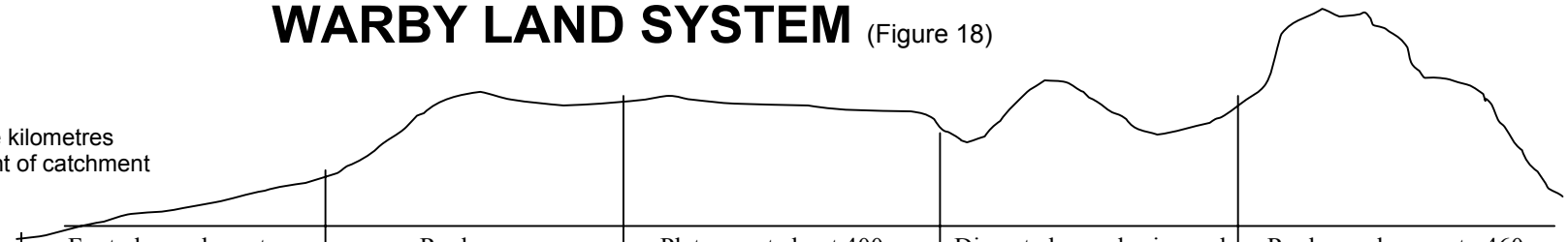
WARBY LAND SYSTEM (Figure 18)

Area: 50 square kilometres
2 percent of catchment



Topography	Foot-slopes down to plains at about 200 m elevation.	Rocky spur	Plateaux at about 400 m elevation.	Dissected area: basins and valleys	Rocky peaks – up to 460 m elevation.
Climate	Average annual rainfall about 640 mm; summers dry with thunderstorms. Growing season: March-May and September-December. Estimated average temperatures: Jan 21°C; July 7°C; Year 14°C. Estimated evapotranspiration: Jan 130 mm; July 20 mm; Year 750 mm.				
Parent Materials	Hill-wash and alluvial fan deposits of granitic material.	Granite and slope detritus.	Deeply weathered granite, *in situ*.	Granite and granitic alluvium.	Granite and slope detritus of disintegrated granite.
Soils	Deep, coarse sandy loams, pale or bleached gradational soils and corse sandy reddish gradational soils.	Coarse, sandy loams and pale or weakly bleached gradational soils; some gritty, friable brownish gradational soils.	Reddish duplex soils, some yellowish duplex soils. Deep pale or weakly bleached gradational soils in drainage lines.	Coarse sandy loams, and pale or weakly bleached gradational soils.	Stony, coarse sandy loams, pale or weakly bleached gradational soils; some gritty, friable brownish gradational soils.
Vegetation	Woodland to short open forest of red box, red stringybark with some red gum. Grass ground cover – much kangaroo grass.	Golden wattle, sheoak, poor form long-leaf box and some red gum. Grass, rock, ferns, moss and dry forest litter.	Woodland of red gum with grass-trees and tussock grass and wallaby grass.	Woodland of red box and red gum with wattles and grass trees. Tussock and ledge grass.	Woodland of long-leaf box, red stringybark and red box. Native grasses, rock, fern and dry forest litter ground cover.
Land Use	Much is cleared; grazing, mainly sheep; citrus and small-fruit orchards and vineyards.	Largely unused.	Some cleared and grazed. Uncleared areas are used for firewood production.	Some grazing, mainly sheep: firewood production.	Largely unused.
Erosion Hazard	Moderate to high on long steep slopes	High on steep slopes: moderate elsewhere.	Low to moderate	Moderate to high.	Moderate to high on long steep slopes.
Erosion Status	Generally sound; rill and stream-channel erosion below depleted catchments.	Generally sound; some sheet and rill erosion.	Generally sound	Some sheet erosion after fires or where heavily grazed. Generally sound.	Generally sound.
Potential Land Use	A suitable area for citrus, vineyards and such fruit as passionfruit and olives. Water areas on lower slopes suitable for pasture.	Reservation for recreation.	Some areas may be suitable for fruit growing but economics and desirability of agricultural or horticultural development are doubtful. Reservation for recreation.	Reservation for recreation with firewood production.	Reservation for recreation.

THE WARBY LAND SYSTEM

(See Fig. 18)

The granite ranges and their footslopes in the lower rainfall area in the north have been separated as the Warby land system. The name is taken from the Warby range west of Wangaratta. The portion of the land system within the Broken River catchment is only about 50 square kilometres (2 per cent of the catchment) and includes several small isolated areas further south near Lurg. The land system was separated from surrounding areas because of rock type and topography, and from granitic areas further south because of climate. The particular combination of parent material and climate has resulted in a distinctive vegetation.

The topography consists of low rocky peaks and spurs rising from the relatively flat remnants of plateau areas, which are moderately dissected by numerous small streams. The range falls to the plains in a sweeping concave slope, the foot of which runs at a low gradient well out onto, the plains. Most of the plateau remnants are outside the catchment. The highest are in the vicinity of Mt. Glenrowan (575 m), where there are very fragmentary remnants at about 460 m. More extensive areas at about this elevation also occur further north, and several other small areas at successively lower elevations, down to about 370 m, are found further along the range.

