(xiii) Telgangatuk Unit – The unit consists of plains country of very subdued relief, with a recurring sequence of gently sloping rises, swamps and lunettes. The lakes are of sub-circular outlined and may be quite large, as Lake Kanagulk.

This Telangatuk unit adjoins and is sharply defined from a large area of Kowree unit to the north-west, it grades sharply into the tablelands of the Glenelg unit to the south, and rises to the Black Range unit in the east. Some slight internal variation in the vegetation of the unit is encountered where it adjoins the Black Range unit, as yellow box (*E. melliodora*) becomes more common and is present with both river red gum (*E. camaldulensis*) and yellow gum (*E. leucoxylon*).

Cross section				
	WSW.			ENE.
Topography	Long gentle slopes		Swamp or lake	Lunette
Geology	Tertiary and Post-Tertiary sediments			
Soils	Solonetzic soil (fine-sandy with A horizon less than 12 in. thick)	Gilgaied solonetzic soil	Gilgaied solonetzic soil or swamp	Solonetzic soil
Vegetation formation	Savannah Woodland	Tall Woodland	Savannah Woodland	
Vegetation association	*E. leucoxylon* *E. hemiphloia* *E. melliodora*	*C. luehmanni* *E. hemiphloia*	*E. camaldulensis* *C. luehmanni* *M. pubescens*	*E. leucoxylon* *E. camaldulensis*

Fig 29 – Telangatuk Unit

The parent material is post-Miocene deposits derived almost certainly from sandstones now represented by the Black Range and the Grampians.

(xiv) Ullswater Unit – The unit consists of plains country with slight undulations caused by a recurring sequence of slight ridges and lakes with lunettes. The ridges run in a SSE-NNW direction, and may be found discontinuously at about one mile apart, but they are more continuous and pronounced at about five miles apart. The lakes are sub-circular and very variable in size, while the lunettes are larger and more well developed in this unit than in others, forming a distinctive feature of the landscape.

This Ullswater unit is the most central and extensive in the Shire. It adjoins a number of areas of the Kowree unit, these usually being found on the more pronounced ridges; it merges into the Benayeo unit on the west and grades into somewhat similar units of Edenhope to the south and Goroke to the north. It may be regarded as intermediate and transitional in character between these latter two units.

The unit varies internally from the illustrated sequence in that all components are not always developed in each recurring sequence, and that black box (*E. largic florens)* occurs but rarely along the southern fringe of the unit, increasing in frequency to the north until it attains the distribution shown. The parent material is variable post-Miocene sediments.

