Environment

The 800 square mile Eppalock Catchment occurs on gentle gradients to the north of the Great dividing Range, extending from the Divide almost to the Riverine Plain. The main streams are the Campaspe and the Coliban (Fig 1).

Since settlement the forests have been gradually cleared, and today they occupy only one-seventh of the land, mainly around the boundary of the catchment.

Native grasses which replaced the forests were overgrazed, and the drier land I the north began to erode.

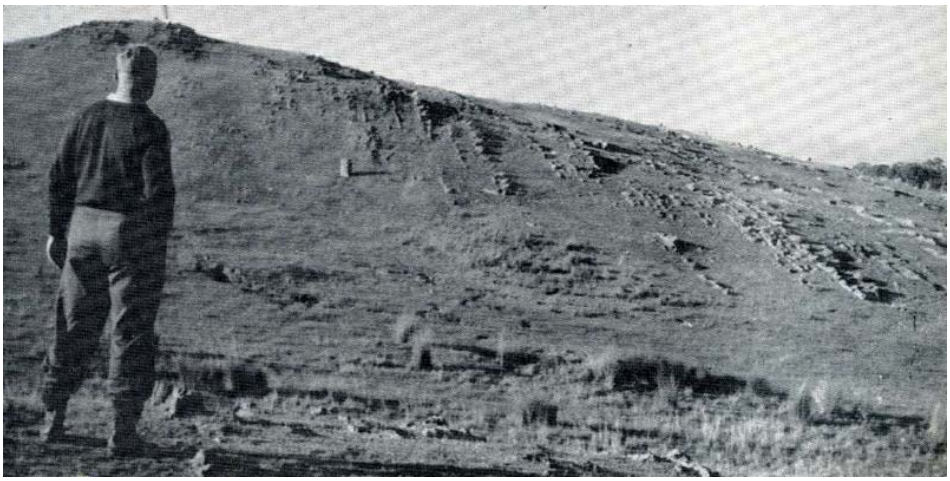
In north, land use has been almost entirely sheep grazing by t in the humid south, farming is diversified with sheep, cattle and crops.

Physiography and geology

The catchment is for the most part gently undulating, with general levels of 2,500 feet above se level in the south-west, falling to 650 feet at the reservoir. There are some noticeable ranges, for example at Mount Macedon (3,500 feet) and Mount Alexander.

The basement rocks (Fig 1) are Ordovician slates and sandstones which usually dip steeply, strike approximately north-south, and contain reefs of quartz. Pliocene and Pleistocene basalts occur in tongues along former drainage lines, and the land thereon is sometimes flat, forming the only large level areas in the catchment. Devonian granodiorite is found in two large areas, usually encircled by ridges (aureoles) of metamorphosed bedrock ranging from spotted slates and hornfels.

Less common outcrops include Permian tillites, Tertiary fluciatile deposits, Silurian sandstones forming a low range in the north-east, Devonian dacite at mount Macedon, trachyte, trachyandesite and variable Cambrian rocks.



Steeper areas of land on Ordovician slates and sandstones in the northern part of the Catchment.

Climate

The climate in the southern part of the catchment it humid whereas in the north it tends towards the Mediterranean type, with cool moist winters and hot summers which are for the most part dry. From south to north the average annual rainfall declines from 44 to 20 inches (Fig 1) and the mean annual temperature increases from 49.9 to 58.5°F.

Variations during the year in average temperature, rainfall and potential evapotranspiration are shown for the northern, central and southern parts of the catchment in figs 2 and 3. Because the northern areas are drier and warmer throughout the ear than the southern areas and have marked summer drought, there is a flush of growth in the spring. Pastures dry off in November or December, depending on the depth of rooting and on the ability of the soils to store moisture during the cooler months. The most productive species in these northern areas are annuals such as subterranean clover and Wimmera ryegrass, and summer-dormant perennials such as phalaris.

In the south, cold prevents significant winter growth and the flush of growth occurs during summer. Potential evapotranspiration is not much higher than rainfall during the summer and an average of only 2.3 inches of moisture needs to be stored in the soil during the cooler months for continued active growth over the summer. The most suitable pastures in the south are summer growing perennials such as white clover and perennial ryegrass, and crops such as potatoes are widely grown.

