23. ARARAT LAND-SYSTEM

All the areas of Ordovician and metamorphosed Ordovician sedimentary rocks are included in the Ararat land-system. The total area of the mapping unit is 186 square miles and it is located in the eastern parts of the survey area with also a small area in the west adjacent to Rocklands Reservoir.

The sedimentary rocks consist of sandstones, shales and mudstones which were intensively folded in Post-Ordovician times and widely metamorphosed to slates, hornfels, and schists by the intrusion of granites and associated quartz reefs and veins. These intrusive rocks are the source of the large quantities of quartz stone that are a characteristic feature of the soils in the land-system.

Hills, rolling plains and undulating plains make up the landscape and the rolling plains occupy most of the mapping unit. The hills occur in the east and south-cast as four parallel high ridges. The longest ridge extends for ten miles, from near Great Western at its northern end, to Mt. Chalambar south of Ararat at its southern end. Two shorter ridges occur close by to the south-west of the main one. One of these is composed of hornfels and culminates in Mt. Ararat (2,020 ft.), the highest peak in the hills. The fourth ridge is the shortest, and constitutes the lower slopes and main massif of Good Morning Bill situated near Maroona. The undulating plain is not extensive and is found along the north-western and western boundary of the land-system as a number of small, individual areas. Here the sedimentary rocks are overlain in part by coarse sands and gravels of Tertiary age.

Plate 36 – Typical scene in Ararat land system, with Mt Chalambar (part of Ararat land unit) in the background and the gentler slopes of Moyston land unit in the foreground

Land-Units

The hills, rolling plains and undulating plains are land-forms that divide the land-system into three land-units. Ararat land-unit covers the hills, Moyston land-unit covers the rolling plains, and Illawarra land-unit the areas of undulating plain. The first two land-units are very similar to each other in terms of their climate, geology, soils, vegetation and land-use, and they will be described together in subsequent paragraphs. Any differences between them are related to their differences of topography. Illawarra land-unit is described separately because it has some features peculiar to itself. The relationships of the land-units to each other and their features of environment and land-use are summarized in Figure 27.

Ararat and Moyston land-units

Red and brown gravelly solodic soils occur over the rolling plains and on the middle and lower slopes of the hills so that they form the dominant group of soils in the land-system. Their profiles have characteristic features which distinguish them from solodic soils on other parent materials. These features are first, a prominent layer of quartz stones lying above the clay at the bottom of the A horizon and also, to a lesser degree, in the top few inches of the clay. Second, the colour of the clay is commonly red (2.5 YR hue) and this applies over most of the landscape although variations according to slope and drainage do occur. Thus on the upper slopes 5 YR red hues also occur, and on the lower, flatter slopes the clay is often yellowish brown (10 YR hue) or strong brown (7.5 YR hue). These features are more evident in weathered profiles exposed in table drains and road cuttings than in a freshly dug pit. In these positions, the layer of quartz stones above the clay projects clearly from the weathered face of the A horizon, and the red clay exhibits considerable cracking at the surface, where it is dry, to give a strong, medium, sub-angular blocky structure.

The A horizons of these solodic soils are composed of a gritty, fine sandy loam which averages four to five inches in depth on the upper positions of the landscape and eleven to thirteen inches on the lowest positions. Associated with this trend is the development of a bleached horizon above the clay. The bleach is absent in the uppermost positions and becomes more evident in the lowest positions. Another feature of these soils is the fragments of parent rock, such as mica schist, that are sometimes present in the layer of quartz stones and in the clay subsoil.

In addition to the main group of solodic soils, there are two other groups in specialized situations. On the steepest slopes of the hills there are shallow soils which resemble both skeletal and solodic soils. A typical profile shows a clay loam often no more than four inches' deep overlying a clay which in turn overlies decomposing rock. Abundant stones of quartz and rock lie throughout the soil. In drainage lines between the rolling plains and hills, the soils show evidence of their wetter sites and alluvial parent materials. The A horizon is a loam or fine sandy loam without grit or quartz stones, and the clay is usually between twelve and eighteen inches below the surface with brown, yellow and grey rather than red colours.

