

WAARRE LAND SYSTEM

Widespread through the catchments of Coorimungle and Scotts Creek and in the lower reaches of the Gellibrand River catchment are the calcareous clays and marls of the Gellibrand marl formation. The rolling coastal plain developed over these deposits comprises this Waarre land system.

The most commonly encountered soils are the brown coarse structured calcareous gradational soils. They generally have heavy textures throughout the profile with a heavy clay in the B horizon. These soils are represented by component 2. They are somewhat atypical of the normal soils encountered in limestone and marl parent material. It is thought that their coarse structure and large slickensides indicate a very long period of soil formation and possibly belong to a previous climatic period – their structural properties are very similar to the coarse structured soils of the Tomahawk Creek and Kennedy's Creek land system. Permeability of these heavy clay subsoils is somewhat impeded but when they do become saturated then they are prone to landslips and many of the road batters exhibit varying degrees of slumping.

Although most of these areas have been cleared, remnants of the original vegetation indicate that the structure was originally a woodland and the association included swamp gum, shining peppermint, manna gum and messmate. It is interesting to note the wide tolerance to soil acidity of shining peppermint. It competes well against other native vegetation on the most acid sands with a surface pH of around 4, and also forms part of the association on those soils where the pH goes from around neutral at the surface to around 8½ at 1 metre below the surface in this component.

Beneath these beds of highly calcareous clays and marls lie the sediments which comprise the Kennedy's Creek land system to the north. They are frequently exposed on the lower slopes of this landscape as represented by component 3. Profiles are generally fairly young without strong structural development and permeability is moderate to good. These soils are much more stable than the others in the land system and do not possess the same erosional hazards. However, due to their low position in the landscape waterlogging can become a problem during the wetter parts of the year.

The original vegetation is in turn dependant on the drainage of the site. The better drained areas formerly supported woodlands of swamp gum, messmate and other eucalypts. However in some areas the sites are waterlogged by the emergence of springs along exposure of these more permeable beds and the natural vegetation is restricted to closed scrublands and heathlands of black sheoak, scented paperbark and other moisture loving species.

Large drainage lines in the southern parts of this land system often consist of lagoonal deposits in a broad river valley drowned by the last Holocene minor marine transgression. As such these areas are poorly drained with peat, clay and other deposits comprising the soil parent material. Vegetation is restricted to a closed scrub formation by the bad drainage. These areas are represented by component 4.

Close to the coast in the southern parts of the study area, the duplex profiles with red and yellow mottled, coarse structured subsoils of component 1 are encountered. These soils are somewhat acid at the surface becoming neutral at about 1 metre and it is not until about 1 ½ metres below the surface that the pH becomes quite alkaline. The marls and clays here have been weathered much more deeply so that the bottom of the B horizon continues past 2 metres. Dispersibility of these soils is high and they are quite prone to gully erosion. There are several examples of gullies adjacent to the study area that seemed to have been initiated by long straight tracks channelling surface runoff water straight down a slope. On coastal cliffs where these soils have been exposed, raindrop action has washed most of the clay out of the subsoil exposures leaving behind ironstone gravel. Thus the coastal cliffs all possess a steep gravelly slope on their uppermost reaches which is a hazard to any over enthusiastic sightseers. Because of the severe exposure of so many of these sites to coastal winds, the vegetation is often stunted from salt pruning so that only an open scrub of prickly tea tree, sea box, dropping sheoak, and other coastal species develops. Further inland in the study area on more sheltered sites, an open forest of messmate, swamp gum and scent bark is more commonly encountered.

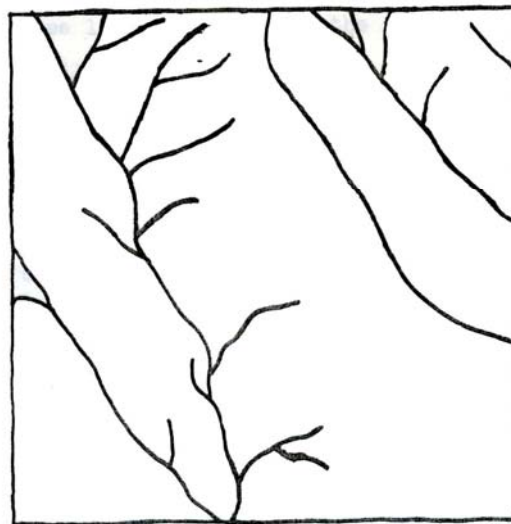
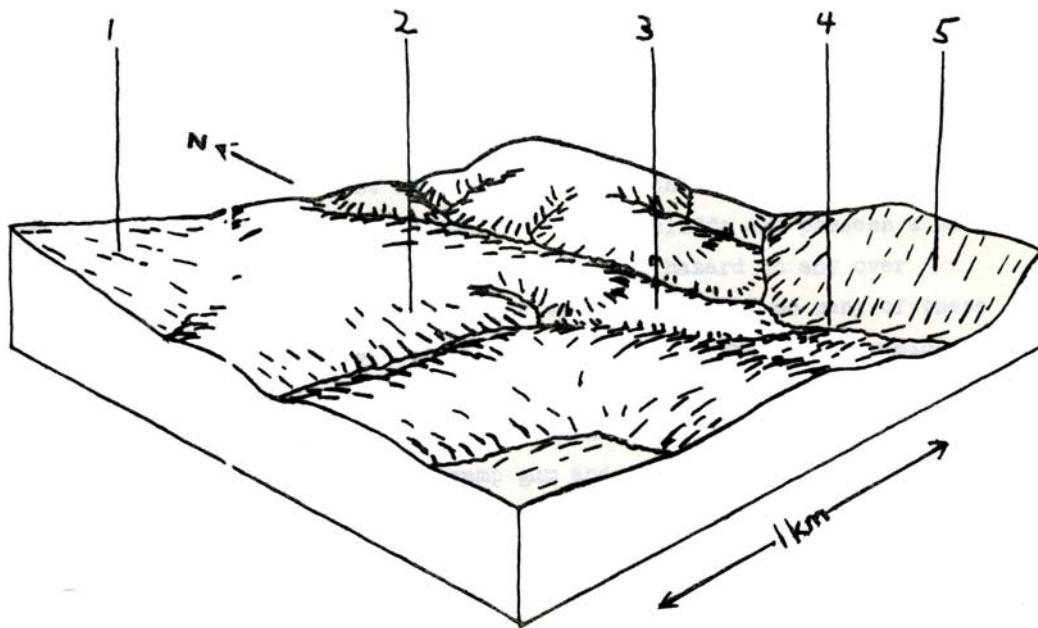
On steep slopes, and particularly along the scarps of Curdies fault, more typical soil profiles of the groups commonly encountered on highly calcareous parent material are found. These shallow black light clays or clay loams of component 5 belong to the great soil group referred to as rendzinas. The severe slopes on which they have usually formed leads to them being prone to sheet erosion and minor