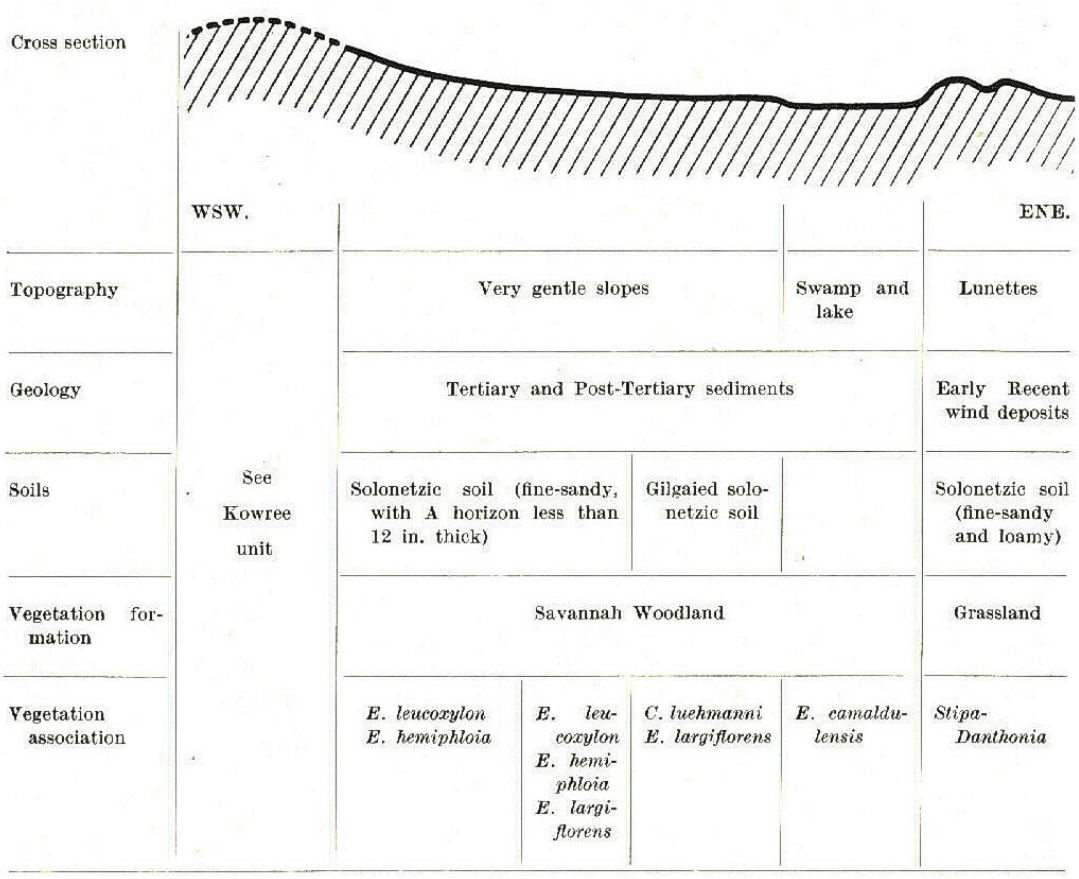

Fig 30 – Ullswater Unit

(xv) White Lake Unit.-The unit consists of a shallow valley running south-north, and approximately five miles wide, that is, roughly the distance between adjacent major ridges of stringybark. In the bottom of the valley there are several saline lakes and adjacent lunettes, and the land rises gradually from the valley bottom.

This White Lake unit adjoins and is sharply defined from areas of the Kowree unit to the east and north-west, it grades into the Edenhope and Glenelg units to the west and south, and probably continues north out of the Shire along that line of salty lakes which passes west of Mt Arapiles to Mitre Lake and north. It is very probably that this unit occupies the site of an old valley through which the Glenelg River or an adjacent stream flowed north, before this was captured by dissection extending upward along the present course of the Glenelg River. The chief feature of this unit, namely the high content of salt in the lakes and adjacent soils, possibly is related to this fact of having received material from a large catchment area.

Cross section	W.					E.
Topography	Gentle to moderate slopes	Swamp and lake (fresh)	Gentle slopes		Swamp and lake (salt)	Lunette
Geology	Tertiary and Post-Tertiary sediments					Early Recent wind deposit
Soils	Solonetzic soil (fine-sandy, with A horizon less than 12 in. thick)		Solonetzic soil (fine-sandy)	Salt-pan		Solonetzic soil (fine-sandy)
Vegetation formation	Savannah Woodland			*	Devoid of vegetation *	Grassland
Vegetation association	*E. leucoxylon*	*E. camaldulensis*	*E. leucoxylon*	*	*	*Stipa-Danthonia*

* These lake edges support either a wet scrub of *Melaleuca halmaturorum* or else a grassland of *Hordeum hystrix*, *Distychlis distychophylla*, *Cladium filum*, and *Salicornia* spp.

Fig 31 – White Lake Unit

(e) Soil Conservation and Land Development in relation to Mapping Units

One aspect of soil conservation is the prevention and control of erosion, but equally important is the increase of chemical and physical fertility. The units of the Shire of Kowree show differences in extent of erosion damage, erosion hazards, and possibilities of increasing fertility. In the following discussion of soil conservation in the different units, emphasis is given to technical problems and potentialities, though it is realized that economic factors will have much influence on future land use.