The distribution of eucalypt woodlands in Moyston and Ararat land-units is shown in the land-system diagram (Figure 27). In both land-units the upper slopes and crests of the landscape carry a short woodland of long leaf box and red stringybark with also yellow gum and yellow box present in some localities. On the middle and lower slopes a number of eucalypts is found including yellow box, yellow gum, red gum, apple box and long leaf box. Around Maroona and Good Morning Bill in the southern parts of the area there is a difference, in that red gums are the only species on the middle and lower slopes although woodlands of long leaf box, yellow box and apple box occur on the upper slopes and crests.

The main primary industry in Ararat and Moyston land-units is the growing of fine wool with mostly Merino sheep on native and introduced pastures. Beef cattle are a supplement to the main source of income on many properties.

Introduced pasture species commonly used are Mt. Barker and Bacchus Marsh subterranean clovers, phalaris and perennial ryegrass. In most situations phalaris is the more successful of the two grasses because the sites afforded by the rolling plains and hills are too dry for perennial ryegrass, particularly under the average annual rainfall which varies from 21 to 24 inches across the two land-units. Perennial ryegrass has been successfully grown on flatter and wetter paddocks within the area.

The type of pasture used and the method of establishing introduced species vary across the two land-units according to their topography. Native pastures still predominate on most of the hills because of the inaccessibility to tractors and implements and the cost of the alternative technique of using light aircraft. In some places aerial topdressing and seeding have been used. However, the value of establishing introduced pastures of annual species on the hills is now being seriously challenged by the requirements of soil conservation. Experiments have shown that introduced annual pastures, and weeds like capeweed and barley grass which they encourage, give far less protection to the soil during the summer and autumn than the native perennial grasses (Dunin and Downes, 1962). The erosion hazard on the hills and the volumes of run-off water arising from them are therefore increased. Unlike the flatter land, the hills cannot be ploughed to renovate the pastures and remove the unwanted species. It is now considered that the native perennial grasses should be encouraged to provide a denser cover on the hills. This requires the erection of sub-divisional fences to separate the hills from the flatter land below.

On the lowest slopes of the hills and on parts of the rolling plains, native pastures are being improved by topdressing with molybdated superphosphate and by the introduction of subterranean clover and phalaris.

On the gentle slopes and flats in Moyston land-unit, the pastures are usually introduced by cultivation and sowing, and there, subterranean clover and perennial ryegrass are used, and white clover and strawberry clover have shown promise in the wetter paddocks.

For many years pasture improvement over most of the Ordovician sedimentary country was severely retarded by the inability of clovers to grow vigorously in the solodic soils. In recent years molybdenum, applied with superphosphate, has stimulated clovers and enabled pasture improvement to spread throughout these areas (Newman 1955, 1956). Lime is often a necessary addition to the more acid topsoils where molybdenum alone fails to give a satisfactory stimulus to the clovers. Newman (1955) found that lime was required in topsoils with pH values less than 5. 5.
The carrying capacity of unimproved native pastures in the two land-units is half a dry sheep per acre, and the introduced pastures have raised this to two dry sheep per acre.

Ararat and Moyston land-units have the highest erosion hazard and the most widespread incidence of erosion within the agricultural parts of the survey area. The environmental features contributing to this situation are the steep topography, erodible solodic soils and climate. The solodic soils are susceptible to water erosion because they have large amounts of gravel, a poor structure and consistence, a tendency to surface sealing, and they are readily dispersed in water as colloidal suspensions. The climate contributes to the high hazard and high incidence of erosion because there are marked wet and dry seasons, and the low summer rainfall comes as intermittent storms of high intensity at a time when the pastures are dead and thin and give little protection to the soil.

