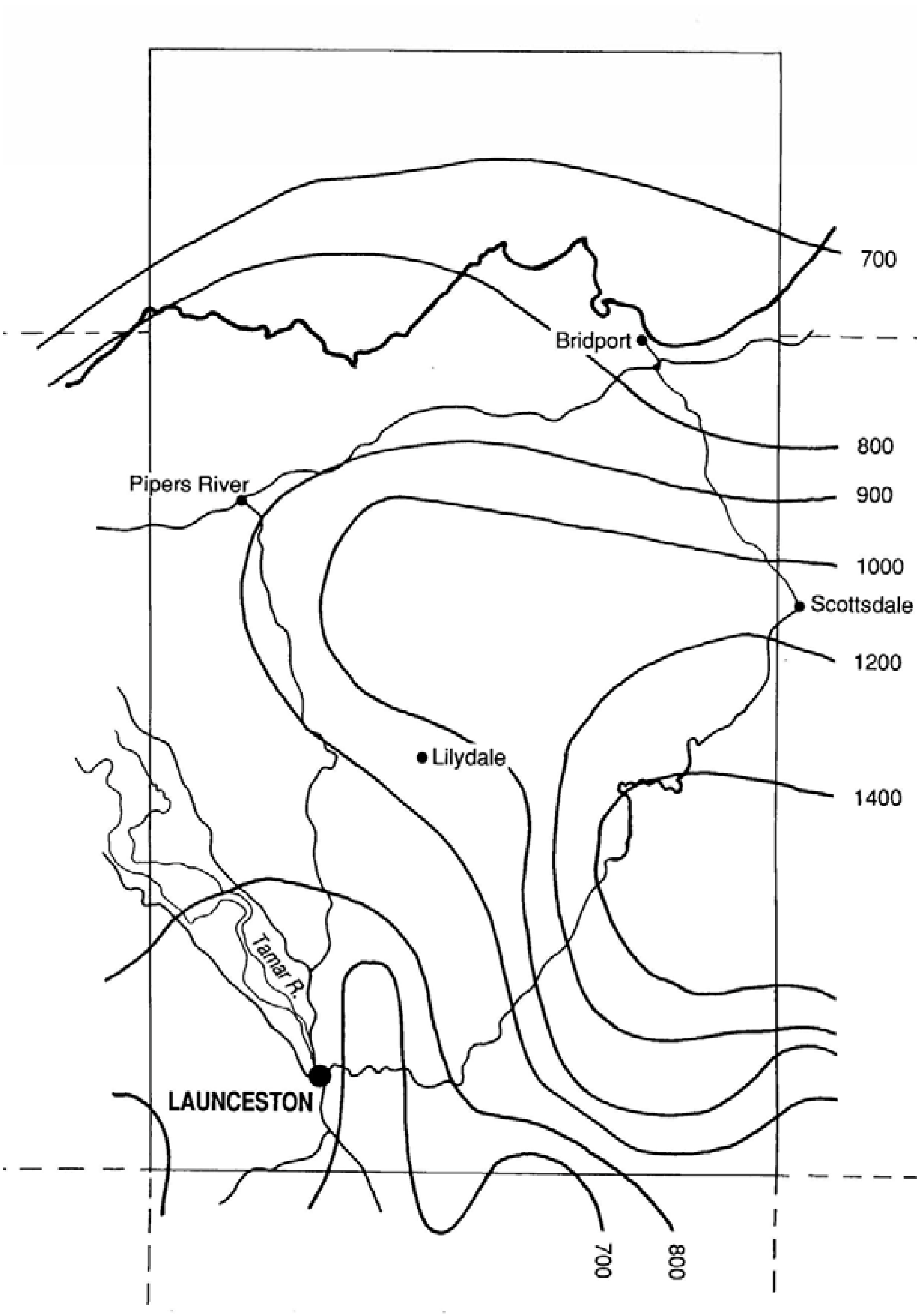

Figure 2: Average annual rainfall (in millimetres) of Pipers map, and mean monthly rainfall (in mm) for Launceston City and Scottsdale.
(Source: Hydro Electric Commission, 1986, Average Annual Rainfall Map of Tasmania (1:500,000 scale map, unpublished). Hobart, Tasmania.)

Station	Period of record	No. of full years of record	Average in recorded years	Calculated average 1911-40 (in)	(mm)
Bridestowe	1924-1956	32	40.1	40.6	1031
Bridport	1913-1956	44	30.6	29.3	744
Danbury Park	1948-1957	10	30.5	30.9	785
Diddleum Plains	1941-1956	14	62.0	60.0	4524
Distillery Creek (Filtration Plant)	1957	1	26.5	30.0	762
Invermay	1932-1950	18	25.4	25.8	655
Jetsonville	1917-1956	33	38.4	37.2	945
Karoola	1901-1922	3	35.6	41.0	1041
Launceston	1883-1958	73	28.5	28.6	726
Lilydale	1894-1956	51	38.7	38.6	980
Musselboro	1931-1957	24	44.6	44.0	1118
Myrtle Bank	1931-1956	25	63.3	63.0	1600
Nabowla	1927-1955	24	38.4	38.1	968
Nunamara	1942-1954	10	40.7	40.2	1021
Pipers River	1927-1928	2	34.6	34.0	864
Sth Springfield	1910-1952	19	50.4	49.0	1245
Springfield	1905-19524	48	52.1	51.3	1303
St Patricks River	1906-1954	40	56.1	56.9	1445
Windermere	1889-1890	2	40.2	34.0	864

Table 6: Average yearly rainfall for selected stations.
(Source: Nicholls, K.D. & Aves, S.M., 1961, Average Yearly Rainfall in Tasmania. Commonwealth Bureau of Meteorology, Melbourne.)

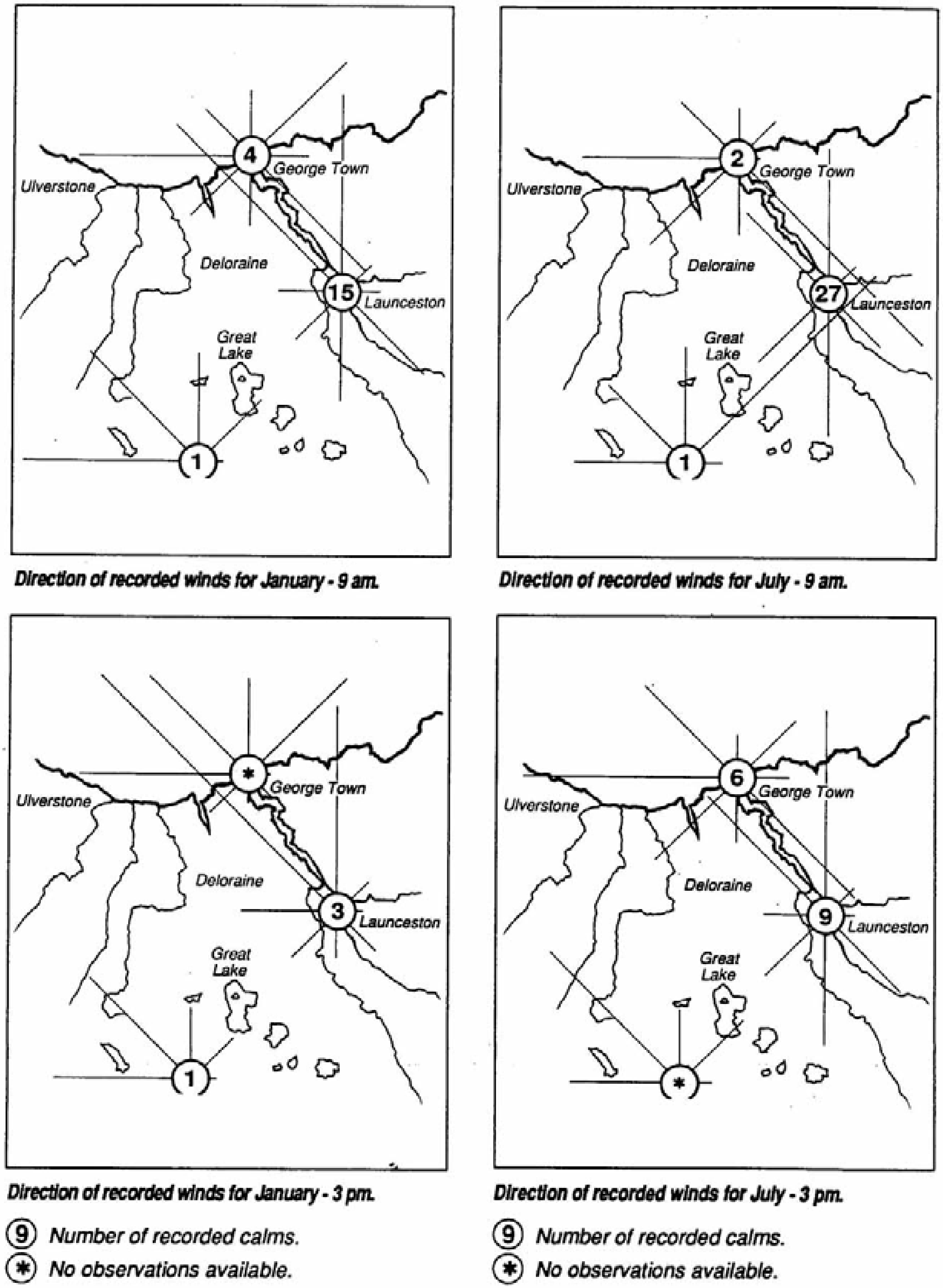

Figure 3: Windrose information for Launceston and George Town. (Source: Langford, J., 1965, Weather and Climate, in Atlas of Tasmania.Lands and Surveys Department, Hobart.)

9.3 Land Use

The major land use on the Pipers map is grazing of both sheep and beef cattle. This includes intensive grazing of improved pastures, and grazing of native pastures, partially cleared areas, steeper country and stony land.

Dairying is concentrated in the higher rainfall areas around Lilydale and west of Scottsdale (Nabowla, Springfield), although supplementary irrigation is used during summer months to boost pasture production.

Cropping is restricted to isolated pockets scattered throughout the area. Intensive cropping is concentrated on the red soils on basalt (krasnozems) around the West Scottsdale-Jetsonville and Pipers River areas. The major crops grown are potatoes, peas, carrots, onions, poppies, beans and cereals. Hops are also grown on the heavier alluvial soils around Springfield. Peas and potatoes are also grown on sandy alluvial soils near Bridport. Vines for wine production are centred around the Pipers Brook and Pipers River areas, principally on the free draining basalt soils, and in areas where the microclimate is favourable i.e. sheltered, frost free areas with the necessary growing degree days. Apple orchards are situated at Dilston and Legana, although in the past more extensive areas in the Tamar Valley were planted for apples. Principal forage and green fodder crops grown include oats, rape, turnips, choumollier and to a limited extent, lucerne.