landslips (stock terracettes are common). However, they are of very limited occurrence, being observed only in the southern parts of the land system. In some areas these soils have also developed on colluvial wash material which may overlie the brown coarse structured gradational profiles of component 2. Thus these latter sites have the appearance of component 2 soils but with exceptionally deep A horizons.

The lower parts of the landscape in the upper reaches of the Cooriemungle Creek Catchment have been overlain by alluvial material originating from Fergusons Hill. These sandy deposits up to 30 cm deep can give the soil profile a duplex appearance. Recent clearing of Fergusons Hill may explain these deposits and the observed drainage line siltation. Severe gully erosion also seen in some parts of the Cooriemungle catchment has probably resulted from the increased runoff and hence higher maximum peak flow associated with the clearing of this catchment.

Growing seasons in this land system are quite favourable for agriculture. Plant growth would be restricted from the winter months by cold temperatures. Allowing for 120 mm available soil moisture retention on these heavily textured soils, it is estimated that moisture restrictions to plant growth would normally only occur during late January, February and March, shortening to only February and March in the more humid coastal areas. Thus generally this land system is well suited to agriculture and in particular dairying. However, some care is needed to prevent deterioration of the soil and maintain long term productivity.

BLOCK DIAGRAM AND DRAINAGE PATTERN FOR THE WAARRE LAND SYSTEM



1:25000

Waarre Land System

AREA: 105 Km²

Component		1	2	3	4	5
Proportion		4	65	20	8	3
Climate	Rainfall mm	Annual: 900 – 1000 mm Monthly range: 40 mm Jan – 120 mm Aug				
	Temperature °C	Annual: 13.5° Monthly range: 9° July – 18° Feb				
Seasonal Growth Factors		Period when average monthly temperature < 10°C June – August Period when precipitation < potential evapotranspiration: Nov - March				
Geology	Age Lithology	Marine clays, marls and limestone of miocent age.				
Topography	Landscape	Undulating hills with some fault scarps				
	Elevation m	0 – 165 m				
	Local Relief m	45 m				
	Drainage Pattern	Dendritic				
	Drainage Density km/km ²	2.9				
	Landform	Undulating plain				Fault scarps
	Position	Upper slopes crests	Midslopes, crests	Lower slopes	Broad drainage lines	STEEP SCARPS
	Average Slope (Range)	5% (2% - 9%)	11% (4% - 21%)	4% (1% - 7%)	0% (0% - 1%)	33%
Slope Shape	Linear	Convex	Concave	Linear	Linear	
Native Veg	Structure	Open forest	Woodland	Woodland	Closed scrub	Woodland
	Dominant Stratum Species	Messmate, Swamp Gum Scent Bark	Swamp Gum, Shining Peppermint Occasional Messmate	Messmate Swamp Gum	Scented Paperbark Woolly Tea Tree	Manna Gum Blackwood
	Other Common Species	Not possible to assess as very few remnants of original complete vegetative community exist.				
	Parent Material	Unconsolidated clays, sands	In situ, marl, limestone	Unconsolidated clays, sands	Plant remnants alluvial sand & clay	In situ, marl, limestone
	Group	Brown duplex soils, coarse structure	Brown calcareous coarse structured gradational soils	Yellowish grey gradational soils coarse weak structure	Grey gradational soils	Black calcareous gradational soils
	Surface Texture	Fine sandy loam	Loam	Sandy loam	Peaty sandy loam	Clay
	Permeability	Slow	Slow	Moderate	Rapid	Moderate
	Av. Depth M	> 2	1.7	> 2	> 2	> 2
	Northcote Class	Db 4.43	Gc 2.21		Gn 2.92	Uc 6.12
Land Use		Cleared areas: grazing for beef cattle, dairy farming, grazing for sheep			minor uncleared areas: nature conservation, landscape conservation (includes Port Campbell national park coastline)	
Hazards Of Soil Deterioration		Mod hazard of gully erosion severe hazard of sheet erosion from foot traffic	Mod hazard of landslips & slumping of rd batters. Low hazard gully erosion	Low hazard of gully erosion & sheet erosion	Low hazard of gully erosion mod. Hazard of soil pugging	Severe hazard of minor landslides stock terracett-es low hazard of sheet erosion
Management Practices For Soil Conservation		Road & track construction with adequate table drains & culverts. Road batters designed with no slopes greater than 1 in 3. Drainage from roads, dairys, etc. Taken away from existing minor drainage lines on hillslopes. At least partial tree cover maintained on all slopes exceeding 8% stock wintered on paddocks away from poorly drained areas				