Table 3 – Summary of soil conservation and land development problems in land units of the Shire of Kowree

Land Unit	Present Use and Annual Rainfall	Erosion Damage	Erosion Hazard	Disadvantages	Suggestions for further development, research, etc.
Apsley	Mainly pastoral, with only limited areas of scrub. Limited cereal cropping. Small area of commercial orchards (stone fruits) 22-23 inches rainfall.	Only very occasional gullying on steep slopes.	Possibly gully erosion in valley systems. Possible salting.	Proportions subject to waterlogging. Vermin sheltered in uncleared scrub.	Improvement of pastures. Trials of different pasture species and fertilizer on different soil types. Investigation of animal health problems. Drainage. Supplementary irrigation with underground water on better-drained soils. Extension of dairying, in association with irrigation. Extension of cropping in rotation with pastures. Extension of commercial orchards.
Benayeo	Mainly pastoral, but little improved pasture. Little cropping 20-22 inches rainfall.	Nil	Rill erosion on few low ridges.	Many swamps and large areas subject to waterlogging. Limited accessibility in wet seasons.	Improvement of pastures, particularly on crabhole land. Drainage. Supplementary irrigation with underground water, especially for dairying. Rotation of cereal crops with pastures.
Black Range	Unused virgin land, mainly stringybark and heath. 23-26 inches rainfall.	Nil	Serious sheet and gully erosion possible on steep slopes.	Infertile sandy and stony soils. Absence of permanent surface water. Danger of bushfires. Possible losses to foxes and native fauna. Steep slopes, high cost of clearing and of transport due to lack of roads.	Continued reservation from agricultural production, especially of areas lying in catchment of Glenelg River. Limited foothill areas of moderate slopes might be used for pasture and horticulture.
Edenhope	Mainly pastoral with only limited areas of scrub. Limited cereal cropping. Small area of commercial orchards (stone fruits) 20-23 inches rainfall.	Only very occasional gullying on steeper slopes.	Possible salting.	Proportions subject to waterlogging. Vermin sheltered in uncleared scrub.	Improvement of pastures. Trials of different pasture species and fertilizer on different soil types. Investigation of animal health problems. Drainage. Supplementary irrigation with underground and surface water on better-drained soils. Extension of dairying, in association with irrigation. Extension of cropping in rotation with pastures. Extension of commercial orchards.
Glenelg	Mainly pastoral. 22-25 inches rainfall.	Very serious sheet, rill and gully erosion. Salting. Slumping on steep slopes. Siltation in valley. No evidence of erosion on plateau.	Sheet erosion. Gully erosion and landslides on steep slopes cleared and grazed. Slating along drainage lines.	Steep slopes and limited access.	Improvement of pastures. Trials of aerial top-dressing. Closer control of grazing on slopes. Measures to control headward erosion. Afforestation of steeper slopes.