Forestry is also a major land use with private and commercial forests providing wood for both pulp and sawlogs. Forestry occurs mainly on the dolerite, Mathinna Bed (sandstones and siltstones) and granodiorite country, with the majority in exclusion areas of State Forsests.

For further information on land use statistics in Tasmania, refer to 'Australian Bureau of Statistics, 1990. Agricultural Statistics Tasmania, 1988-89. Catalogue No. 7114.6.

9.4 Geology

The rock types and other soil parent materials on the Pipers map vary widely. They include alluvium, sand, gravels, mudstones, sandstones, dolerite, granodiorite and basalt, and range in age from Quaternary to Silurian.

The geology of the area and its past geological history has a major influence on the present day topography and landforms. Geology also influences the erosion types, drainage characteristics, and soil types, and therefore is a major control influencing land capability.

The Pipers map includes part of the Tamar Graben, the North East Coastal Platforms, and North East Highlands. Refer to Figure 4 which shows the physiographic regions of Tasmania.

The Tamar Graben (rift valley) was formed by major faulting with a north westerly trend. The north eastern side of the Graben has been dissected by the present Tamar River, and ends in the drowned inlets of the Tamar Estuary. This drowned river valley has been formed as a result of past changes in sea level. Many of the fault depressions which occur in the dolerite on either side of the Tamar River, have subsequently been infilled by Tertiary deposits of clays, sands and gravels. The southern half of the Graben (which is to the south and south-west of the Pipers map) incorporates the Launceston Tertiary Basin.

Along the northern coastline, extensive areas of sandplains and windblown sand dunes occur. These areas are part of the North East Coastal Platforms, which consist mainly of undulating low plains. This coastal platform has been formed by seaward extensions of emerged platforms, by processes of coastal accretion.

The North East Highlands rise up gradually from the coastal platform to more hilly and mountainous areas inland. The northern half of the map is composed predominantly of siltstone and sandstone deposits, with gravel and alluvial infill basins occuring in flatter depressions and along river valleys. The siltstone and sandstone sequences are commonly referred to as Mathinna Beds, and are the oldest rocks on the map (Silurian age). Lag deposits of rounded and angular quartz gravels often occur in association with the Mathinna Bed deposits in the north of the map, especially in the Pipers River - Bridport area. Younger sandstone and mudstone deposits (Permian and Triassic age) occur around the Lower Turners Marsh and Lilydale areas. A large area of Tertiary sandstone occurs between Bridport and Scottsdale.

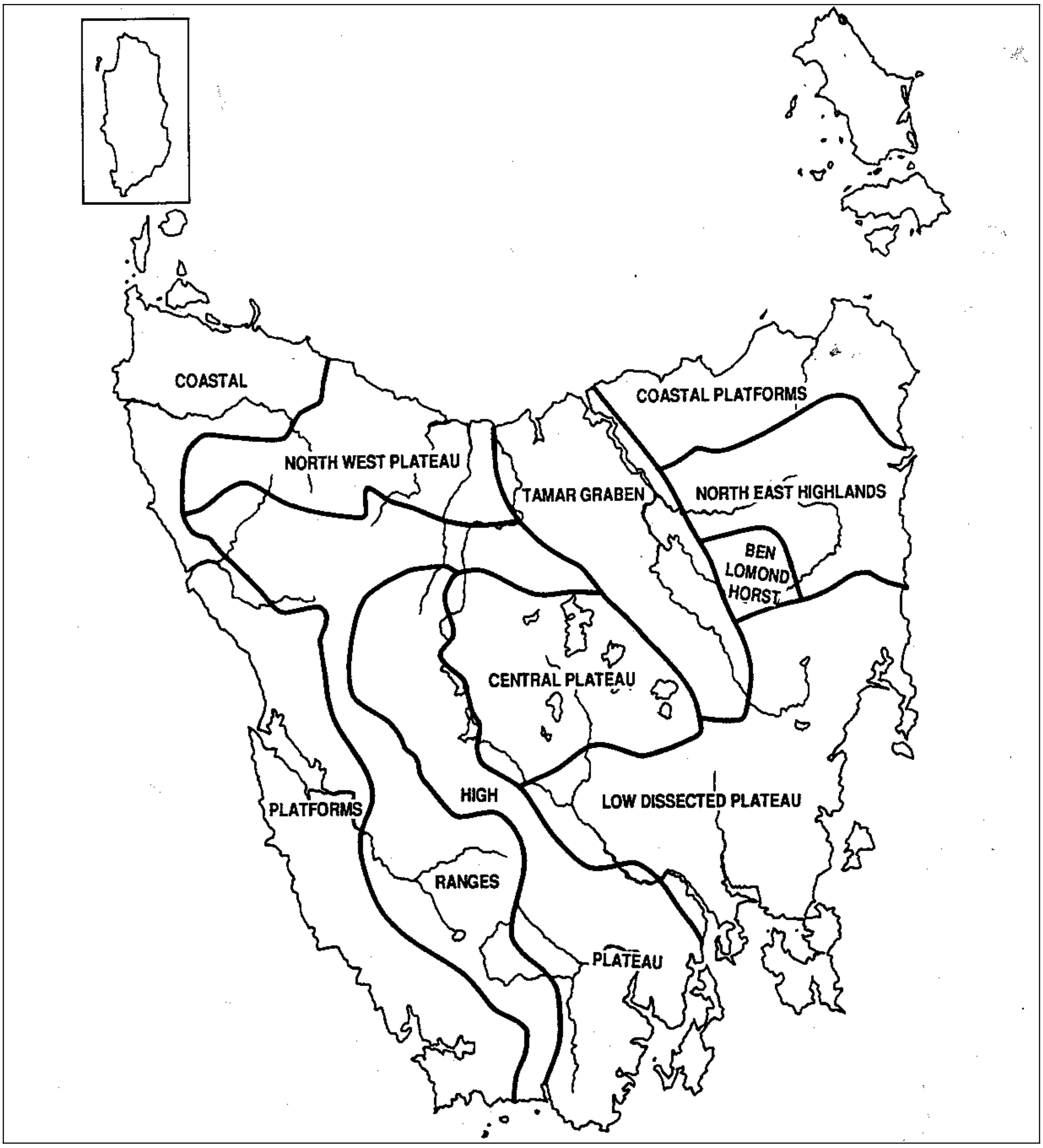

Figure 4: Physiographic regions of Tasmania.
(Source: Australian Bureau of Statistics, 1988, Tasmanian Year Book. Page 32)

The southern half of the map consists of rolling to steep dolerite hill country, with Mathinna Beds and granodiorite occurring to the east. The granodiorite is part of the Scottsdale Batholith (upper Devonian in age), and has intruded the Mathinna Bed sequences.

The dolerite has also originated as intrusive bodies during Jurassic times, and has intruded into the older basement rocks (Permian and Triassic). It occurs as very thick sheets and dykes, and as it is very resistant to erosion, and has been uplifted by subsequent faulting, many of the higher points in the landscape on the Pipers map, are dominated by dolerite (e.g. Mount Barrow). Large areas of dolerite talus and scree often occur around the edges of these higher elevated dolerite bodies, and overlie older sedimentary rocks through which the dolerite has intruded (e.g. slopes of Mount Arthur).

There are also outcrops of basalt occurring throughout the map which have been extruded as volcanic eruptions in Tertiary times. These volcanic erruptions were mostly located along fault lines, and occurred as small localised centres, or as fissure eruptions related to the major NNW trending faults. The basalt is also more resistant to erosion, and therefore in some areas where it caps other sediments, it occurs as elevated plateaus (e.g. Grindelwald). In other areas the basalt flowed along pre-existing river valleys, and has often influenced or changed the direction of flow of some rivers (e.g. Tamar River, St Patricks River).

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9.5 Soils

The soils of the area are very diverse, complex and variable in terms of occurrence, colour, depth, structure, and texture. No detailed soil maps cover the area apart from the unpublished Beaconsfield Survey which covers the Legana - Riverside area.

Generally speaking, the soils on the Pipers map are poor for cropping use, apart from the red basalt soils which cover a very limited area. These basalt soils, although having good structure which can withstand regular cropping, have low to moderate chemical fertility. (See Section 10.2 for further description of krasnozem soils.)

Alluvial soils which occur along the major river and stream valleys, are generally deep and have a range of textures from sandy loams to heavy clays. Some of these alluvial soils would be well suited to cropping in areas not subject to regular flooding or frosts, and many areas would benefit from the installation of drainage. The alluvial soils are usually slightly acid, with pH (1:5 water) around 5.5 - 6.0.

Grey podzolic soils are fairly extensive in the Tamar Valley, and are formed on sandstones, siltstones and sand and gravel deposits. These grey soils are relatively infertile and are low in phosphorus, potassium and molybdenum. They also have copper and selenium deficiencies which can affect animal production. These soils are very acid, with pH around 4.9, and require liming and high fertiliser inputs to be farmed successfully. They also have very poor soil structure and low organic matter levels, which render them easily erodible and unsuitable for general cropping use.

Soils on mudstones have higher clay contents which tend to make them prone to waterlogging. In additontopsoils can also be highly erodible and B horizons are often highly slaking.

Podzol soils occur on the windblown sand deposits near the coast. These soils usually have a dark grey topsoil overlying a light grey sand and a brownish black organic-iron layer. The sand can continue for many metres in depth. These soils are highly susceptible to wind erosion and are unsuitable for cropping because of poor soil structure, low moisture holding capacity and low fertility. Many of these soils in low lying areas, are also water-logged during winter.

Soils on dolerite are variable in terms of soil depth and the amount of stones and boulders present throughout the profile. Topsoils are generally brown, grey-brown or red-brown clay loams, over heavier clay subsoils. Most of the dolerite soils are moderately well drained where there is sufficient slope to aid run-off. The major limitation to cropping of the soils on dolerite is the amount of stones and floaters present, together with shallow soil depths in some areas. The dolerite soils are moderately acid with pH around 5.0-5.5.

The granodiorite soils are also acid, and are low in available potassium and phosphorus. They are very loose and friable, often with coarse sand textures, and can be easily eroded under poor management.

