MURRAY LAND SYSTEM

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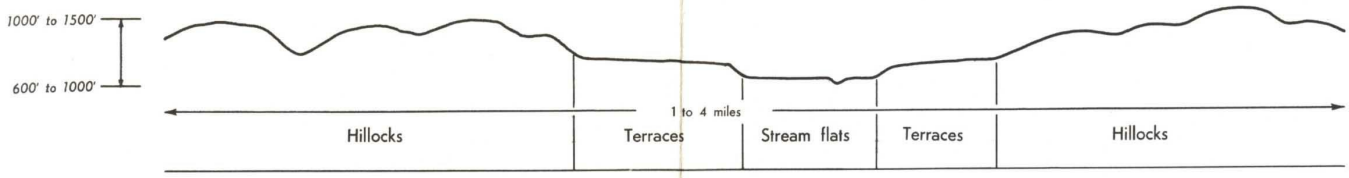
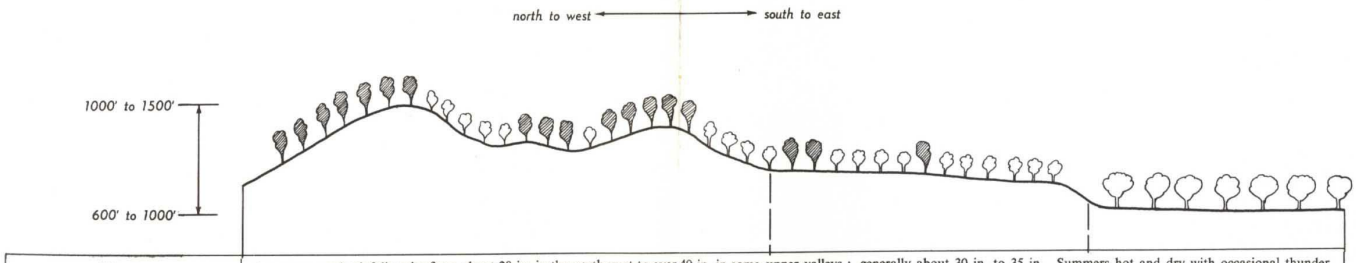
Area: 396 square miles 10·2% of catchment

(a) Distribution of land forms



(b) Land system diagram



Climate	Average annual rainfall varies from about 28 in. in the north-west to over 40 in. in some upper valleys ; generally about 30 in. to 35 in. Summers hot and dry with occasional thunder storms, winters cool and wet		
Geology	Variable—granite, gneiss, schist, Ordovician shales and mudstones	Post-Pliocene alluvium	Recent alluvium
Topography	Rolling to hilly	Undulating to rolling	Flat to undulating
Land Form	Hillocks	Terraces	Stream flats
Soil Groups	Leptopodzols, some red podzolics and occasional regosols. Cryptopodsols and amphipodzols in higher rainfall areas	Red podzolic soils and occasional regosols and leptopodzols	Alluvial brown earths, stream regosols, some gley podzolic soils and occasional minimal prairie soils
Vegetation Structure	Mainly dry sclerophyll forest tending to wet sclerophyll forest ; savannah woodland tending to tall woodland in drier areas	Savannah woodland tending to dry sclerophyll forest	Savannah woodland
Vegetation Floristics	*E. macrorhyncha* alliance ; *E. tereticornis–E. albens–E. goniocalyx* alliance	*E. tereticornis–E. albens–E. goniocalyx* alliance *E. macrorhyncha* alliance	*E. camaldulensis* alliance
Present Land-use	Mostly cleared ; grazing sheep for wool and/or meat, beef cattle, dairying. Pastures usually top-dressed with superphosphate, some sown to improved species		Grazing beef cattle, dairying, fodder crops
Potential Land-use	Grazing is the most suitable form of use. Higher productivity possible with improved pasture species, adequate fertilizer application and sound management	Grazing, including dairying ; higher productivity with better pasture species, fertilizer applications. Spray irrigation should be possible on small areas adjacent to perennial streams	Better-drained flats could carry high productivity irrigated pasture ; wetter flats could carry perennials tolerant of wet conditions
Hazards	Sheet and gully erosion. Slumps and earth flows from steeper slopes in wetter years	Gully erosion, particularly if adjacent hills produce substantial run-off	Flooding, stream-bank erosion, frosts
Problems	Pasture improvement and management, particularly on slopes where tractor working is not possible. Subdivisional fencing to control grazing	Pasture improvement and management. Development of irrigation systems	Drainage and flood prevention or control. Irrigation techniques ; "pugging" of wet soil by stock