The erosion hazard has been accentuated throughout the years since settlement by the extensive removal of the dense eucalypt woodlands from the hills and rolling plains to provide additional grazing areas. This was followed by the siting of sub-divisional fences that allowed the steep slopes to be grazed as intensively as the flatter land. Rabbits became a serious problem and greatly increased the grazing pressure exerted by the flocks of sheep. For these reasons, the native pastures were overgrazed and erosion became widespread.

At the present time sheet erosion is serious under unimproved native pastures, particularly on the hills and steeper parts of the plains. These areas need to be carefully grazed to maintain a vigorous cover of native perennials, and this can be done by correct sub-division and by the elimination of rabbits. Introduced pastures on the lower slopes have successfully reduced run-off and therefore have reduced or stopped sheet erosion and gully erosion. However this has been accompanied by a reduction in the amount of water reaching the farm dams so that pasture improvement brings with it the need to ensure an adequate supply of water for the stock.

Gullying is a serious problem associated with the sheet-eroded slopes. Most creeks and drainage lines have been converted into deep, broad gullies with vertical walls and flat floors. In addition, gullies have developed in many places away from the natural drainage systems where run-off has been concentrated, for example, in table drains beside roads and along stock tracks and plough lines. Erosion of the gully walls is particularly prevalent and is probably the greatest contributor to the silt load of the streams. In many places the walls of the gullies have exposed silt deposits at least twelve inches in thickness clearly overlying the original soil. The extreme erodibility of the clay subsoil is further shown by the need to construct concrete fords as road crossings over the smaller creeks, and also by the use of masonry and concrete walls to protect bridges and culverts on the larger creeks.

Salting does occur along some of the drainage lines and some areas have reached the hardpan stage, but it is not as serious here as it is in the Dundas land-system.

The Soil Conservation Authority uses a wide range of techniques in the Moyston and Ararat land-units to stop erosion and to develop systems of conservation farming. These techniques include pasture improvement within the catchments to eliminate sheet erosion and to reduce the volume of run-off moving into gullies and salted areas. On many slopes contour ripping is a necessary mechanical aid which reduces run-off and increases the infiltration of water into the soil. Work around the gullies can take a number of forms depending on the nature of the problem. These forms include diversion banks, concrete structures, grassed chutes, soil-saving dams, tree planting, and the fencing of vulnerable places to prevent grazing.

Sound farm management is possible, even on areas of the highest erosion hazard, if careful attention is given to the techniques of conservation farming.

Illawarra land-unit

This land-unit comprises the western and north-western parts of Ararat land-system where extensive low rises have slopes that are shorter and far less steep than in the Moyston and Ararat land-units. The rises are made up of low outcrops of Ordovician sedimentary rocks, some of which are capped with Tertiary sands and gravels, and they are separated from each other by narrow alluvial plains that have been included in the Mt. William Creek land-system.

One of the characteristic features of the land-unit is the soil that has developed in the Tertiary deposits. This is named the Illawarra series of clay leptopodzol and a detailed description is given on p. 187. Briefly, the texture of the A horizon is gritty loamy sand or loamy sand and there may or may not be soft stones of quartz grains cemented by ferric oxide. The colour of the A, horizon is strong brown or yellowish brown. The B horizon is a gritty light clay and its depth below the surface is usually within the range of twelve to twenty inches although ten and thirty inches have been recorded. Wherever the rises are not covered with sands and gravels, there is a very shallow sandy loam, only about one to three inches deep, overlying a grey and brown clay. The characteristic feature of this soil is the large quantities of quartz stones lying over the ground and throughout the profile.

On the middle and lower slopes of the rises, below the other soils, there are solonetzic soils with textures influenced by coarse sand and quartz stones from the higher positions. The clay is eight to twelve inches below a coarse sandy loam or loamy sand which has varying amounts of quartz stones.

Illawarra land-unit differs from the other land-units in its vegetation as well as in its soils. A heath woodland of long leaf box grows on those rises capped with the sands and gravels. The heath understorey is well developed and consists mainly of daphne heath, flame heath and woolly tea-tree. This plant community is an indicator of the Illawarra clay leptopodzols. Elsewhere in the land-unit there is a tall woodland of yellow gum, with also yellow box, growing in the solonetzic soils.