Land Unit	Present Use and Annual Rainfall	Erosion Damage	Erosion Hazard	Disadvantages	Suggestions for further development, research, etc.
Goroke	Mainly pastoral and cereal growing. Limited areas of scrub. 19-21 inches rainfall.	Sheet erosion on sandy banks; shallow gullying on slopes; wind erosion of cleared sandy areas.	Wind erosion of sandy areas. Rill and gully erosion on sloping land used for grazing or cultivation.	Large proportion of swamps.	Improvement of pastures, especially on more fertile soils used for cropping. Trials of phalaris, lucerne, perennial veldt grass on different soil types. Establishment of cover on sandy areas. Supplementary irrigation on lunettes using water from swamps and underground. There may be possibilities of concentrating swamp and lake water in selected lakes, suitably enlarging their storage capacity with appropriate walls, and using the water for supplementary irrigation on adjacent lunettes.
Kowree	Mainly unused virgin scrub, limited grazing on patches of native grass.	Insignificant	Wind erosion of sand ridges, possibly serious. Gully erosion on slopes, possibly serious.	Infertile sandy soils. General lack of surface water. Danger of bush-fires. Possible losses to foxes, rabbits and native fauna. Limited access due to lack of roads. Competition by bracken.	Investigations to define possible areas suitable for pastures. Trials on establishment, development and management of pasture on sandy soils. Investigation of water movement through eleanted sandy areas in connection with possible erosion of adjacent lands. Investigation of timber production e.g. *Pinus* Limited possibilities for commercial orchards.
Kybbyolite	Partly cleared and in pastoral use. Limited cropping. 20-22 inches rainfall.	Occasional gully erosion on steeper slopes.	Limited gully erosion. Possible salting.	Proportion of swamps and land subject to waterlogging.	Improvement of pastures. Drainage. Investigation of animal health problems.
Little Desert	Mainly virgin scrub, limited scrub grazing and little pasture development. Mainly 17-19 inches rainfall.	Insignificant	Wind erosion of deep sands.	Infertile sandy soils. Lack of surface water. Fire hazard. Low rainfall in northern parts. Cost of clearing scrub. Limited access due to general lack of roads. Possible losses to foxes, rabbits and native fauna.	Further survey of soil variability throughout the entire Little Desert would be advisable if settlement is intended. Pasture trials and an adequate assessment of climatic conditions in the more accessible southern parts of the unit.
Neuarpur	Mainly used for pasture and cereal production. Limited area of improved pasture. 19-20 inches rainfall.	Only a few shallow gullies on few low ridges.	Erosion is possible on the scattered low ridges, otherwise there is no risk.	Many swamps and large areas subject to waterlogging. Limited access in wet seasons.	Improvement of pastures, particularly on crabhole land. Drainage. Supplementary irrigation with underground water. Extension of cropping in rotation with pastures. Dairy production.

Land Unit	Present Use and Annual Rainfall	Erosion Damage	Erosion Hazard	Disadvantages	Suggestions for further development, research, etc.
Powers Creek	Mainly virgin scrub and forest. Limited pasture development on small areas of heath land. 23-25 inches rainfall.	No erosion on uncleared stringybark areas. Occasional sheet, rill and gully erosion, only on red gum areas.	Wind erosion of deep sands. Gully erosion and salting in reg gum areas.	Swamps and waterlogged areas. Soil infertility. Clearing costs. Limited access. Competition by bracken.	Fuller survey to define possible areas for clearing – probably restricted to heath lands. Investigation of pasture establishment on heath lands. Timber production.
Tallageira	Mainly unused. Limited grazing on patches of native grass. 20-22 inches rainfall.	Sheet, rill and wind erosion on grazed areas.	Wind erosion on deep sands.	Soil infertility. Parts subject to waterlogging. Clearing costs and competition by bracken. Limited access. Fire hazard. Possible losses to foxes, rabbits and native fauna.	Further survey to define areas most suitable for clearing and pasture development. Extension of commercial orchards.
Telangatuk	Mainly pastoral use of native grasses. Limited cropping of grain and fodder. 20-22 inches rainfall.	Gully erosion on sloping land in east. Occasional salting.	Gully erosion on sloping land at east of unit.	Many shallow swamps and areas subject to waterlogging.	Improvement of pastures. Trials of different pasture plants and fertilizers on different soil types. Drainage. Extension of commercial orchards. Extension of cropping in rotation with pastures.
Ullswater	Mainly in use for pastures. Cropping on more fertile soils for grain and fodder. Small area of orchards. 20-22 inches rainfall.	Slight gully erosion on steeper slopes. Occasional salting.	Gully erosion on steeper slopes. Possible salting on slopes below sandy ridges.	Proportions subject to waterlogging and swamping. Restricted access in wet seasons.	Improvement of pastures, especially in swampy sites. Investigations of animal health problems. Drainage. There may be possibilities of storing drainage water in local lakes, suitable enlarging the storages by appropriate walls, and using water for supplementary irrigation on adjacent lunettes. Supplementary irrigation, using surface water, especially as suggested above, and underground water in western areas. Extension of cropping in rotation with pasture. Extension of commercial orchards.
White Lake	Mainly cleared and used for pasture. Limited cropping. 19-20 inches rainfall.	Sheet and rill erosion on steeper slopes. Gully erosion on lower slopes. Some salting.	Sheet and gully erosion on slopes in eastern portion.	Saline areas.	Improvement of pastures, especially on sloping land. Reduction of salting. Extension of commercial orchards.

