THE TANGAMBALANGA LAND SYSTEMS

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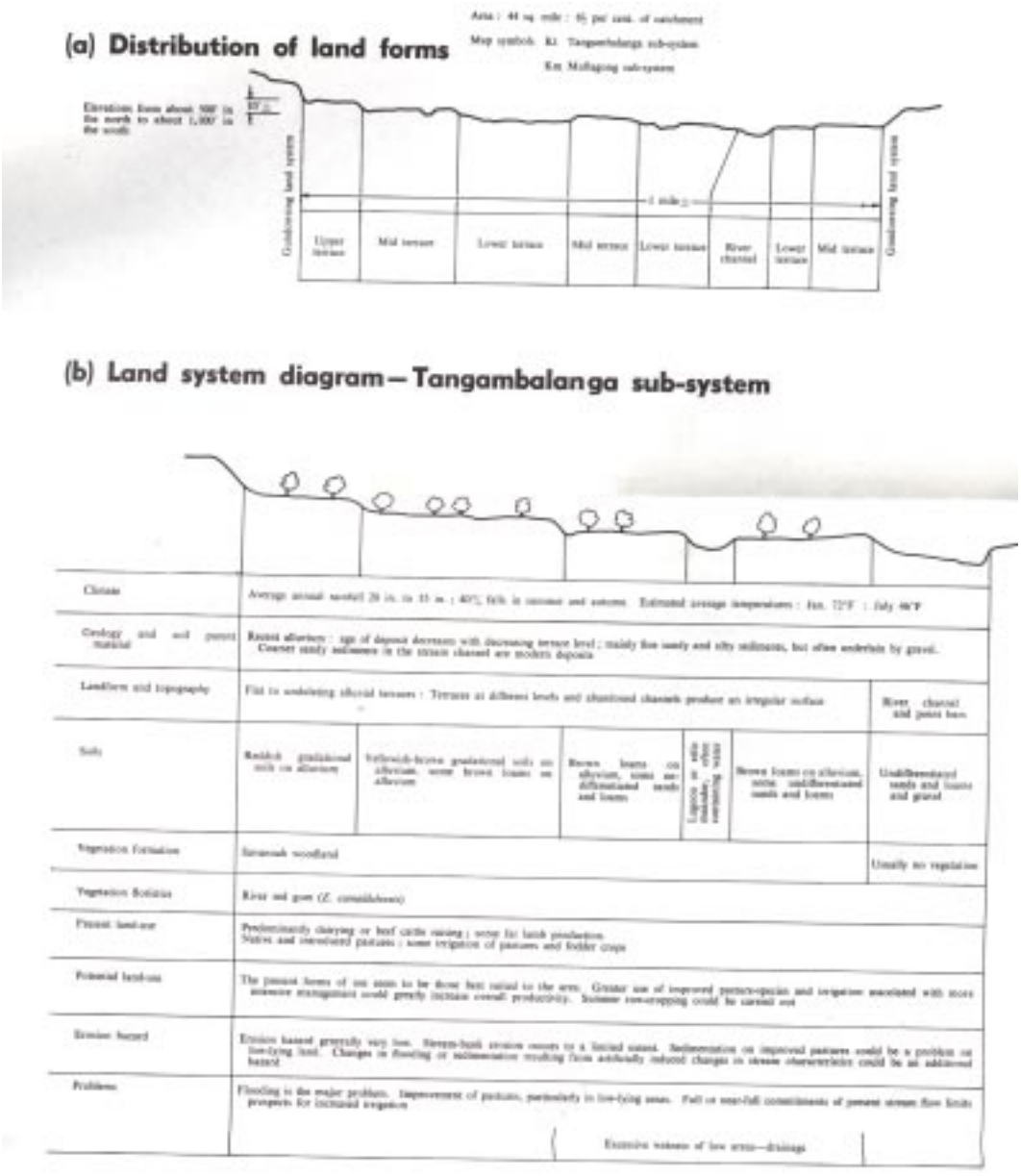
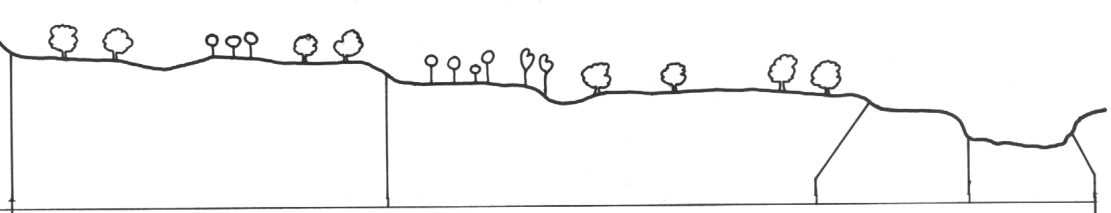