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10. Description of Land Capability Classes on Pipers Map

The following sections describe the different types of land which have been mapped in the six land capability classes found on the Pipers map. The complexity of the pattern of land capability mapped is a reflection of the complex geology, soil types and topography found on this map.

10.1 Class 1 (0 ha) No areas of Class 1 land have been mapped.

10.2 Class 2 (910 ha; 0.40% of Pipers map land area)

Class 2 land on Basalt

Class 2 land has been mapped on basalt soils (krasnozems) which occur in small isolated pockets around Pipers River, north-west of Scottsdale, Lebrina, and Prossers Forest Road.

The krasnozem soils have been formed on basalt flows which were deposited in Tertiary times as a result of volcanic eruptions. They are deep, well structured and free draining soils, suitable for intensive cropping use.

Soil depths can range up to 1 metre deep. The krasnozem soils are friable clay loams over clay subsoils. They have a strongly developed granular structure, and are easy to work over a wide range of moisture conditions. Organic matter content is high in the surface horizons, and needs to be maintained by the use of green manure crops. This would maintain the excellent soil structure and retain minerals essential to plant growth. Leaching of nutrients such as calcium, potassium, sulphur and magnesium are common in deeply weathered basalt profiles, but these losses can be combated by accumulation of nutrients in organic matter in the surface horizons.

To preserve the excellent soil structure and the long-term potential of this land for cropping, class 2 land should be cropped in rotation for five to eight years, in a ten year cycle. Slopes can range up to 12% on class 2 land on basalt. Soils are generally stable, particularly under pasture. When under crop, minor soil conservation works such as graded drains may be necessary to limit fluvial erosion (sheet and rill). Compaction by cropping machinery also needs to be limited in order to prevent compaction of topsoils which may result in decreased infiltration rates.

At present these areas are used for grazing, dairying and limited cropping. Although they are capable of more intensive cropping use, the limited size of the areas available on these gently sloping krasnozems are the major factor limiting intensive use of these soils, especially in the Pipers Brook - Pipers River areas.

In the West Scottsdale area, the red basalt soils are used intensively for cropping, e.g. potatoes, peas, carrots, onions, poppies and cereals. Other crops such as berry fruits, orchards, flower crops and a wide range of other vegetable and horticultural crops can also be grown.

On this map class 2 land occurs in areas with rainfalls less than 1200mm, and although frosts do occur in some areas during winter, they are generally not a significant hazard to cropping use.

An example of the effect of climate is shown in the area of Class 2 land at Prossers Forest Road. This area has a less favourable climate (in particular winter frosts) which would slightly reduce the range of crops able to be grown in comparison with Class 1 land. In areas away from frost hazard, similar areas with slopes between 0 and 5% would be classified as Class 1 land.

The major features of the land capability classes on basalt are shown in Table 7. Refer to Photos 1 and 2 for examples of Class 2 land on basalt.

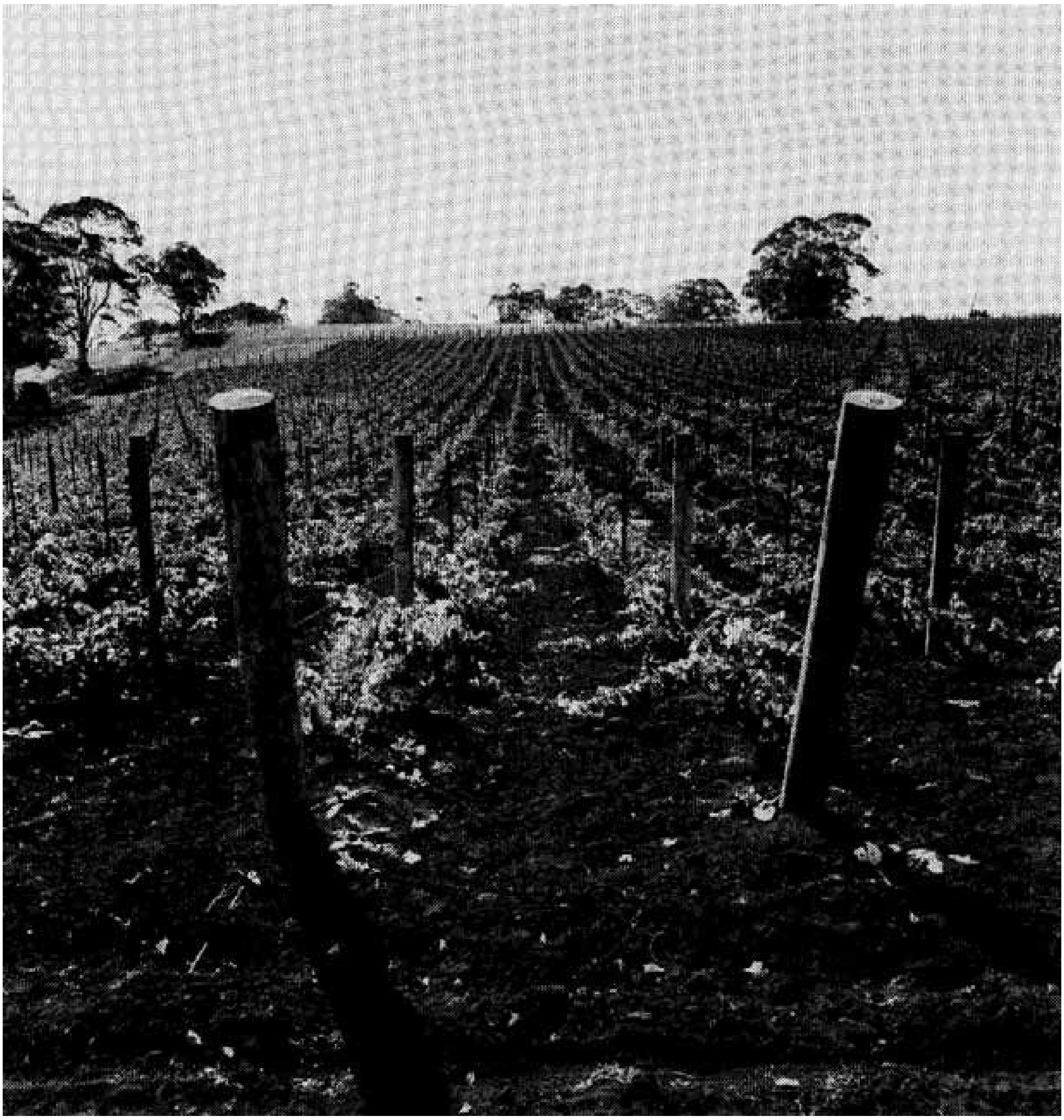


Photo 1: Class 2 land on basalt, with vineyards. Pipers map 185423. Lebrina.

CLASS	SLOPE	EROSION TYPES (under cultivation)	MANAGEMENT MEASURES REQUIRED (under cultivation)	TYPES OF CROPS	LENGTH OF CROPPING PHASE
1	0-5%	Nil to low sheet and rill	No special management practices	All vegetable and allied crops. Cereals	8-9 years (out of 10)
2	5-12%	Low to moderate sheet and rill	Minor conservation works	All vegetable and allied crops. Cereals	5-8 years
3	12-18%	Moderate sheet and rill, low gully	Major conservation works	All vegetable and allied crops. Cereals	2-5 years
4	18-30%	Severe sheet, rill and gully	Major conservation works	Potatoes. Occasional cereals	1-2 years
5,6	>30%	-	-	Unsuitable	Unsuitable

Table 7: Features of land capability classes on basalt.

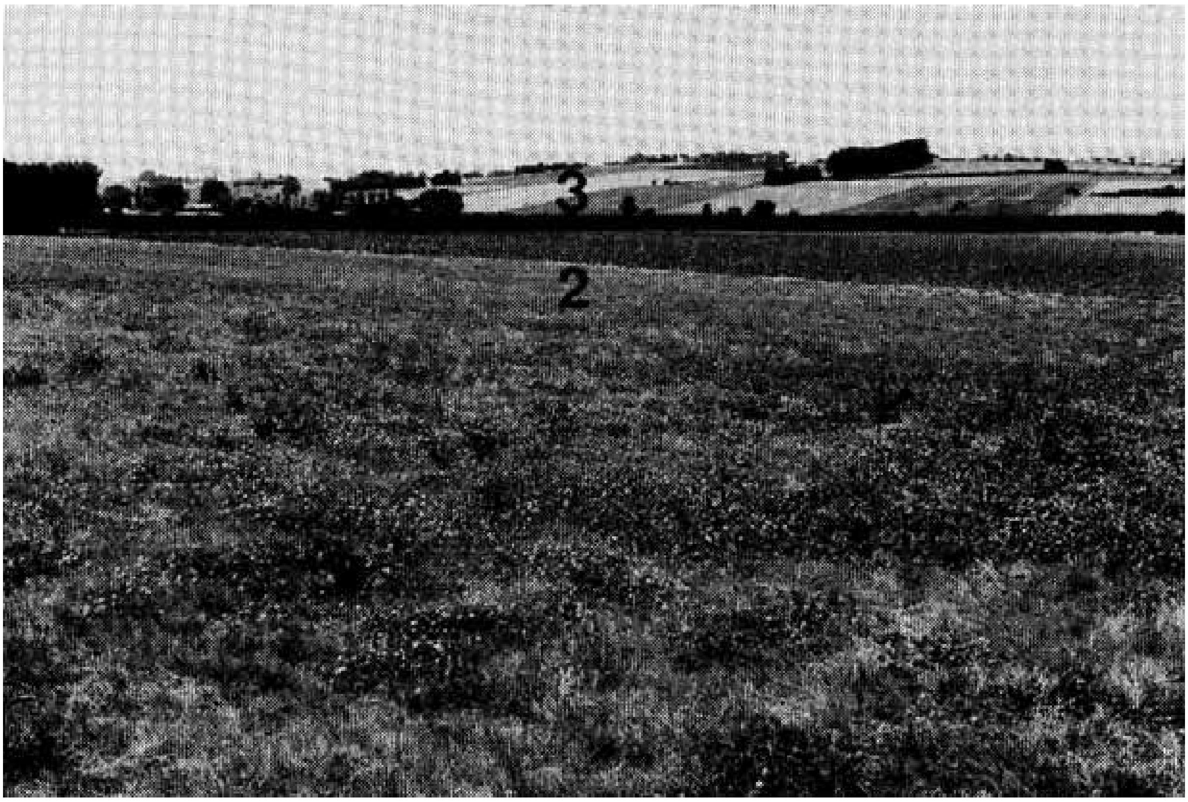


Photo 2: Classes 2 and 3 land on basalt. Pipers map 418418. View NW from Tasman Highway to West Minstone Road.