The units are dealt with in the following order:

Black Range	Mountainous, unused
Edenhope, Apsley	Plains, settled
Ullswater	"
Telangatuk, Kybybolite	"
Goroke	"
White Lake	"
Benayeo, Neuarpur	"
Tallageira	Sand plains and sand ridges, unused
Kowree, Little Desert	"
Powers Creek	"
Glenelg	Valley slopes and tableland, settled

Fig. 32.-An attractive roadside scone in the Apsley unit where solonetzic soils are used extensively for improved pastures. The erosion hazard is insignificant.

The *Black Range* unit is Crown Land, largely unused because of inaccessibility, apparent infertility, and high clearing costs. There is no evidence of accelerated erosion but sheet and gully erosion would certainly occur in the absence of protective surface cover, owing to the prevalence of steep slopes and loose sandy soils. Some parts with gentler slopes, at the base of the Range and on plateau areas, may be suitable for pastures, timber production, or fruit-growing, but no development should be undertaken without thorough investigation including selection of suitable land**,** pasture experiments, and trials of fruit-trees. Part of the unit is in the catchment of the Rocklands reservoir, so it would be preferable to avoid any settlement of this land and thus safeguard the catchment from fire and erosion damage.

The *Edenhope* and *Apsley* units are predominantly cleared pastoral lands (Fig. 32) with only small proportions, mainly on lunettes, used for grain and fodder crops. Very large areas show little or no pasture improvement, though apparently quite suitable for subterranean clover. The very gentle slopes and coherence of surface soils generally prevent any serious threat of erosion; gully erosion is noticeable only occasionally on or near the relatively small area with steeper slopes. Wind erosion of cleared sand dunes occurs in the Apsley unit, probably a consequence of serious rabbit infestations before the spread of myxomatosis. Erosion hazards are almost confined to the steep slopes and sand dunes. Salt damage could result in some areas of poor drainage following excessive clearing of trees and intensive grazing,

Fig. 33.-A remnant of grey box (Eucalyptus hemiphloia) and bull oak (Casuarina luehmanni) vegetation along a fence line in the Toolondo district. Tree removal has aided growth of natural grasses, but occurrence of crabholes hinders pasture improvement.

Control of water movement is obviously important in these units. Some extension of artificial drainage may be needed but the chief requirement is productive pastures to use surplus water and improve soil permeability. Field experiments valuable for pasture improvement in these units have been conducted at Kybybolite and Apsley but variations in potassium and calcium contents of the solonetzic solodic soils indicate the need for fertilizer trials in varying soils. There is particular need for trials on the establishment and management of improved pastures, with special regard to fertilizer requirements and crop rotations. Seasonal flooding of swamps and other low parts restricts production on significant areas but as these become dry there are favourable conditions for productive growth if plant species can be provided to utilize this short growing season. Investigations for these should also aim at the development of rotations to allow periodical growth of crops after soil improvement by productive pastures.