Fig 11 - Kiewa Land System - Tangambalanga sub-system, Mullagong sub-system

(c) Land system diagram—Mullagong sub-system



Climate	Average annual rainfall 30 in. to 45 in. ; 40% falls in summer and autumn. Estimated average temperatures : Jan. 70°F : July 45°F			
Geology and soil parent material	Recent alluvium : age of deposit decreases with decreasing terrace level : mainly fine sandy sediments underlain by gravel			Sands and gravels
Landforms and topography	Undulating to flat alluvial terraces at different levels, and abandoned channels : irregular surface			Stream channel
Soils	Reddish gradational soils on alluvium, usually with sandy textures and often gravelly	Predominantly yellowish-brown gradational soils on alluvium, some brown loams on alluvium	Brown loams on alluvium, undifferentiated sands and loams	Undifferentiated sands and loams and gravel
Vegetation formation	Savannah woodland to tall woodland			Usually no vegetation
Vegetation floristics	River red gum (*E. camaldulensis*) dominant in north on locally wet sites. Swamp gum (*E. camphora*) becoming dominant and replacing river red gum in south. Candlebark gum (*E. rubida*) dominant on well drained sites			
Present land-use	Predominantly dairying and beef cattle fattening ; some fat lamb production, mainly on introduced pasture species. Some irrigated pastures and summer fodder crops. Tobacco growing, mainly in the south			
Potential land-use	Suitable for intensive grazing of improved pastures. Row-crop production would also be a suitable form of land-use			
Erosion hazard	Erosion hazard generally very low. Stream-bank erosion is a moderate hazard			
Problems	Early or late frosts may damage frost-sensitive crops. Low temperatures reduce pasture growth in winter. Excessive wetness where tributary drainage lines cross the flats. The flood hazard is much lower than on the Tangambalanga sub-system			

Fig 11 - Kiewa Land System - Tangambalanga sub-system, Mullagong sub-system

1 KIEWA LAND SYSTEM

The Kiewa land system extends as a narrow strip along the Kiewa River, from its junction with the Murray River to Mount Beauty, and also along the lower reaches of Yackandandah Creek. It has an area of 44 square miles which is about 6½ per cent of the catchment.

The only parts of the land system that are not freehold land are the permanently reserved river frontages which form a narrow strip, normally 1 chain wide on either side of the main streams.

The land system has been divided into two sub-systems, (Tangambalanga and Mullagong) primarily on the basis of differences in flooding characteristics and drainage.

The distribution of land forms within the land system is shown in Figure 11 (a) and the features of the environment in the two sub-systems are shown in Figures 11 (b) and 11 (c).

(a) Tangambalanga sub-system

This sub-system consists of the broad flood plain of the Kiewa River from a little north of Dederang down to the Murray River. It has an area of 26 square miles which is a little less than 4 per cent of the catchment.

The average annual rainfall ranges from about 28 inches in the north to about 35 inches in the south. Up to 40 per cent of the rain falls during summer and autumn, but the reliability of this rain is low, and it usually occurs as short, high intensity storms. Winter rain is the most reliable and is spread over a greater number of days. December to March inclusive have an average of 412- wet days per month, but for May to October inclusive the average is 10 wet days per month.

Temperatures arc amongst the warmest in the catchment although because of the low topographic position frosts may be more severe and more frequent than on the adjacent Dederang land system. The average frost-free period is estimated to be about 180 to 200 days. Estimates of average temperatures are about 72°F. in January and about 46°F. in July.

The soil parent materials consist of river alluvium derived from the widely diverse rock types in the catchment. The most abundant rocks in the catchment are the gneisses and schists of the metamorphic complex, but granites and granodiorites are also common. All contain quantities of mica, and so, abundant mica is usually a notable feature of the material in which the soils are formed. Although in general the flood plain consists of the finer-textured sediment (silts and clays), fine sand is always present and coarser sand occurs as lenses within the soils and as deposits along the present-day stream channels. Gravel beds are often found at shallow depths.

This sub-system consists of the dissected remnants of two terraces, and occasional benches of a third and higher level each separated by about 2 to 3 feet. Mild dissection of the mid-terrace has produced shallow channels which carry water in moderate or high floods. The lower terrace also has an irregular surface resulting from numerous abandoned meanders and channels. These usually fill early in a flood and may retain water after the flood recedes (Plate 25). Generally the bed of the river is only about 3 to 4 feet below the general level of the lower terrace. The banks of the river are often 1 to 2 feet higher than the general level of the mid terrace as a result of the formation of natural levees.