Photo 3: Class 3 land on granodiorite. Pipers map 374395. Koomela Road, West Scottsdale. Class 5 land on sandstone in background.

10.3 Class 3 (2895 ha; 1.3%)

Class 3 land has been mapped principally on basalt and granodiorite.

Class 3 land on Basalt

Areas of Class 3 land on basalt occur in the following localities: Pipers River, Pipers Brook, Lebrina, West Scottsdale, Grindelwald, Bowood, Ferny Hill and Bridestowe Estate. These areas have average rainfalls less than 1200mm. Frosts do occur on areas inland, but they are not a significant hazard, and are not severe enough to alter the capability assessment. An example of class 3 land on basalt is shown in Photo 2.

These areas are also part of the Tertiary basalt flows, and soils are similar to those on Class 2 on basalt (refer to 10.2 and Table 7). However slopes are steeper than those on Class 2, ranging between 12 and 18%, with the result that the land is more susceptible to water erosion under an intensive cropping regime. Therefore more intensive soil conservation works are required than that on Class 2 land, and careful soil management practices are necessary when cropping is carried out. These measures would include grassed waterways and cut off drains at frequent intervals to intercept run-off , and the use of cover crops and green manure crops to increase organic matter content and to protect soils from sheet, rill and gully erosion.

The soils on Class 3 land on basalt are also deep, well drained and have good soil structure. They are suitable for cash cropping but the slope means that cultivation and crop rotations should be limited, in order to maintain soil structure, prevent loss of top soil by erosion, and to preserve the long term sustainability of this land for cropping. At present these areas are used for dairying, grazing and cropping. Cropping is more intensive in the Jetsonville-Scottsdale areas, and major crops grown are potatoes, peas, carrots, onions and cereals.

Class 3 land on Granodiorite

Class 3 land has also been mapped on granodiorite deposits in the West Scottsdale and Springfield areas. An example is shown in Photo 3. Topography is flat to rolling (up to around 10% slope) and at present these areas are used for grazing, dairying, and occasional cropping (potatoes, cereals).

The soils are coarse textured with topsoils which are very susceptible to fluvial erosion (sheet, rill and gully) on steeper slopes. Soils are very acid, and are low in potassium and phosphorus. However with correct fertiliser treatments and careful management to limit erosion, these areas are capable of increased cropping use. Summer irrigation would also increase the potential of these soils as they tend to dry off rapidly during the summer. Rainfall in this area is around 1200mm per annum, and this together with winter frosts, may limit the potential of some crops.

Other Class 3 land

Other small areas of Class 3 land occur near St Leonards on flat, higher terraces, with lateritic type soils. These terraces are the northern most extent of the Launceston Tertiary Basin which occupies the southern half of the Tamar Graben.

10.4 Class 4 (62 975 ha; 27.5%)

Class 4 land has been mapped throughout the region on a wide variety of rock types and topographies. These include alluvial flats, rolling slopes on Mathinna Bed Sequences (siltstones, sandstones, slates), granodiorite, basalt, dolerite gravels, Permian and Triassic age sandstones and mudstones, and Tertiary clays and gravel deposits.

Class 4 land on Alluvium

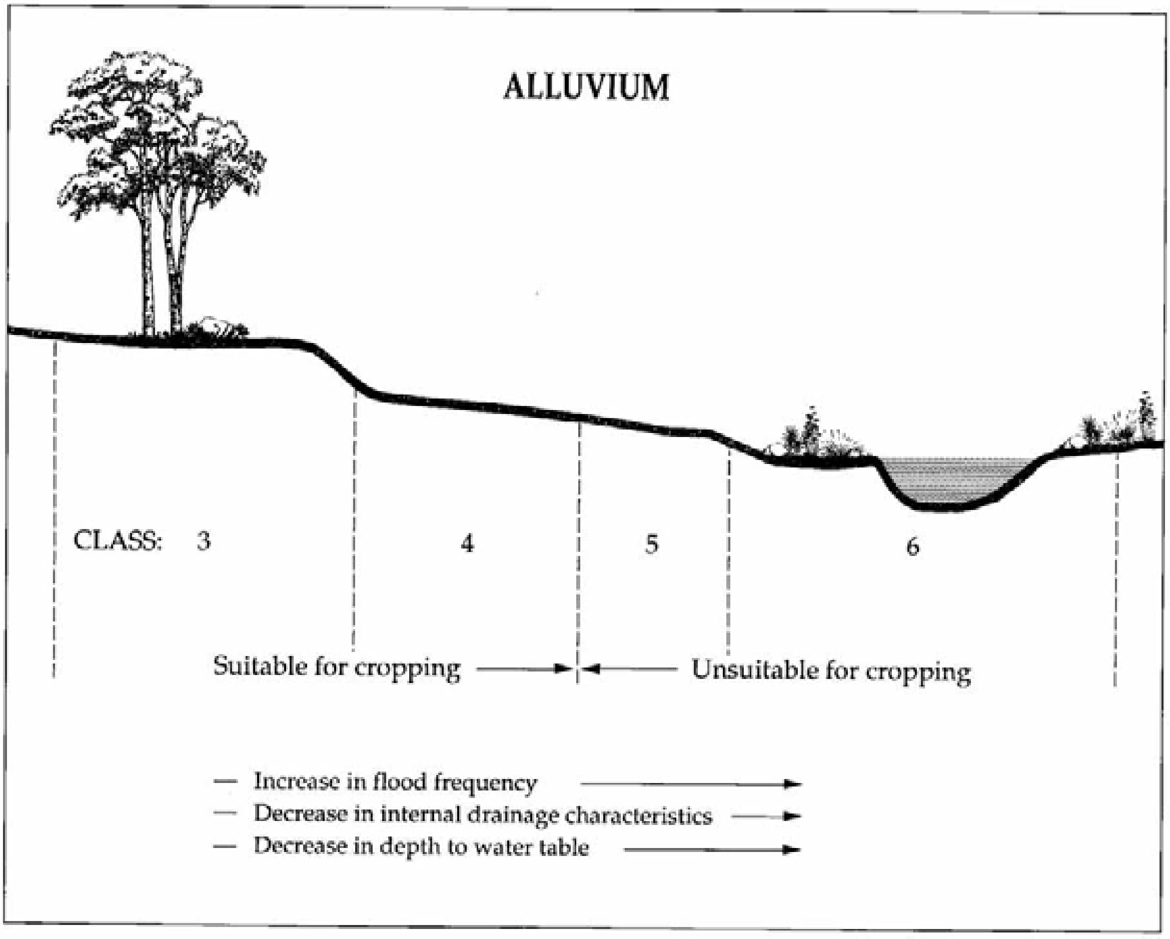
Alluvial flats adjacent to streams and rivers which are subject to occasional flooding have been mapped as Class 4. The frequency of flooding can vary, but is usually around two to three times per year. The time of year when flooding occurs is critical, as is the length of time the water stays on the land surface. The risk of flooding in these locations combined with either high water tables or slow internal soil drainage, limit the cropping potential. Away from flood risk, or with better internal drainage, land with similar soils may be mapped as Class 2 or 3. Refer to Figure 5 for a diagrammatic representation of the land capability classes on alluvium, and to Photo 4 for an example of class 4 land on alluvium.

Class 4 land on alluvium occurs on a wide range of soils depending on the nature of the alluvial deposits. On higher terraces soils can be deep with brown silty to sandy loam textures. Areas with very sandy textures can be excessively drained and can dry out rapidly during dry periods. In more poorly drained lower areas soils can be grey gleyed clay soils with mottled and gleyed subsoils, or dark soils with heavy clay textures. These soils are more prone to surface ponding of water because of slow internal drainage.

Cropping would be limited to occasional crops such as cereals and forage crops. Drainage (where economically feasible) would substantially improve the present condition of some of the heavier clay soils, and would result in more rapid removal of surface water and more intensive use of these areas.

Localities where this type of Class 4 land occur are along the North Esk River, Brid River, Little Forester River, Great Forester River, Lisle Creek, Denison River, Second River, Pipers River, Pipers Brook, Patersonia Rivulet and St Patricks River.

Photo 4: Class 4 land on alluvium. Pipers map 283223. St Patrick's River Flats, Tasman Highway



Class	3	4	5	6
Flooding Frequency	Not flooded	Occassionally flooded	Often flooded	Frequently flooded
Water Table	Fluctuating	Fluctuating; near surface in winter	Surface water in winter	Surface water much of the year
Internal Drainage	Well to moderately well drained	Moderately well to poorly drained	Poorly to very poorly drained	Very poorly drained

Figure 5: Diagrammatic representation of land capability classes on alluvial deposits.

Class 4 land on Mathinna Beds

Large areas of Class 4 land are mapped on sedimentary sandstones and siltstones of the Mathinna Bed sequences. These areas occur in the following locations: Bridport Back Road, Pipers Brook Road, Golconda, Retreat, Lebrina, Tunnel and North Lilydale. Photo 5 shows an example of this type of Class 4 land.

The soils on these deposits are mostly grey podzolic soils. They have a very sandy and loose topsoil, which is highly susceptible to water erosion if the soil surface is disturbed and left unprotected. The soils have been leached of nutrients, and require high fertiliser inputs including phosphorus and potassium. Trace elements of molybdenum, copper and selenium are also required. These soils are very acid, with pH around 4.9. Many areas between Pipers River and Bridport have large amounts of quartz gravels present in the soils.

Slopes can range up to 18%. Above this slope, the potential erosion hazard is considered too severe for this type of land to be safely cultivated for cropping purposes, and has been mapped as Class 5 land. On the steeper slopes, intensive soil conservation measures such as major earthworks would be needed, if cropping was undertaken.

This land is used mainly for grazing, with occasional crops such as root and green fodder crops grown (turnips, choumollier, etc). The poor soil structure, low fertility and high erosion hazard severely limit the cropping potential of this type of land.

This land is used mainly for grazing, with occasional crops such as root and green fodder crops grown (turnips, choumollier, etc). The poor soil structure, low fertility and high erosion hazard severely limit the cropping potential of this type of land.

Figure 6 illustrates the sequence of land capability classes on these deposits.