The *U11swater* unit resembles the Edenhope and Apsley units but its particular features are more uncleared areas, more widespread cereal-cropping in the past, steeper, grades with gully erosion, and numerous lakes, swamps, and lunettes. The recommendations for the previous two units generally apply, but two additional lines of investigation are suggested: more intensive use of lunette soils for fodder crops (lucerne, maize, root crops), vegetables, cereals, and fruit, especially using supplementary water from lakes or underground water, and further utilization of deep sandy soils near ridges for orchard crops or timber production.

The *Telangatuk* (Fig. 33) and *Kybybolite* units are allied in their practices and problems to the last three units.

The *Goroke* unit is predominantly pastoral and agricultural land. Its problems differ somewhat from adjoining units to the south, owing to its lower rainfall, greater slopes, and earlier prevalence of cereal-growing.

Fig 34 – The creast of one of the distinctive ridges in the Goroke unit, north-west of Duffholme, looking towards Mt Arapiles. The site has a sandy solodic profile (Profile 7, Appendix I) with a yellow gum (Eucalyptus leucoxylon).

Ready drainage from the ridges (Fig. 34) into numerous swamps gives this unit an even more arid environment than is expected by comparison of its rainfall with that of units to the south. Erosion is noticeable-sheet erosion on sandy banks, frequent shallow gullies on ridge-slopes, and wind erosion occasionally on sandy patches near ridge tops. Some of the wind erosion is associated with former aboriginal camps (Fig. 35) and is probably older than European settlement; fortunately it is not extensive. Prolonged cultivation and intensive grazing have induced soil compaction and consequently sheet and gully erosion; this would be intensified on the steeper slopes if large-scale reversion to cereal-growing takes place without safe rotations and possibly soil conservation works such as graded banks.

Pasture improvement is confined to a few properties which show the merits of subterranean clover, phalaris, and lucerne on solonetzic or solodic soils, and of perennial veldt grass on deeper sands. Natural grasses provide the main herbage on the large holdings, while Wimmera ryegrass is more important on the smaller farms where some cultivation is still customary. Experimental trials, demonstration plots, and pasture competitions in this unit would contribute much to pasture improvement and soil conservation. Topical subjects for investigation include pasture improvement for solonetzic and gilgaied solonetzic soils on gentle slopes, and the alternation of productive pastures with cereal-growing.

Fig. 35.-Wind erosion on aboriginal carnp sites occurs in several places in the Goroke unit.

A feature of this unit is the apparent low productivity of large areas of the most fertile soils on lunettes, the extensive gilgai areas, and the less infertile types of sandy soils. Irrigation potentialities may be rather limited in this unit, compared, with others to the west and south-west, owing to difficulties in the supply of underground water, but some use might be made of surface water in swamps and lakes.

The *White Lake* unit is mainly open pastoral land where cereal-growing formerly was more extensive. The steep slopes show sheet erosion and there are, occasional moderately deep gullies on gentler slopes (Fig. 36). Salt damage occurs mainly around the salt lakes, but also in association with drainage lines and gully erosion. Further extension of cereal-growing would need precautions such as wide rotations, improved pastures, and possibly soil conservation works to check erosion. Salt damage on lower areas may be increased by further clearing of scrub from higher areas.

Fig 36 – An erosion gully in the White Lake unit

Improvement of pastures should be the main objective of investigations in. this area. Consideration could be given to fruit-growing on selected portions the sloping land. Some of the salted areas would respond to treatments developed by officers of the Soil Conservation Authority (Cope 1955).

The *Benayeo* and *Neuarpur* units have only limited areas of dense woodland and are mainly pastoral lands. Cereal-growing is restricted by swampiness and the expense of cultivating the extensive gilgai soils. These soils require levelling to fit them for the operations involved in pasture improvement; consequently, improved pastures occur mainly on areas previously used for cultivation. Erosion is insignificant except on the occasional low ridges which show a few shallow gullies.