The excess of rainfall over potential evapotranspiration during the cooler months ranges from 25 inches in the south to 6 inches in the north (Fig 3.), illustrating how the major contribution to stream flow originates in the headwaters of the catchment. Assuming the pastures root to only 2 feet, within which only 4 inches of moisture can be taken up and retained, then the average amount of water leaving the soils as seepage and deep percolation ranges from 21 inches per annum in the south to 2 inches in the north.

Soils

The main soils on each rock type are listed in Fig. 1. Most soils are acid throughout, and of inherently low nutrient status except on basalt where the fertility ranges from moderate to high, being highest on shallow soils and on kranozem-like soils in the south. Duplex profiles predominate on rock types other than basalt, and those in the north on Ordovician sediments and Permian tillite can be classified as solodic soils, sodium comprising more than 5 per cent of the metal ions on the exchange complex in the clay subsoil.

On Ordovician sediments and metamorphic aureoles in the northern and central areas, the soils of the upper slopes are shallow, stony and interspersed with vertically-dipping rock strata. On the lower slopes, reddish duplex soils with hardsetting surfaces occur. The only deep soils are found in alluvial-colluvial swales where the profiles are yellowish, duplex and of high macroporosity and dispersibility. In the south, textural changes with depth tend to be gradual as is usual on most rock types in southern Victoria where the rainfall is higher than approximately 35 inches per annum.

The widest range of soils occurs on basalt, probably because of variation in factors such as topography, erosional history, climate, age of flows and the contribution of alluvium from adjacent non-basaltic rocks.

The least variation occurs on the granitic rocks in the central areas. There the profiles are almost always duplex, with coarse sandy A horizons and with B horizons of particularly low permeability.

Native vegetation

The original structural types were woodlands in the north, and dry sclerophyll forests in the higher-rainfall south, except on basalt in the centre and north where grasslands and savannahs predominated.

Thirteen species of eucalypt are common. Each species may occur on a variety of rocks and soils, but distinct associations can be recognised and these are related to variation in climate, rock type and topographic situation. Forests dominated by messmate (*E. obliqua*) and peppermint (*E. dives*) or by manna gum (*E. viminalis*) predominate in the south. Grey box (*E. hermiphloia*) is the most abundant species in the northern woodlands, usually mixed with one or more of the following species: yellow gum (*E. leucoxylon*), red box (*E. polyanthemos*), red stringybark (*E. macrorrhyncha*), long leaf box (*E. goniocalyx*), yellow box (*E. melliodora*) and red gum (*E. camaldulensis*). Relatively few tree species occur in the savannahs on basalt, the chief being red gum which is admixed with snow gum (*E. pauciflora*) and manna gum in the south, and is occasionally replaced by grey box in the north.

Kangaroos grass (*Themeda australis*), wallaby grasses (*Danthonia* spp.) and spear grasses (*Stipa* spp.) appear to have been the original dominant grasses in the grasslands and savannahs, and they were possibly common in the understorey of the woodlands.

Land Classification

Landscapes have been developed by the interaction of climate, geology, topography, flora and fauna, soil and times, and this interaction affects current processes within landscapes, including plant growth. Thus surveys integrating the features of the environment are needed to recognize different kinds of land as a basis for the study processes, of the most suitable form(s) of land use and of the management required to maximise yields whilst retaining ecological stability.