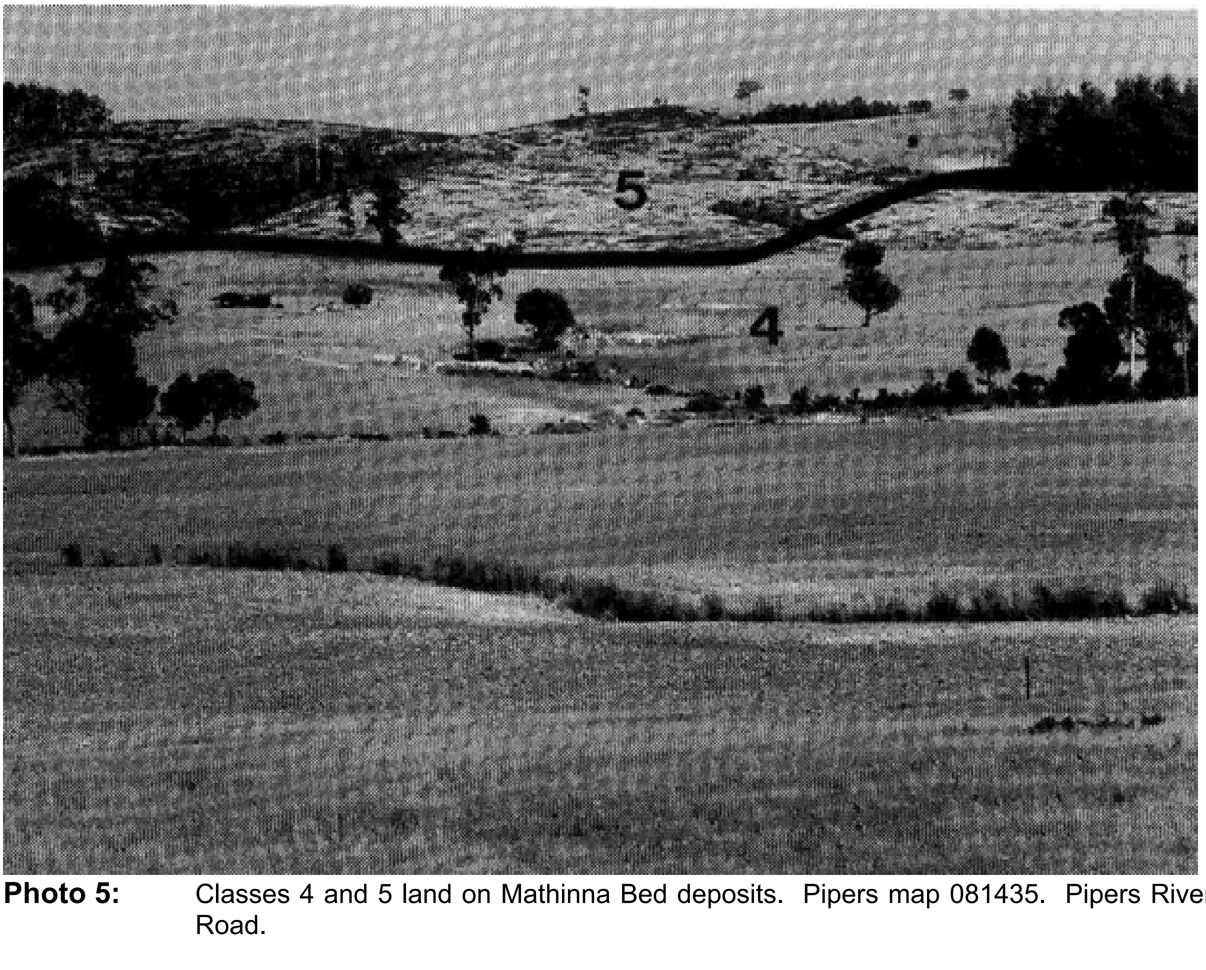


Photo 5: Classes 4 and 5 land on Mathinna Bed deposits. Pipers map 081435. Pipers River Road.

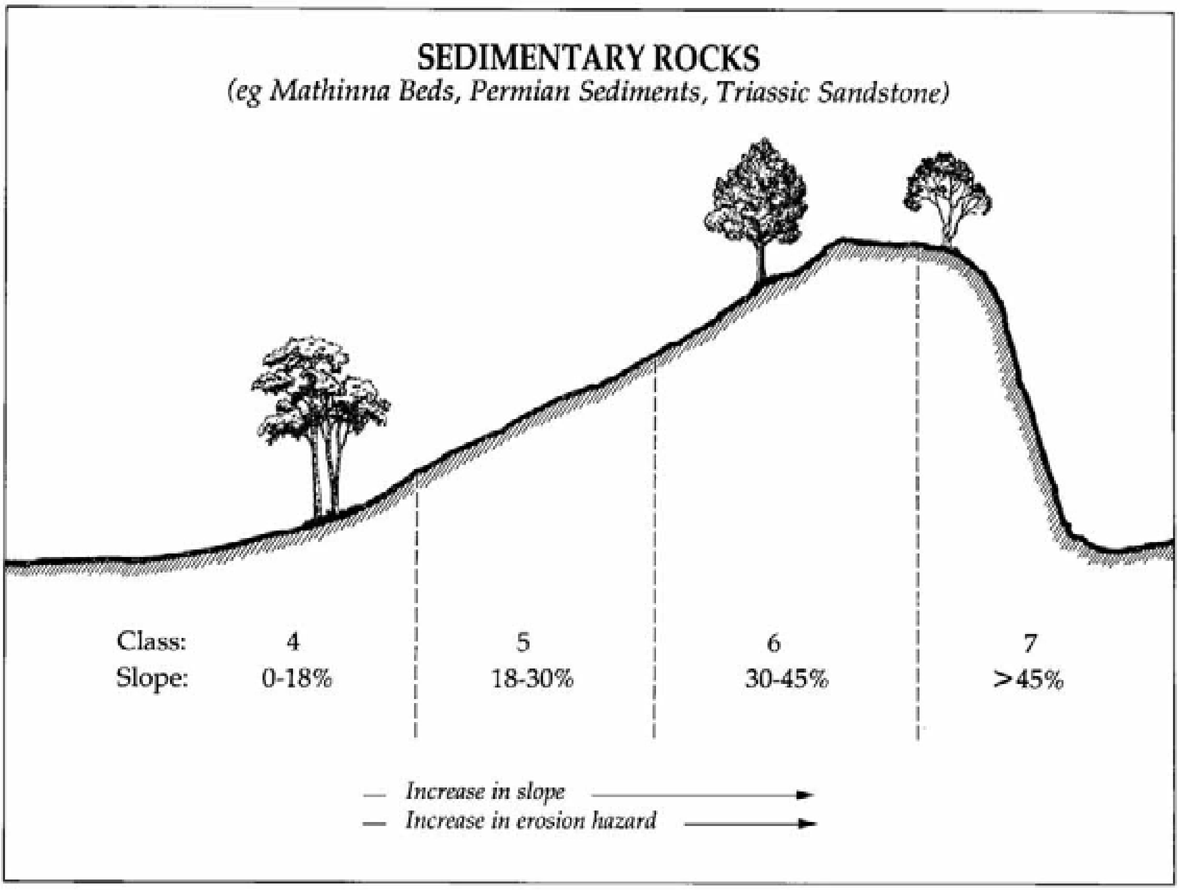


Figure 6: Relationship between land capability classes on sedimentary rock types, with podzolic soils.

Class 4 land on Basalt

Class 4 land on basalt occurs at West Scottsdale, Pipers Brook, Lebrina, Georges Plain, Myrtle Bank, Bullocks Hunting Ground and Watery Plains. The major limitations to cropping in these areas is slope, rock outcrops and climate.

Areas with rocky soils occur at Bullocks Hunting Ground and Watery Plains. Here slopes are generally less than 15%, but the amount of stones in the soil profile limits intensive cultivation. Areas at Myrtle Bank and Georges Plain also have rock outcrops, and occur on less steep slopes, however the elevated position of this area (500 metres) means that cropping is further limited by winter frosts, shorter growing seasons and exposure to wind.

On land in the West Scottsdale, Pipers Brook and Lebrina areas, slopes are much steeper, ranging between 18 and 30%. The basalt soils have superior soil structure and lower risk of erosion than soils on other types of Class 4 land, and therefore can be cultivated on steeper slopes. However if cultivation is carried out on these slopes, major soil conservation works and careful soil management practices are necessary. This type of land is only suitable for occasional cropping (one to two years in ten). More frequent cropping would result in a deterioration of soil structure and a resulting unacceptable level of erosion (sheet, rill and gully).

Class 4 land on granodiorite

Class 4 land has been mapped on granodiorite at Blumont, Springfield, West Scottsdale, Nabowla, Camden Plains and Tayene. The major constraint to cropping is the susceptibility of the soils to erosion, particularly under cultivation on steeper areas. Slopes range between 10 and 20%. The soils on these granodiorite deposits are very acid and low in fertility, requiring high fertiliser inputs. Many of the areas where this type of land occurs also has higher rainfalls (>1200mm), and are subject to winter frosts.

Class 4 land on Clays, Sands and Gravels

Class 4 land has also been mapped on Tertiary deposits of clays, sands and gravels. These deposits generally occupy fault controlled troughs along the Tamar Valley and occur at Windermere, Dilston, Alanvale, Waverley, St Leonards, Corra Linn, Legana and Rosevears. These deposits are on terraces, or rolling low hills, with slopes ranging up to 18 - 20%. Soils are sandy or gravelly loams and clay loams, and can be subject to sheet and rill erosion. Limitations to use of these areas are the erosion hazard, low fertility soils and the shallow and gravelly nature of many of the soils.

Class 4 has also been mapped on more recent gravels, sands and clay deposits of upper Tertiary age which occur at Nabowla, Fourteen Mile Creek, Back Creek and Ferny Hill - Bowood areas. The amount of gravel in these deposits varies with some areas having large amounts of quartzitic gravels present throughout the profile. Other areas are very sandy with low fertility soils and weakly structured soil profiles, prone to erosion.

Other Class 4 land

Other areas of Class 4 land occur on mudstones at Lilydale, Bangor, Karoola, Turners Marsh, Lower Turners Marsh, Patersonia and Nunamara; on dolerite gravels at Waverley and Alanvale; and on sandstone at Underwood, Lalla, Turners Marsh and Old Bangor Tram Road. The mudstone soils have generally high clay contents in the subsoils, with slow internal soil drainage. Soils on the dolerite gravels are well structured and free draining brown loams, but have numerous stones and gravel throughout the profile which hinder frequent cultivation. Sandstone soils are usually very poorly structured with sandy topsoils and bleached A_2 horizons, are low in fertility, and very prone to erosion.