The bulk of the rock in the land system is porphyritic grey granite, but there are variations in colour and texture, and in a few places there are also significant areas of fine-grained aplitic dyke rocks, and hornfels. Some of these have been quarried as building stone. The area is closely faulted and jointed, and the tumbled joint blocks make the exposed slopes very rocky.

Average annual rainfall is about 640 mm. The westerly facing slopes provide an abrupt obstruction to the prevailing winds, and thunderstorm activity seems to be more intense there. Similarly, orographic effects may give rise to a local increase in annual rainfall, but there are no rainfall recording stations suitably placed to confirm this. The figures for temperatures and evaporation given in the land system diagram are derived from graphs dependent on elevation. The plateaux and upper drainage basins are liable to more frost than the lower areas, particularly in isolated clearings where this may be a significant land-use factor. During frosty weather fogs often blanket the lower slopes and adjacent plains, leaving the hills clear, so, that the number of clear frosty nights on the upper area may also be greater than experienced at the recording stations on the plains. The side slopes are relatively frost free, being steep enough to allow effective cold-air drainage without much ponding. The length of the growing season is limited by low temperatures in winter and by dryness in summer. The estimate given is extrapolated from a more detailed assessment of conditions at Benalla.

Red gum-red box woodland is the characteristic vegetation of this land system, and this is the only instance in the catchment where a vegetative community is virtually restricted to the one land system. While the native vegetation is of little economic value for timber, it yields substantial quantities of honey. The area is also valued by apiarists as a relatively warm wintering area for hives, and the winter-flowering *Casuarina* provides abundant pollen which is essential for brood rearing. It is a particularly attractive vegetation and also includes a number of interesting minor species such as the rare spur-wing wattle (*A. triptera*).

The soils of the land system are varied and closely related to topographic position. The steep slopes carry immature soils ranging from coarse sandy loams to pale or weakly-bleached gradational soils with some friable reddish gradational soils according to drainage and parent material. The plateaux carry reddish duplex soils which have deep sandy A-horizons abruptly overlying mottled red and grey gritty clay, and sometimes yellowish duplex soils. Both the massive pale gradational soils in the valleys and the duplex soils on the flats of the plateaux become saturated in winter and vehicular traffic is then feasible only on made roads.

An interesting feature is the occurrence in this lower rainfall area of deep, friable brownish loams, very similar to those from higher rainfall areas. These soils occur in areas of concentrated surface drainage on steep slopes, and particularly between large rocks. It seems that these areas receive runoff from the rock surfaces and this increases the effective moisture.

Generally the soils are permeable, and on the slopes they are well drained. They are reasonably fertile, and with the addition of superphosphate and provision for the supply of nitrogen-for example by legumes, they can be expected to be adequate for most agricultural purposes. The limiting feature is the steepness of slopes, which means the erosion hazard over much of the area appears to be too high to justify clearing. The long lower slopes are mostly cleared and under pasture, except for a few citrus groves, vineyards and soft-fruit orchards. Hail from the thunderstorms triggered by the west-facing slope is a significant land use factor in this area. The lower slopes are the only areas in the land system suitable for intensive land use.

Citrus growing, both oranges and lemons, without irrigation on the deeper, well drained soils on the Warby foot slopes has been relatively successful on the eastern side of the range, but the western slopes have not proved as good, possibly because they dry out more rapidly. Their success is partly attributable to the local conditions which enable fruit to be held on the trees until fruit from irrigation areas has passed through the markets. A number of growers are now building large dams so that they can irrigate their groves.

There are a number of other fruits that could be established. For example passion fruit, which requires well drained loams in a sheltered and frost free site, and cherries, which are already grown both on the plateau and the foot-slopes. The upper side-slopes possess sites suitable for olives, which should find an increasing market.

The plateaux, where cleared, are quite suitable for pasture, but the economics of clearing for this purpose are doubtful. Although cherries and other soft-fruits may be grown on these areas they also present marketing problems.

The clays of the duplex soils should be suitable for dam construction. However, many of the soils on the side-slopes are much too permeable for this. Much of the top of the range could be utilised as a catchment for local water storage, which could be used on the lower slopes for stock and domestic purposes, limited irrigation, or at least the watering of young orchard trees in dry seasons. The annual runoff is not very great-about 90 mm-except where bare surface conditions yield storm runoff, but should be sufficient to fill small earth dams.

The Warby land system receives only moderate rainfall with a maximum in winter, and has a high potential water use in summer. The coarse textured and usually deep soils allow substantial deep percolation after soil-moisture deficits have been satisfied in winter. The area is not a significant source of runoff for stream flow, but good springs are a feature of the footslopes.

The vegetation and elevated topography make the site a worthwhile recreation area for the nearby population centres of Wangaratta and Benalla. It also serves as a source of firewood, but the demand for this is declining.

Plate 15. Low hills and valley slopes make up the Swanpool land system. The area shown is at Lima South.

The steep slopes have a high erosion hazard, and poor land use could result in significant erosion and sedimentation of the lower slopes. The present condition is generally sound.

The present land uses appear generally suitable, and erosion is not serious over most of the area. Heavy grazing of some steeper slopes by sheep, particularly where pasture improvement has not been carried out, has resulted in sheet erosion and minor gully erosion. Much of the area is not directly used, except for dry firewood gathering.