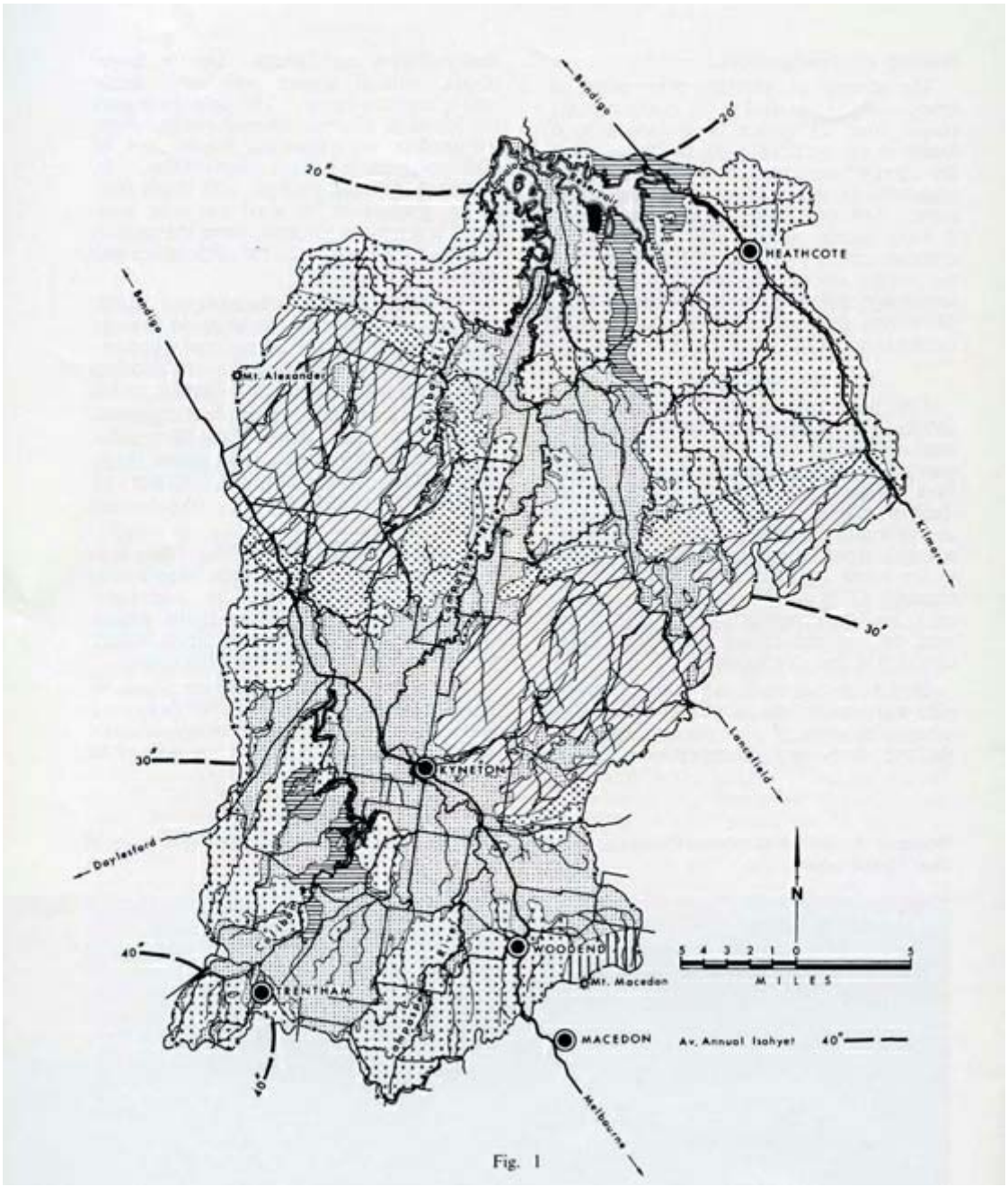
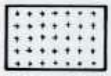
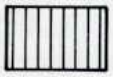


Figure 1 – Land Systems in the Eppalock Catchment

Land System.	Geology.	Topography.	Native Vegetation.	Soils.	Hazards.
 Sandon	Ordovician, interbedded slates and sandstones with quartz reefs.	Dissected ridges with narrow alluvial swales.	Woodland in North. Forest in south.	Shallow stony gradational soils. Reddish duplex soils. Yellowish duplex soils on alluvium. Friable reddish gradational soils in south.	Severe sheeting in north Severe gullying in centre and north Severe salting in centre and north.
 Moolort	Upper Pliocene to Pleistocene volcanic rocks, mainly basalt.	Dissected plateaux. In south gently dissected uplands. Volcanic cones.	Grassland. Savannah. Woodland. Forest in south.	Stony shallow gradational soils (red, brown, grey). Duplex soils (red, brown, grey). Grey calcareous clays. Reddish friable clays.	——
 Ravenswood	Devonian granitic rocks, mainly granodiorite.	Gentle to moderately steep ridges with narrow alluvial swales.	Woodland. Forest.	Reddish yellow duplex soils with coarse sandy A horizons.	Slight gullying and salting.
 Derrinal	Permian tillites (glacial).	Dissected plains, usually gentle slopes.	Woodland.	Reddish yellow duplex soils.	Severe salting, moderate gullying.
 Metcalfe	Contact metamorphic rocks—spotted slates, hornfels, sandstones.	Aureole ridges.	Woodland. Savannah woodland.	Shallow stony loams. Reddish duplex soils.	Severe sheeting and gullying. —
 Macedon	Devonian dacite.	Mountain.	Forest.	Stony gradational soils. Yellowish brown duplex soils. Reddish friable duplex soils. Gradational soils with dark A horizons.	——
 Archdale	Tertiary fluviatile sands, gravels, clays (lateritised).	Dissected plain.	Woodland. Heath woodland.	Ferruginous reddish duplex soils.	——