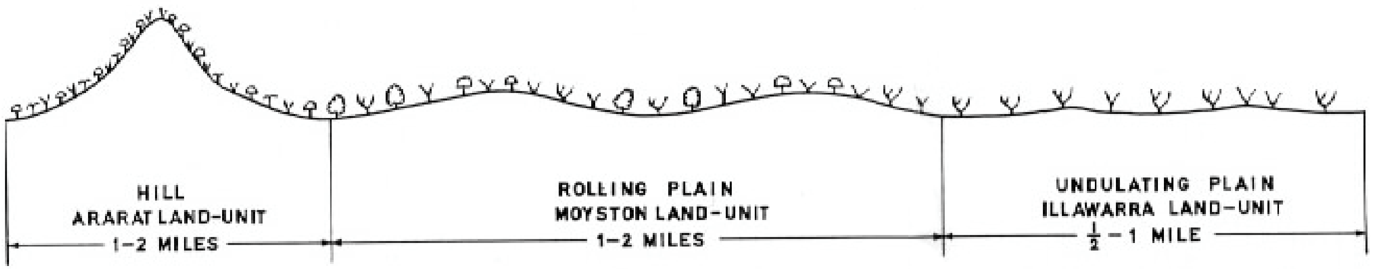
Most of the land-unit is uncleared and unused and these areas coincide with the long leaf box heath woodlands. Part of the reason is that the heath woodlands are within Reserved Forest and unoccupied Crown land. However, even where they are held under freehold tenure they remain uncleared for evidently it is difficult to establish introduced pastures in the clay leptopodzols. So far as is known, no experimental work has been done to find out the fertilizer requirements of these soils. Like the nomopodzols they are moderately acid and severely base unsaturated in the A horizon so that they may need a full range of fertilizers before vigorous pasture of introduced species can be established. However they have greater potential for pasture development than the nomopodzols because they have a clay subsoil much closer to the surface which can supply the pastures with nutrients and hold up water to the roots.

Elsewhere in the land-unit, the yellow gum and yellow box woodlands have been partly cleared and native pastures are widely used for sheep grazing. The solonetzic soils are well able to support introduced pastures and they offer considerable scope for raising the carrying capacities and incomes of farms in this land-unit.

To summarize, the Ararat land-system has a high erosion hazard and erosion is widespread, but by adopting the techniques of conservation farming, it is possible to develop prosperous farms with high levels of production and no erosion.

ARARAT LAND SYSTEM

(i) Distribution of land-forms



(ii) Land-system diagram

Climate		Average annual rainfall 21-24 inches : growing season late April to October							
Land Form		Hill			Rolling plain			Undulating plain	
Geology		Ordovician and metamorphosed Ordovician sedimentary rocks							Tertiary sands, gravels
Topography		Steep slopes >10%			Moderate slopes 5-10%			Gentle slopes 2-4%	
Soil		Solodic soils	Skeletal and shallow solodic soils		Red and brown solodic soils			Brown solonetzic soils (Darracourt series)	Clay leptopodzol
Land Class		4A	4B and 5	4A	4A			2A and 2B	4A
Land Use	Present	Wool growing on native and introduced pastures							Unused
	Problems	Finding the best form of land-use			Establishing pastures, stopping erosion			Establishing pastures, waterlogging on flat land	
Water Erosion	Hazard	Very high			High			Low	
	Actual	Sheet erosion, gullies			Sheet erosion, gullying, stream bank erosion			Moderate sheet erosion	None
Native Vegetation	Structure	Short woodland			Tall woodland	Short woodland	Tall woodland	Tall woodland	Heath woodland
	Species	Long leaf box and red stringybark (dominant), yellow gum, yellow box, sheoke (minor)			Red gum, yellow gum, yellow box	Long leaf box, red stringybark	Apple box, long leaf box	Yellow gum (dominant) Yellow box (sub-dominant)	Long leaf box (dominant) yellow gum

Figure 27 – Ararat Land System