Fig. 31 – Murray Land System

The Murray land system comprises the lower and topographically more mature reaches of the major streams, and has a wide distribution in the north of the catchment. It consists of the broad valley bottoms of the Murray and Mitta Mitta Rivers and the numerous more important tributaries, such as Tallangatta Creek (Plate 35), Cudgewa Creek, Corryong and Nariel Creeks and Thowgla Creek. An isolated occurrence is at Tom Groggin on the upper Indi River. The area of the land system is 396 square miles which is a little more than 10 per cent. of the total catchment. More of this land system becomes available for temporary use as the level of the Lake Hume falls below the full supply level, usually in late summer and early autumn. This land system provides the best conditions for agriculture to be found in the catchment. Because of this it was the first land in the north to be settled, and is now entirely freehold, except for some very small areas which are reserved for camping and watering of stock, and the usual creek or river frontages which are permanently reserved from alienation.

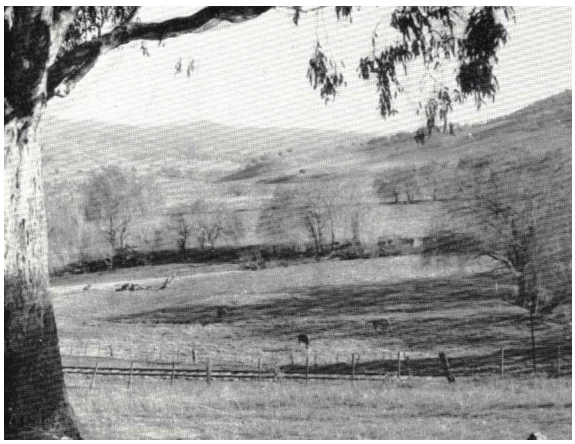


Plate 35. Murray lad system on Tallangatta Creek.
The broad lower terraces, or alluvial flats, are flanked by remnants of older terraces and fans about 25 feet to 35 feet higher, and these grade into the hillocks. Willows are extensively planted along streams in the land system.

The land system is composed of stream flats, upper terraces* of older alluvial origin and hillocks (Figure 31). The proportion of each land form varies. The stream flats, which occupy about 15 per cent. of the land system, are at elevations of from about 550 feet, which is below the upper level of the reservoir, to about 1,000 feet in the upper reaches of the north-eastern valleys. Terraces occupy about 35 per cent. of the land system. They generally slope gently from the bordering hillocks down to within a vertical distance of from 15 feet to 30 feet of the flats. There is usually a fairly sharp scarp joining the terrace and the flat. Frequently dissection of the terraces has occurred, so that their original relatively undulating surface is broken into rolling or hilly topography. The upper elevations of the hillocks are from about 1,000 feet in the north-west, to about 1,200 feet to 1,500 feet in the east.

The terraces and flats are built up of alluvial material derived from the variety of rock types found in the catchment, and are of post-Pliocene origin. Their relative ages have been established by applying the principles of cyclic landscape development (Butler 1959 ; van Dijk 1959). Because the land system occurs over a wide area, the hillocks are derived from a variety of rocks. Grey granite is the parent rock along much of the Murray River and up the Cudgewa and Corryong Creeks. Gneiss occurs on the lower reaches of the Mitta Mitta River and changes to schists around Eskdale and then to unaltered Ordovician sandstones, mudstones and shales through to the end of the land system on this stream. Most of the Tallangatta Creek is flanked by schists but Ordovician sediments occur in the upper reaches of the land system on this stream.

The average annual rainfall over this area varies rather more than is desirable in a land system. From about 28 inches per annum in the far north-western corner it rises to about 40 inches in some of the upper-valley tracts, such as Mitta Mitta and Nariel Upper. Furthermore, the upper-valley areas are generally cooler than the more northerly areas. The flats in the lower part of the streams are often

* These consist of remnants of an old landscape formed by mergence of alluvial-colluvial fans and alluvial terraces.

flooded for short periods during winter and spring, but higher up the valleys the flats are only rarely flooded.