The lands of the catchment have been classified according to the methods devised by the Soil Conservation Authority. Ecosystems have been recognized at three scales – the land-system, land-unit and land component.

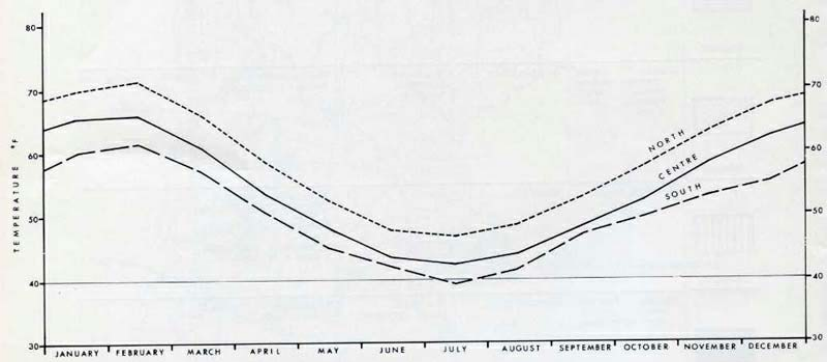


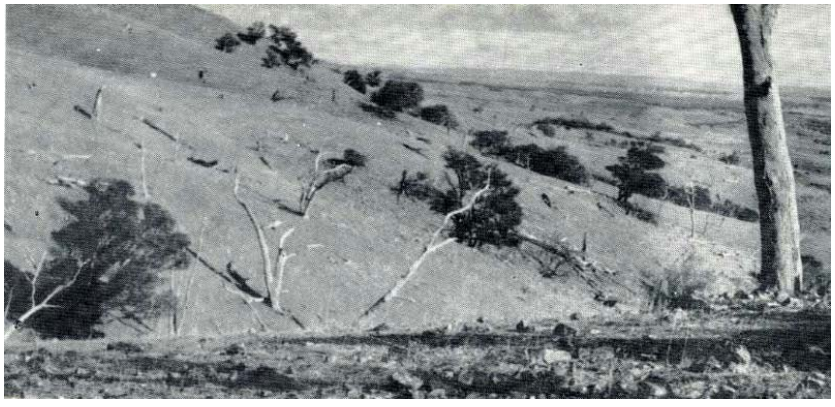
Fig. 2

Average Monthly Temperatures in Northern (Bendigo, adjacent to Catchment), Central (Kyneton) and Southern (Trentham) Parts of the Catchment

NOTE : Growth ceases at 40° F

Figure 2 – Average Monthly Temperatures in Northern (Bendigo, adjacent to catchment), Central (Kyneton) and Southern (Trentham) Parts of the Catchment
Note: Growth ceases at 40^0F.

Patterns at the broader, land-system scale have been differentiated by changes in geology (Fig 1). These are subdivided into land-units according to changes in topography, native vegetation and soils. For example within the Sandon land-system on Ordovician sediments, dive land-units have been mapped, several recognizable changes in vegetation and soils being cause by the variation in climate on these rocks. The features of the driest land uni (Kimbolton) which lies in the very north of the catchment and which contains three widespread components are listed in Fig 4. The land component occurs in areas too small to map at a reconnaissance scale. It is identified in a given climate and on a given geological type of changes in topographic situation, e.g. upper slopes, lower slopes, swales, and also in vegetative association and soil type. It is an ecosystem which recurs in a landscape and which is recognized by its distinctive combination of climate, geology, topography, vegetation and soil. Thus it is only with a component that uniform conditions for plant growth can be sought. For practical purposes the component is a recurring part of a farm, forest, wildlife reserve, 7 c., which is uniform with respect to potential, hazards and required treatment.