There is an extensive area in the far north-east of the sub-system where flood water from the Murray River may flow south-west into the Kiewa system. This section of the sub-system has larger channels than the remainder and a number of large, more-or-less permanent lagoons. An anabranch of the Murray River, known as Ryans Creek, also traverses the sub-system in the north.

Soils of the mid-terrace are yellowish-brown gradational soils. The structure and colour of the A-horizon are variable, apparently depending on the position of the soil in relation to flood levels which contribute fine sediment to the surface. It is probable that the dark, strongly structured surface soils commonly found on the lower terrace, have been produced by the continuous accumulation of fine sediments in grassy vegetation. The continuous decomposition and growth of the grass, and the active soil fauna which is usually associated with grassy swards, have contributed to the formation of the dark, organic and highly structured surface soils. It seems that this process may have influenced some

of the soils on the mid terrace. In soils which have been above flood level for a long time, and which have been continuously grazed since settlement, the strongly developed fine structure has deteriorated as the influence of the organic matter has declined. Soils which still occasionally receive thin deposits of fine sediment, and on which grazing pressure has apparently not been high, still retain the well developed fine structure and dark colour.

The soils of the lower terrace are mainly brown loams. These are dark silty or fine sandy loams with good structure in the top few inches. Other soils are the undifferentiated sands and loams in which current bedding is usually discernible. Frequently a foot or more of silty or fine sandy material may be found overlying a yellowish-brown, heavier-textured soil, which appears to be the B-horizon of a truncated yellowish-brown gradational soil.

Plate 25 - The Kiewa land system - abandoned stream channels such as the one shown often retain water throughout the year

On the western side of the Kiewa River below the confluence of Yackandandah Creek, the lower terrace has been overlain by fine sediment resulting from mining along the creek. In some places up to 3 feet of greyish-brown and dull reddish-brown mottled silty loam overlies the greyish-brown loam of the old soil surface.

The third level which is not always present, is usually about 2 feet higher than the general level of the mid terrace. It usually takes the form of a longitudinal ridge, or a small bench in an embayment in the still higher terraces of the Dederang land system, which has protected it from erosion by the river. These appear to be relics of a once extensive terrace which was almost completely destroyed during the formation of the lower terraces. Soils on this terrace are reddish gradational soils. They have a sandy loam surface texture and may be weakly bleached. They have weakly developed structure, except in the surface where biological activity results in better structure.

The characteristic native vegetation of the Tangambalanga sub-system is the savannah woodland of red gum (*E. camaldulensis).* Fen in which reeds *(Phragmites communis)* and numerous other water-loving plants occur, grows in the shallower parts of the lagoons and sluggish parts of the streams.

Most of the sub-system is used for grazing beef cattle or dairying. Because of the wetness of some areas and the regular flooding, much of the northern part has not been improved beyond killing or removing the trees (Plate 26). The pastures are not as productive as they could be and large areas are

covered with useless vegetation such as rushes (Juncus spp.). The much dissected nature of the surface of the flats makes working with machinery difficult in many parts of the north.

Better use would be made of this land if better pasture species were more generally used. The problem of management of pastures which are flooded periodically may require special consideration. Much of this area could be irrigated from the adjacent river if allocations of water could be made available. At present Kiewa water is fully committed to existing and approved proposed irrigation.

The yellowish-brown gradational soils on alluvium would be suitable for growing summer crops if irrigation water were available. Although the brown loams on alluvium may be rather poorly aerated for much of the year they seem to be the most fertile soils in the catchment and may also prove suitable for intensive cultivation of irrigated summer crops.

Erosion of the bed and banks of the river causes occasional local problems although the stream is generally sound. Flooding is a major problem in the improvement and management of the land in the sub-system. This is especially so at the northern end, where the backing up of Murray River flood waters can create flood conditions or accentuate flooding in the lower Kiewa. When river improvement projects are being considered, usually with the objective of reducing flooding or controlling stream-bank erosion, it should be remembered that the stability of the bed and banks of the stream has been achieved by a meandering channel and the spreading of flood flows over a wide surface. Attempts to reduce the meandering or to reduce the normal flooding pattern may lead to instability of the stream.

Plate 26 - Unimproved grazing land in the Kiewa land system at Little River. This land is regularly flooded in winter and spring

Apart from the construction of a large storage in the upper reaches of the river, there does not appear to be any satisfactory long-term alternative to the established pattern of periodic flooding on these river flats, and land-use should be planned to allow for it as it has been in the past. General improvement in pastures in the agricultural areas of the catchment is not expected to have much effect on the incidence of floods as most seem to be the result of heavy general rain when the catchment is saturated, or of warm spring rains which cause substantial snow-melt.