See Photo 6 for an example of Class 4 land on Permian sediments.

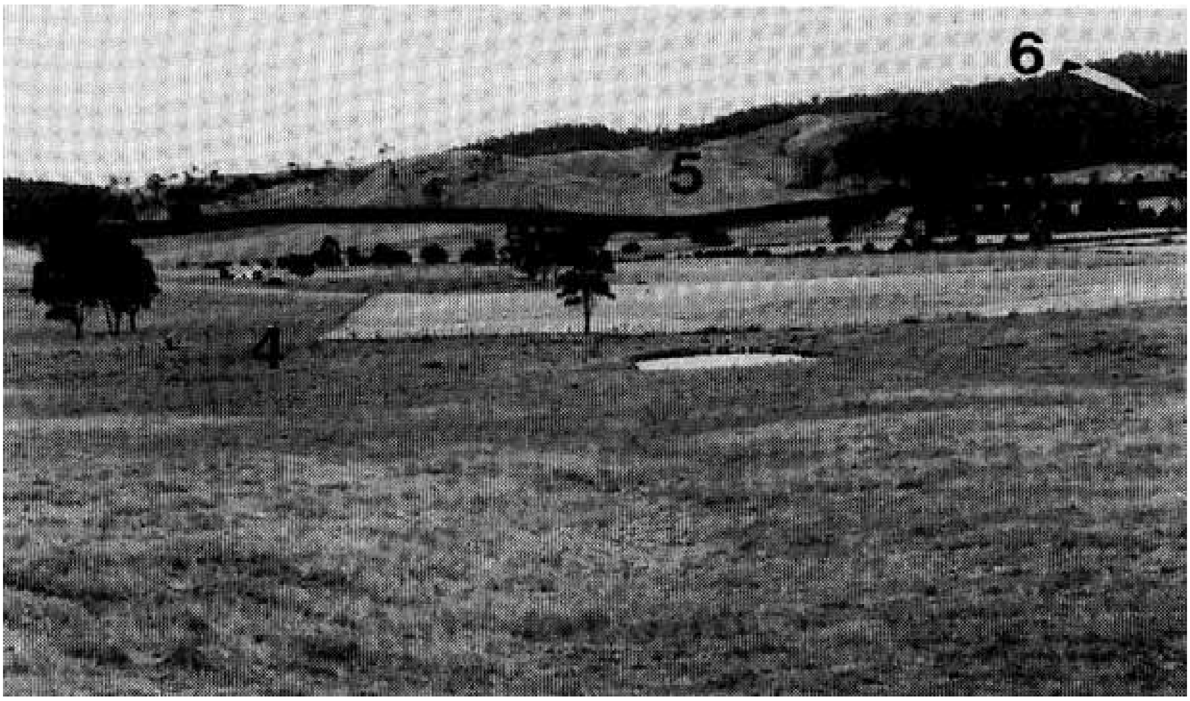


Photo 6: Class 4 land on Permian sediments. Pipers map 126367. Paling Track. Classes 5 and 6 in background on Mathinna Bed deposits.

10.5 Class 5 (41 890 ha; 18.3%)

Class 5 land has been mapped on a wide range of topographies and soil parent materials including windblown sands, alluvial deposits, sandstones, basalt, dolerite and granodiorite.

Class 5 land on Alluvium

Class 5 land occurs on flat alluvial terraces and floodplain areas. These areas are subject to more frequent surface flooding than similar areas mapped as Class 4. In some areas the soils also have slow internal drainage and high water tables. These factors make these areas unsuitable for cropping use.

Along the floodplain terraces of the North Esk River near Launceston, flooding occurs on average three to four times per year. These areas can be under water for several days, especially during winter and early spring. Although the soils on these flat terraces are recent alluvial type soils, the flooding hazard restricts the use of this land to grazing. In areas that are not as frequently flooded, similar soils have been mapped as Class 4 (refer to Figure 5).

Class 5 land has also been mapped in narrow alluvial basins in dolerite hill country areas. The soils have heavy clay textures with poor internal drainage and high water tables. Dolerite boulders and lateritic gravels often occur throughout the profile. Subsoils can be gleyed and often water-logged. Drainage outfalls are restricted, limiting the potential to improve the drainage of these areas. Examples of this type of land occur at Prossers Forest, along Pipers River Road, and at Barbers Bottom. Photo 7 shows an example of this type of Class 5 land.

Photo 7: Class 5 land on alluvium. Pipers map 163263. Lilydale Road.

Class 5 land on Windblown Sand

Class 5 land on semi-consolidated windblown sand deposits occur in the north of the map sheet along the coastal platforms. Locations are Lulworth, Weymouth, Bellingham, Saltwood Road, Jerusalem Plains and Bridport. This coastal sandplain is gently undulating, consisting of low sand dunes interspersed with wetter depressions and drainage lines. It varies in width, ranging up to 6 km inland from the coast.

The sand deposits are variable in depth and in some places, outcrops of the underlying older formations such as Mathinna Beds, are evident. The sand has been blown inland from the coastal zone but is now stabilised and most has been developed for grazing purposes. The sandy soils have low natural fertility, are low in organic matter, and have a low water holding capacity. Nutrients are easily leached from the plant root zone, and high fertiliser inputs are required to maintain acceptable levels in the soil. Soils are generally well developed with typical podzol features such as a bleached and structureless A_2 horizon and an iron-organic B horizon. Soil depths can be up to one metre to the organic B horizon. The wetter swampy areas have dark organic sandy clay soils.

Although of gentle relief (up to 10% slopes) these areas are not suitable for cultivation for cropping, although cultivation may be carried out during the pasture establishment phase. The soils are prone to wind erosion and therefore maintenance of a complete pasture cover and prevention of surface disturbance is necessary. The higher sand dune areas are subject to summer droughts which severely reduce pasture growth, while in some low lying areas the wetter drainage lines and depressions may benefit from drainage to maintain high producing pasture. A further problem is the occurrence of salting in some of the lower lying areas.

The relationship between land capability classes on windblown sand deposits is illustrated in Figure 7. An example of this type of Class 5 land is shown in Photo 8.

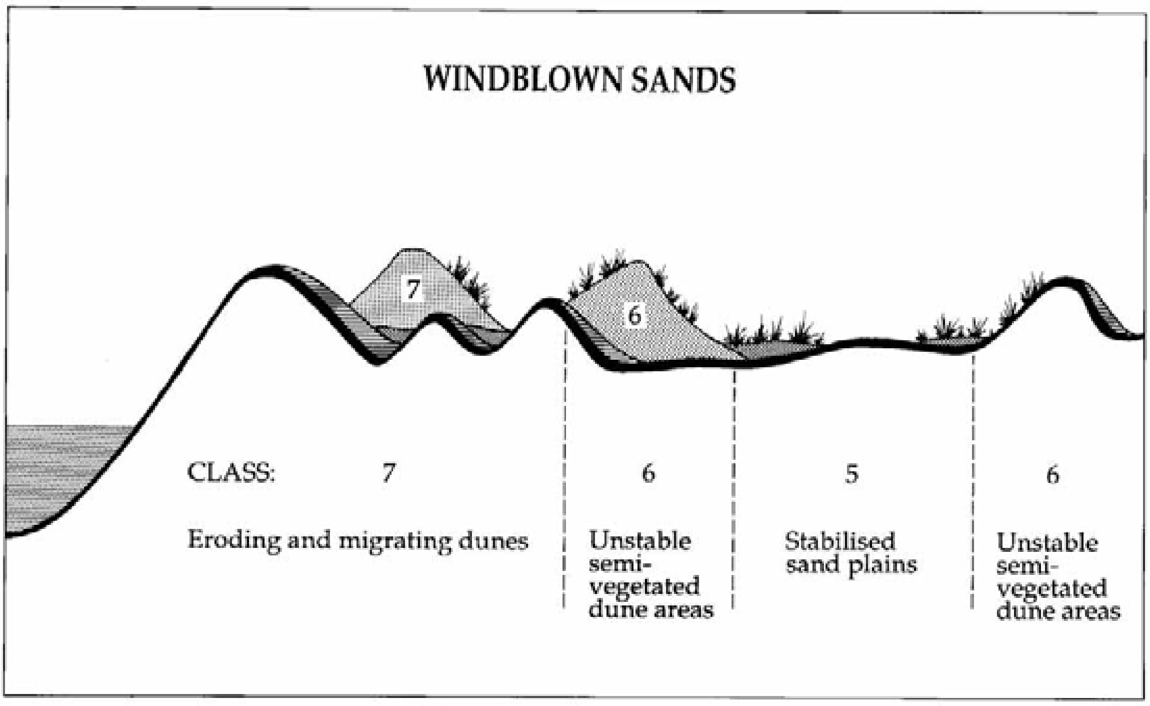


Figure 7: Relationship between land capability classes mapped on windblown sands.

Photo 8: Class 5 land on windblown sandplains. Pipers map 295641. Sandy Points Road.

Photo 9: Class 5 land on sandstones (Permian). Pipers map 105337. Rowleys Hill.

Class 5 land on Sandstones and Siltstones

Class 5 land has also been mapped on sandstones and siltstones of Triassic, Permian and Siluro-Devonian ages, including Mathinna Beds. Slopes range between 18 and 30%, which are steeper than on similar deposits mapped as Class 4 (refer to Figure 6). Some areas on gentler slopes may be cultivated for pasture establishment or renewal, but are not suitable for cropping because of the high erosion risk. The soils generally have shallow surface horizons, with a sandy and loose subsurface over clay. They are infertile, strongly leached and require high fertiliser inputs to maintain good pastures for grazing. Soil slip, sheet and gully erosion are the dominant erosion forms. In some areas the abundance of quartz gravels makes cultivation marginal.

Localities where this type of land has been mapped are at Greeta, Wyena, North Lilydale, Tunnel, Retreat, Den Ranges, Myrtle Bank, Lower Turners Marsh, Lalla and Karoola. Photos 5 and 9 show examples of this type of land.

In higher rainfall areas the soil profiles on Mathinna Beds tend to be more reddish brown in colour, often without the bleached A_2 horizon, and contain more angular rock fragments (e.g. Burns Creek, Targa, Lilydale areas).