The Eppalock catchment as seen from Hayes Hill near Tooborac looking northwards across land on Ordovician slates and sandstones

Sheeting, gullying and salting are all severe in the Kimbolton land-unit where, as a consequence, most of the early work done by the Soil Conservation Authority in the catchment was concentrated. Prevention and reclamation are particularly difficult in this type of country as outline by Downes (1958) in his paper on land management problems following disturbance of the hydrological balance in various Victorian ecosystems. He pointed out the need to return towards the hydrological regime operating under the native vegetation, by the use of carefully managed deep-rooted species. Current

treatment is based largely on the use of phalaris, subterranean clover and adequate fertilizers as listed in Fig 4. Future observations on treated land together with research into the mechanisms and dynamics of gullying and salting will indicate whether modifications tot he techniques are necessary.

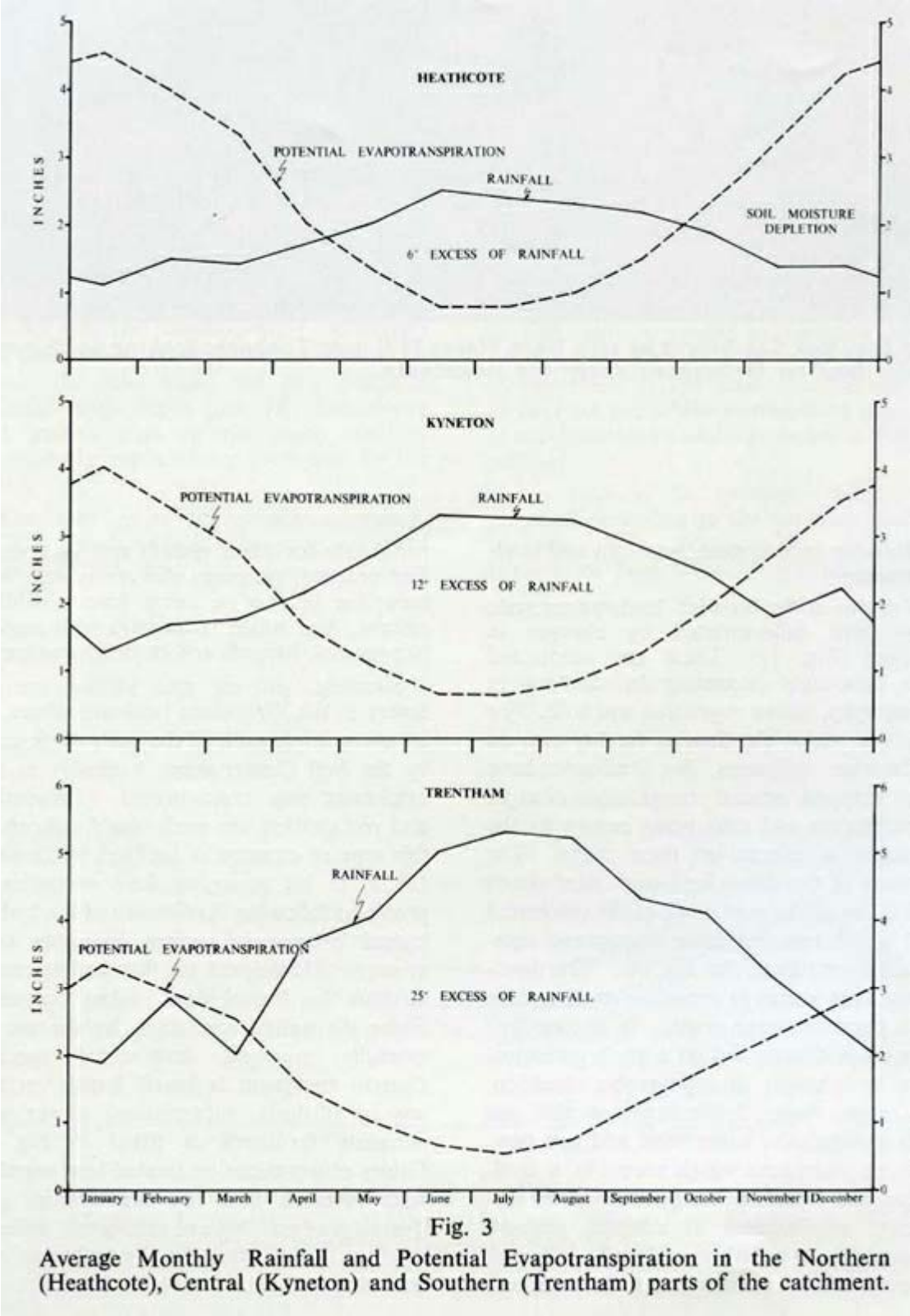


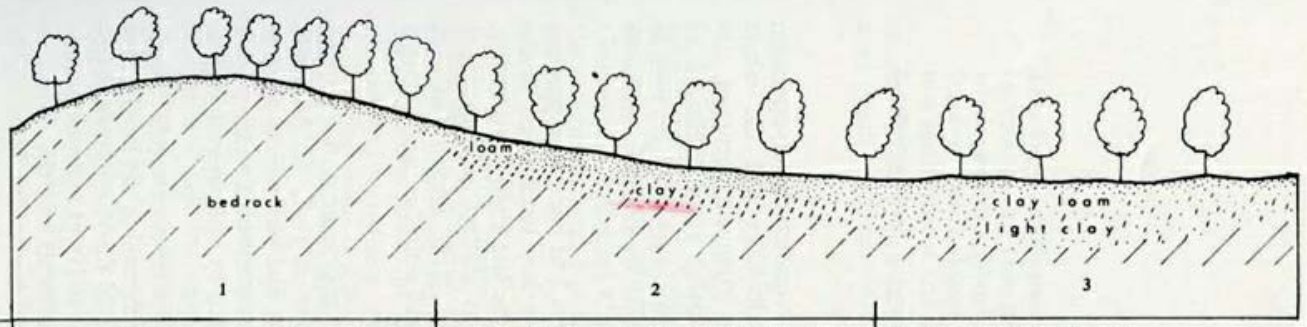
Fig. 3

Average Monthly Rainfall and Potential Evapotranspiration in the Northern (Heathcote), Central (Kyneton) and Southern (Trentham) parts of the catchment.

Figure 3 – Average Monthly Rainfall and Potential Evapotranspiration in the Northern (Heathcote), Central (Kyneton) and Southern (Trentham) parts of the Catchment

Fig. 4

KIMBOLTON LAND UNIT



Component	1	2	3
Climate (average)	Annual rainfall 20–22". Rainfall exceeds evapotranspiration for 6 months (May–Oct.) by 5". Mean winter temperature (J.J.A.) 55°F.		