(b) Mullagong sub-system

This sub-system consists of the Kiewa River flats south of Dederang and the narrow strip of flats along the lower Yackandandah Creek. The latter is included here in preference to the Tangambalanga sub-system, largely because it appears to have a steeper gradient and is generally better drained. The area of the sub-system is 18 sq. miles, which is almost 3 per cent of the catchment.

The average annual rainfall in the Yackandandah Creek part of the sub-system is about 30 to 35 inches and the rest of the sub-system receives from 35 inches up to about 45 inches in the south. The pattern of distribution of rain is similar to that in the Tangambalanga sub-system, although the average number of wet days per month is about 5 to 6 in summer and about 12 in winter.

Although elevations are not much higher than in the Tangambalanga sub-system, temperatures appear to be cooler. One possible reason is that country of higher elevation occurs adjacent to the Mullagong sub-system, and in general, the valley is narrower. Cold air from the high slopes drains downhill and is concentrated in the lowest areas, the river flats. The average frost-free period is estimated to vary from about 180 days in the northern part of the sub-system including the Yackandandah area, to about 150 days in the south.

Two usually well-defined terraces make up the sub-system, but in some areas a third slightly higher, and therefore older terrace, has survived. The differences in elevation between the lower two terraces is usually only about 2 to 4 feet, however because all three are often dissected to similar depths by channels and relic meanders, the surface is often very irregular, and it is sometimes difficult to identify the respective terrace levels.

The lowest terrace differs from that of the Tangambalanga sub-system in having a steeper gradient, or from about 16 feet per mile to 26 feet per mile near Mount Beauty. However, in the northernmost 2 miles of the sub-system, where the flood-plain is constricted, it has an average gradient of only 8 feet per mile, which is less than that of the next 10 miles of this terrace in the Tangambalanga sub-system (11 feet per mile). The river bed is between 7 and 9 feet below the general level of the lower terrace. The lagoons or relic stream channels have less water in them than in the Tangambalanga sub-system and most are dry for most of the year.

The soil parent materials tend to be predominantly fine sands rather than silts, and mica, which is common in the soil in the Tangambalanga sub-system, is not so abundant. These differences may be attributed to the steeper gradients of the flood-plain.

The most widespread soils are the yellowish-brown gradational soils on alluvium, which are characteristic of the mid-terrace. They are rather coarser textured than in the Tangambalanga sub-system, and usually are not as dark or as well structured.

Brown loams with soft consistence on alluvium occur on the lower terrace.

Reddish gradational soils on alluvium, and some gravel deposits occur on the higher terrace. These are not very extensive. They are all well-drained soils with gravel usually at about 3 feet.

Although the vegetation has been cleared from almost all of this sub-system, some remnants indicate that in the south it consisted of tall woodland to wet sclerophyll forest of candlebark gum (*E. rubida).* Savannah woodland of river red gum *(E. camaldulensis)* appears to be confined to the northern part of the sub-system. The Yackandandah Creek area has small areas of woodland of river red gum left on it. Swamp gum *(E. camphora)* occurs with river red gum in the Yackandandah Creek area and in the northern part of the sub-system on the Kiewa River, and occurs without red gum on locally wet sites in the south.

Dairy farming is the most widespread form of land-use, however the area cultivated for tobacco has increased rapidly in the last few years (Plates 22, 23). The freely draining soils are well suited to intensively cultivated and irrigated crops. However, the water resources of the streams are fully committed (S. R. and W. S. C. pers. tomm. 1971) so there seems little likelihood of further development for tobacco on the flats. Some flats are used for grazing of beef cattle and fat lambs. Irrigated and non-irrigated summer fodder crops are grown but not generally on a large scale.

Although there is scope for improvement of pastures with better species and heavier fertiliser applications, any trend towards the more intensive uses, such as row-crops or irrigated pastures, will be limited by water availability.

This sub-system is less susceptible to flooding than the Tangambalanga sub-system and stream-bank erosion is not a serious problem at present. Some sections of the banks of the Kiewa have been unstable in the past but have been controlled with groynes and willow planting.

The Yackandandah Creek flats have been damaged by gold dredging and much of the area consists of dredge holes or coarse tailing deposits. The deposits are used for road surfacing material, but there seems to be little prospect for agricultural production from these areas. Fish farming may be a proposition in the larger dredge holes, or their water could be used for irrigation. One has been developed for recreation.