Class 5 land has also been mapped on Tertiary sandstone deposits in the Lietinna, West Scottsdale and Jetsonville areas. Although the slopes are undulating to rolling (up to 25%), the soils are very sandy, shallow, low in nutrients with high pH, and subject to erosion. These deposits are more consolidated than the windblown sands nearer the coast, and some areas contain large amounts of quartz gravels. Soils can be very variable with some profiles showing typical podzol features associated with sand deposits (e.g. sandy topsoils, pale loose sand subsoils and a hard cemented iron pan at depth). These areas are only suitable for grazing because of the low fertility status and high erosion hazard (in particular wind, sheet, rill and gully).

Class 5 land on Basalt

Steeper slopes on basalt (>30%) have been mapped as Class 5 land in the Pipers River, Pipers Brook and Lebrina areas. These areas are usually steeper scarp edges around the more subdued and elevated topography of the basalt flows. In some areas the basalt colluvium, erosion debris and associated soils form a veneer over underlying older rocks such as Mathinna Bed sandstones and siltstones. Although the slopes are steep (in excess of 30%), the soils are more stable than those on other rock types, and can be used for grazing. Although these slopes can be subject to sheet and slip erosion, this does not pose a major limitation to grazing use, as the fertile basalt soils tend to regrass rapidly.

Other localities mapped as Class 5 land on basalt are at Bullocks Hunting Ground, and Grindelwald. These areas may have slopes less steep than 30%, but the soils contain many basalt boulders. The presence of these rock outcrops is a limiting factor, making these areas unsuitable for cultivation.

A combination of the steeper slopes, susceptibility to erosion, and in some areas the presence of boulders and rocks, make this type of land Class 5.

Class 5 land on Granodiorite

Class 5 land on granodiorite occurs in the Nabowla, Blumont, West Scottsdale Camden Plains and Tayene localities. Because of the generally higher rainfall in these areas (1 000 - 1 400 mm), this land is presently used for grazing of dairy cattle. In the Camden Plains - Tayene area, slopes may not be as steep, but the climate is more severe with colder temperatures, frosts, higher rainfall and shorter growing seasons. Slopes are generally between 20 and 40%. Large rounded granodiorite boulders outcrop in some areas. The soils can be subject to sheet and gully erosion. The combination of steeper slopes, potential erosion hazard and effects of climate, make this type of land Class 5. An example is shown in Photo 10.

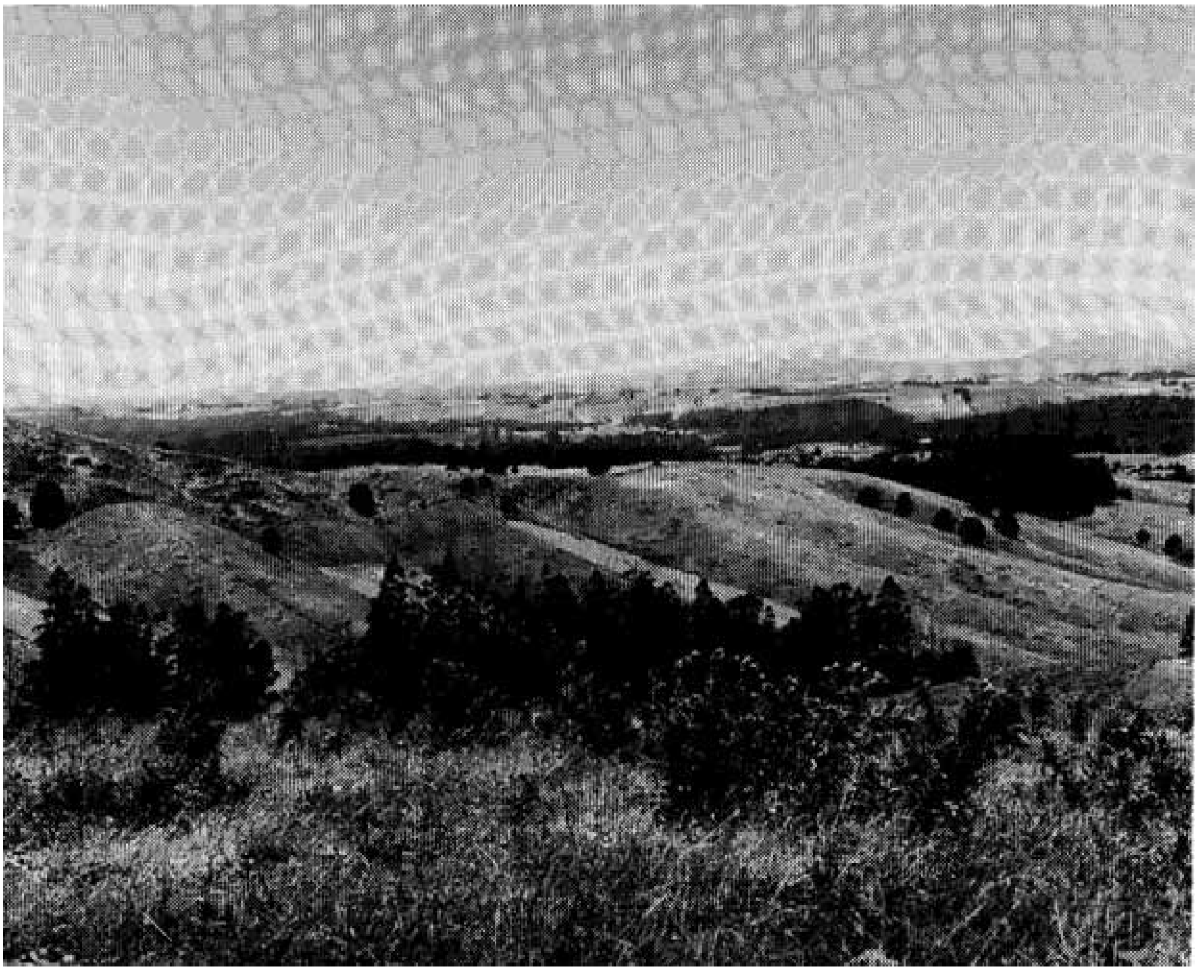


Photo 10: Class 5 land on granodiorite. . Pipers map 355406. McKays Road, West Scottsdale.

Class 5 land on Dolerite

Class 5 land has also been mapped on dolerite. Slopes can range up to around 40%. Although some slopes may be relatively gentle the amount of dolerite boulders and presence of rock outcrops make this land suitable for grazing purposes only. Localities where this type of land occurs are at St Leonards, Rocherlea, Prospect and Ecclestone Road. These areas may be sown to improved pasture species by surface cultivation on the deeper soils around the boulder outcrops. Where the land has so many boulders that surface cultivation is not possible, it has been classified as Class 6. Photo 11 shows an example of Class 5 land on dolerite, and Figure 8 demonstrates the relationship between land capability classes on dolerite.

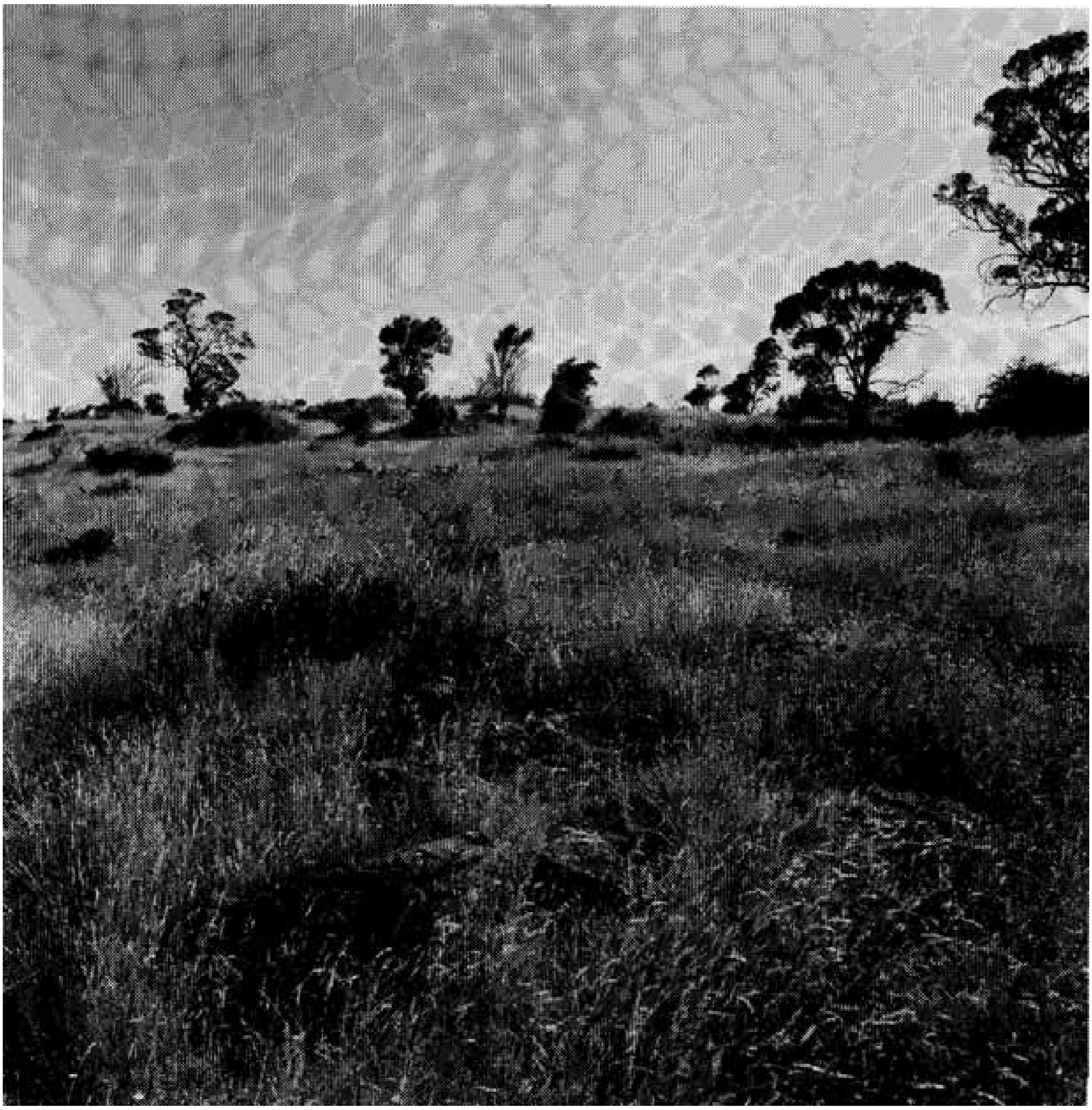


Photo 10: Class 5 land on dolerite. Pipers map 171129. Tasman Highway.