The steeper slopes of both hillock and terrace areas usually have leptopodzol soils. The reddish sub-group is more common on fine-textured parent materials and the greyish-brown or yellowish-brown sub-group is usually found on coarse-textured parent materials. Stumps of red clay, similar to the B-horizon of red podzolic soils, may occur as a relic horizon beneath the leptopodzol surface soil. Cryptopodzols and amphipodzols occur to a limited extent in the high-rainfall areas.

Red podzolic soils are the most common soil on the gently-sloping upper terraces, and they are the most intensively farmed soils. Regosols and leptopodzols sometimes occur on fans or alluvial trials across the upper terraces. In higher-rainfall areas the red podzolics trend towards amphipodzols.

The remnant of a terrace below the upper one, but about 10 feet or more above the broad stream flats, may sometimes be found along the major streams and more commonly on smaller perennial tributaries. The soil on this terrace is a red earth, generally a uniformly red, clay loam with a weak structure.

The soils on the lower terraces or flats are mainly alluvial brown earths and minimal prairie soils, with minimal podzolics on coarser materials near stream channels. Regosols or stratified gleyed alluvial soils occur along the margins of most streams.

The vegetation of the hillocks is the widespread dry sclerophyll forest of the *E. macrorhyncha* alliance. On some steep slopes with shallow soils and a northerly aspect, *E. tereticornis* (probably var. *blakelyi)* and E. *albens* are often dominant, but have a poorer form than the terrace vegetation. The vegetation of the terraces in the drier parts of the land system is savannah woodland of the *E. tereticornis-E. albens-E. goniocalyx* alliance. As the rainfall increases, the *E. macrorhyncha* alliance and ultimately the *E. radiata-E. rubida-E. dives* alliance assume dominance on the upper terraces. Herbs, and particularly grasses, form a more-or-less continuous ground cover under the woodland where it remains unimproved. On cleared land most of the native grasses have now been replaced by sown or volunteer pastures of subterranean clover and rye grass, which are maintained by dressings of superphosphate. The stream flats are largely cleared, but remnants of the savannah woodland of *E. camaldulensis* alliance still exist (Plate 20).

Stream-bank erosion is one of the most serious erosion problems in this land system. It is actively being combated by River Improvement Trusts. Also associated with the lower river flats is the hazard of sudden floodings, mostly in spring and early summer. Stock must be moved to higher ground; pastures are unavailable for some time and the receding flood waters often leave much debris which may make the pastures less suitable for grazing until the grass has grown through. Also, flooding distributes a number of undesirable weeds such as smart weed *(Polygonum hydropiper)* and dock *(Rumex crispus)*.

Gully erosion, which occurs in some of the terraces, has probably been brought about by excessive run-off from steeper slopes in the hillock country or adjacent montane slopes. Incipient to mild sheet erosion occurs on some hillocks. Slumps sometimes occur on steep slopes in wet winters, however these are not usually very large, and do not as a rule require special treatment to stabilise them.

This land system is practically entirely freehold land and is mostly cleared. It is the most intensively used land system in the catchment. Dairy farming is the most intensive form of land-use, however many dairy farmers also run some sheep or beef cattle, but reserve the better grazing for the milking herd, and graze the other stock on the poorer country. The terraces are the land forms best suited for agriculture. The soils are rather low in nitrogen and phosphorus before improvement, however they are readily improved. They are well drained. The topography generally allows cultivation without any special precautions to prevent erosion although contour working is desirable on steeper land.

The stream flats are generally rather wet and cold in winter, and where flooding is likely it is difficult to maintain good pasture because of undesirable weeds and debris.

The flats are often regarded by farmers as too wet or "heavy" for sheep, which are prone to a number of diseases when run on such country. Dairy cows and beef cattle are usually grazed on the flats.

The hillocks are generally too steep for cultivation or for the sowing of pasture, but respond to superphosphate. This is not always a good thing as it may lead to the establishment of annuals with low fodder value in place of perennials. A technique for improving the steeper country without bringing this about is needed. Pastures on the hillocks generally dry off too early to maintain milking dairy cows so that sheep and sometimes beef cattle are run on them. Some farmers have used molybdated superphosphate with good results on the steeper hillocks (p. 82).

Probably much greater use could be made of the numerous small perennial streams which flow through the land system, for irrigation of summer fodder crops. Investigation and extension work is required over all the agricultural lands in the catchment, but particularly in this land system which has the potential for much higher productivity.