A few holdings with sown pastures show the obvious scope for pasture improvement on the gilgai areas. Fertilizer requirements for pastures on these soils need investigation. There is some evidence from similar soils in the Frances district, South Australia, of clover response to zinc fertilizers (N.S. Tiver, personal communication). An area of swampy solonetzic soil, also near Frances, with productive growth of the Yarloop strain of subterranean clover indicates that the determination of appropriate pasture plants is a major problem of pasture improvement for the variable swampy conditions in this unit.

The underground water resources in these units are important enough to merit assessment of their use for supplementary watering of pastures.

The *Tallageira* unit is mainly uncleared. Replacement of stringybark vegetation on the deep sandy soils by pastures would be a risky venture because of expense in maintenance of such pastures and their hazard of wind erosion. The more productive areas are likely to be the patches of heath land and the partly-developed areas with yellow gum and red gum. It is likely that sandy soils in this unit would give pasture responses to copper and zinc as well as superphosphate but no trials have yet been made.

The *Kowree* unit and *Little Desert* unit together form the largest reserve of virgin land in the Shire of Kowree. Some use has been made of the areas for rough grazing, mainly on heath lands in the Little Desert, but there is a general lack of tracks, fences, and water, as well as of grass.

The Kowree unit includes mainly deep sands in areas with a mean annual, rainfall of from 20 to 25 inches, whereas comparable rainfall for the Little Desert is from 20 inches down to 18 inches or even

less. The Kowree unit occurs as strips of virgin land adjacent to successful pastoral holdings and it is almost inevitable that landholders will seek to increase production by progressive use of this unit. The Little Desert, however, forms a large block and its extensive use would entail the formation of new holdings entirely dependent on productivity from infertile soils. Thus although the soils in both units are infertile and relatively arid, involving considerable expense in clearing and subsequent pasture maintenance, the Kowree unit has many advantages compared with the Little Desert.

Fig 37 – One of the smaller areas of native grassland with yellow gum (Eucalyptus leucoxylon) and yellow box (E. melliodora) in the Kowree unit near Lake Kanagulk (Profile 26, Appendix I)

Little or no erosion can be seen at present in these units, but their settlement would certainly have an erosion hazard on sand ridges to contend with, more so in the drier Little Desert than in parts of the Kowree unit, where rainfall is higher and bracken growth occurs on deep sands. There are certainly flatter areas in both units where wind damage would be less likely if clearing was undertaken (Fig.37).

A detailed examination of both units would be useful in assessing the proportions of flat heath lands, less costly for clearing and occasionally moister than areas of stringybark. Investigations such as those in the Coonalpyn Downs of South Australia, involving both the mapping of different soils and establishment of pasture trials, should be undertaken in these units in the future. Some pasture experiments on infertile sandy soils have been undertaken outside the Shire by the Victorian Department of Agriculture, namely in the Miga Lake district and in the Little Desert at points south of Kaniva and Nhill. These have shown various mineral deficiencies and similar findings probably apply in the Little Desert and Kowree units.

Fig. 38.-A view of dissected tableland typical of the Glenelg unit, showing the tableland on the skyline and valley slopes susceptible to soil erosion.

Land development in these two units should be a much less attractive proposition than more intensive use of the cleared areas in the Shire. Sooner or later, however, production will be sought from these virgin areas and it is probable that the Kowree unit will be useful in conjunction with production from

adjacent better soils. Settlement of the Little Desert would require much care; it should be approached with great caution and only after exhaustive trials.

The *Powers Creek* unit has similarities with the Kowree unit, but heath and swampy areas are relatively more extensive. There is certainly scope for pasture development and timber production in this unit as the mean annual rainfall exceeds 22 inches and is reliable. Small areas of open country are comparable with the extensive pastoral lands of the Apsley and Edenhope units.

The *Glenelg* unit (Fig. 38) consists mainly of steep valley slopes and is badly affected by erosion due to extensive clearing and intensive grazing. The small areas of plateau country included in the unit show no erosion and are most suitable for grain and fodder crops. The erosion occurs mainly on the slopes, with some siltation on valley bottoms. Salt damage is present occasionally along drainage lines and also on steep slopes where seepage occurs at the base of a laterite horizon.