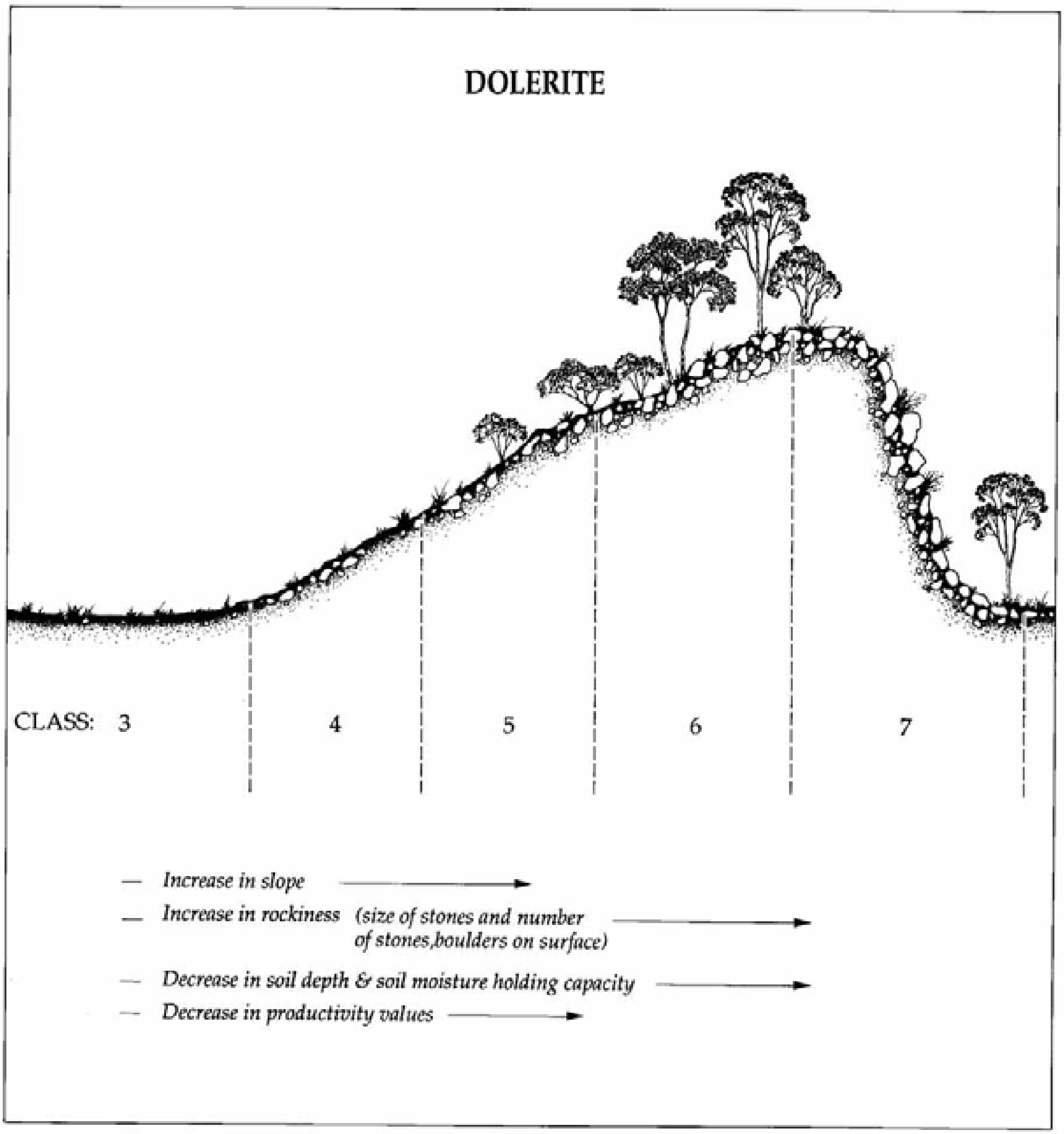


Figure 8: Diagrammatic representation of land capability classes mapped on dolerite.

10.6 Class 6 (39 490 ha; 17.3%)

Class 6 land has been mapped on a wide variety of rock types including sands, granodiorite, sandstones, dolerite and alluvium.

Class 6 land on Dolerite

Class 6 land on dolerite is common in the southern half of the Pipers map, and is extensive throughout the dolerite hill country. Localities where Class 6 occurs on dolerite are Mt Direction, Dismal Range, Boomer Hills, Holloways Hill, Prossers Forest, Underwood, Browns Hill, Mount Edgecombe, Tressick Hills, Nunamara, Grassy Hut Tier and Blackstone Hills.

This type of land is marginal for grazing purposes, because of the amount of rock outcrops. It is used extensively as run country for sheep. Because of the amount of boulders present, improvement of native pastures is not possible by surface cultivation methods. These areas dry off rapidly as there is very little soil present to hold moisture.

Class 6 on dolerite generally occurs on steeper slopes (>35%), and the amount of dolerite boulders present is significantly more than similar land mapped as class 5 (refer to Figure 8). Photo 12 shows an example of Class 6 land on dolerite.

Poto 12: Class 6 land on dolerite. Pipers map 117214. Lilydale Road.

Class 6 land on Granodiorite

Class 6 land also occurs on steep slopes on granodiorite at Peaceful Valley, Musselboro and Upper Brid Road. Slopes are greater than 35% and the soils are prone to severe erosion under pasture. Erosion types are sheet, gully and soil slip. Present land uses are grazing and forestry.

Class 6 land on Estuarine Alluvium

River flats along the Tamar River at Freshwater Point, Tamar Island and north of Dilston are also areas of Class 6 land. These areas are close to high water, are frequently flooded, and have saline soils.

Class 6 land on Sandstones, Siltstones and Mudstones

Class 6 land has also been mapped on steep slopes on sandstones, siltstones and mudstones (Paleozoic and Mesozoic Age deposits). Slopes usually range between 30 and 45%. The poor soil structures, low fertility soils and steepness of slope make these areas more suited to a forest cover in order to protect this land from erosion. Localities where this type of land have been mapped include North Lilydale, Targa, Burns Creek, Bare Point, Nook Road, Pecks Hill and Patersonia.

Class 6 land on Windblown Sand

Class 6 land on windblown sand deposits has been mapped on the higher dune ridges of the coastal plain near Bellingham, Saltwood Road, and Waterhouse Road. Refer to Photo 13 for an example of this type of land, and to Figure 7 for a diagrammatic representation of the relationship between land capability classes mapped on windblown sands.

The weakly structured and very poorly developed soils are free draining with low moisture holding capacities, low organic matter content, and subject to severe summer drought. Soils also have low pH which require high fertiliser inputs.

These areas are highly susceptible to wind erosion if the vegetation cover is disturbed or broken. Most areas are presently stabilised with vegetation, but further development into pasture should be restricted because of the severe erosion hazard. This erosion hazard can be mainly attributed to the following conditions, all of which discourage plant growth: exposure to strong salt- laden winds, the unstable nature of the sand dunes, severe soil moisture deficiencies, very weak soil development and nitrogen deficiency. Eroded areas require stabilisation with suitable vegetation (e.g. marram grass), and prevention of stock trampling, grazing and vehicle access in these areas is critical for protection against wind erosion.

In some areas (e.g. Saltwood Road area) it was difficult to separate the higher more recent dune areas with little soil development, from more stabilised areas, because of the intricate mosaic of dunes and swales. Near Bellingham some of the Class 6 land occurs on lower very poorly drained areas with high water tables. Soils here have typical ground water podzol profiles.

The severe wind erosion potential of these areas combined with poor soil development and infertile soils, combine to make this type of land marginally suitable for grazing purposes.

Photo 13: Class 6 land on windblown sandplains. Pipers map 403607. Waterhouse Road.

10.7 Class 7 (4 700 ha; 2.0%)

Class 7 land has been mapped on windblown sands along the coast, on very steep and stony dolerite areas, and on very steep slopes on Mathinna Bed deposits. All Class 7 land is unsuitable for agricultural use.

Class 7 land on Windblown Sands

The unstable belt of recent windblown sands along the coast has been mapped as Class 7 land because of the extreme erosion hazard (both present and potential). These areas comprise the foredune and adjacent unstable sand dunes and sandplains (refer to Figure 7). These dunes are the most exposed and have very little or no soil development. This together with the rolling nature of the dunes gives them the potential for extreme wind erosion. Where exposed, the sand is easily transported by wind, with extensive areas of blow out dunes and wind eroded areas present. These areas can extend up to 4 km inland in some places. Revegetation is crucial in order to stabilise the dunes and prevent migration of sand onto productive farmland. Class 7 land on coastal sand dunes has been mapped in the following localities: Lulworth, Bellingham, Single Tree Plain, Barnbougle Beach, and Waterhouse Beach.

Class 7 land on Mathinna Beds

Small areas of Class 7 land have been mapped on very steep areas on Mathinna Bed sandstones and siltstones. These areas have slopes in excess of 45%, and if cleared, have an extreme erosion potential. Soils on these slopes are very shallow and infertile, and extremely unstable under pasture. Erosion forms are mainly soil slip, sheet and gully. Some areas can also be very stony with rock fragments. Areas where Class 7 land has been mapped on Mathinna Beds are Camden Hill Road, Lone Star Ridge, and at the end of Nook Road.

Class 7 land on Dolerite

Class 7 land has also been mapped on stony and very steep dolerite gorges, cliffs and mountain slopes. Examples of Class 7 land on dolerite are at Mount Dismal, Blackstone Hills, Rocherlea Hill, Distillery Creek, Weavers Creek, Mount Barrow, Browns Hill, Dido Creek and Oakdens Ravine. Most of these areas are almost bare rock, and remain relatively stable compared to other rock types on similar slopes. Slopes can range up to near vertical in cliffs, bluffs and gorges. Much of these areas are presently under forest vegetation.

10.8 Summary of Land Capability Classes on Pipers Map

Class	Area (ha)	% of land area on Pipers map
1	-	-
2	910	0.4
3	2 895	1.3
4	62 975	27.5
5	41 890	18.3
6	39 490	17.3
7	4 700	2.0
Exclusion areas	75 925	33.2
TOTAL	228 785	100

Table 8: Summary of areas on Pipers map.

11. Map Availability

The Pipers map is the first in a series of land capability maps and reports for Tasmania.

An index of the land capability maps (based on the 1:100 000 Tasmap series) is shown on the rear cover of this report.

Maps and reports currently available in the series are:-

PIPERS

Maps and reports are available for purchase from your nearest Department of Primary Industry Office, or can be ordered direct from:

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