Geology	Ordovician, interbedded, steeply dipping slates and sandstones, with quartz reefs. Strike approx. N.–S. (usually NNW.–SSE.)		
	Mainly sandstones	Mainly slates	
Topography	Low ridges aligned approx. N.–S. Ridge crests and sidespurs broken by minor spurs along strike.		
av. sideslopes	Convex crests and upper slopes 5–10°	Elevations 600–800' Concave-linear lower slopes 2–4°	Alluvial-colluvial swales 1–2°
Soil key features	brownish, gradational shallow soils, stony loam surfaces	reddish duplex soils, hard setting gravelly loam surfaces	Yellowish duplex soils, clay loam surfaces, high macroporosity
Soil av. depth (ft.)	1·0	1·5–2·5	3–6
Vegetation structure	woodland	woodland	woodland
Vegetation association	E. macrorryncha–E. polyanthemos	E. leucoxylon–E. hemiphloia	E. hemiphloia–E. leucoxylon–E. melliodora
Hazards	severe sheeting	mod. sheeting	severe gullying, severe salting
Most suitable land use uncleared	Forestry, conservation of flora and fauna, recreation, retention of timber as protection against erosion and salting.		
Most suitable land use cleared	Grazing of deep-rooted species on all components. Return to trees and shrubs on component 1?		
Land use class where cleared	4a, 6	4a	4a
Rec. pastures lb/ac.	1½ Yarloop, 1½ Woogenellup or Bacchus Marsh, 1½ phalaris		As left plus lucerne as an alternative
Rec. fertilizers cwt/ac.	Establishment 2 of 50–50 lime-molybdated superphosphate, maintenance 1 super per year.		As left but no lime
Potential of land unit	Grazing–2 dry sheep/acre. Yet to be estimated-cropping (low), honey ?, minerals ? forestry (low), recreation (high), water supply (low), conservation of flora and fauna (high)		

Figure 4 – Kimbolton Land System