This salting encourages sheet erosion and gullying. Steep shoulders on the slopes show sheet erosion regardless of salting. Landslips were noted on steep slopes, especially where there had been considerable clearing of adjacent tablelands.

The unit has a marked erosion hazard, comparable with the Kowree, Little Desert, and Black Range units. Further clearing of timber would certainly encourage erosion, but afforestation and, pasture improvement would check the damage. Investigations particularly desirable in this unit should deal with control and reclamation of salting, including an assessment of the influence of tree growth on water and salt movement in soils. Such studies might well be made in the Dundas Tablelands to the south of the Shire, where the characteristic conditions of this unit are present over a much larger area.

IV. ACKNOWLEDGMENTS

Mr. W. D. Andrew, Division of Plant Industry, C.S.I.R.O., supplied information on pasture problems inspected during a visit to the Shire. Mr. A. Mitchell, Soil Conservation Authority, and Mr. E. A. Jackson, Division of Soils, C.S.I.R.O., assisted in the field operations of the survey. Mr. A. R. P. Clarke carried out analyses of soil samples in the laboratories of the Division of Soils. Botanical identifications were provided by Mr. F. M. Hilton, of the Waite Institute, University of Adelaide, and by Mr. A. B. Costin, Soil Conservation Authority. Meteorological data were supplied by the Commonwealth Meteorological Bureau. Information on water analyses was given by the State Rivers and Water Supply Commission of Victoria. Maps and diagrams were prepared under the direction of Mr. P. D. Hooper, of the Division of Soils.

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APPENDIX I - SOIL DESCRIPTIONS

Descriptions are given below of: (a) A range of soils common in the area; (b) A range of soils occurring with stringybark vegetation, which includes most of the Crown Land. The descriptions were made during examination of soils in pits. Data on the soil reaction (pH) and salinity of the soils also are given for many of the horizons. A pH value of 7 refers to neutral conditions, with acid soils

registering lower and alkaline soils higher values. The pH values of soils fall in the range 4 to 10 representing strongly acid and strongly alkaline conditions respectively. The salinity data given are the percentage of total soluble salts, e.g. % T.S.S., 0.19, and the percentage of chlorides calculated as sodium chloride, e.g. % NaCl, 0-02.

(a) Range of Soils Common in the Area

(i) Solonetzic Soils

(1) From open red-gum plain 5 miles east of Apsley (Profile 3).

Depth (in.)	
0- 3	Light grey-brown firm sand (pH, 6.0; % T.S.S., 0.01).
3- 6	Very light greyish brown sand.
6-10	Very light greyish brown sand with rusty flecks.
10-13	Grey and yellow-brown, slightly reddish, mottled tough massive clay with thin bleached sand capping at top. The clay appears to have columns, about 30 in. broad (pH, 6. 6; % T.S.S., 0.05; % NaCl, 0.01).
13-24	Yellowish brown, greyish brown, and reddish brown mottled stiff clay (pH, 7.0;% T.S.S., 0.07; % NaCl, 0.02).
24-30	Yellowish brown firm sandy clay, faintly mottled with grey and reddish tinges (pH, 8.1; % T.S.S., 0.09; % NaCl, 0.05).
30-36	Yellowish brown firm clay sand with pockets of lime at 36 in. (pH, 9.4; % T.S.S., 0.25; % NaCl, 0.09).

(2) In crabhole area near Neuarpur (Profile 6B).

Depth (in.)	
0-3	Light grey fine sandy loam, bard, slightly laminar (pH, 6-9; % T.S.S., 0-03; % NaCl, 0 - 02).
3- 9	Dark grey-brown hard uneven clay with vertical cracking and diffuse bleached top to clay (pH, 7.8; % T.S.S., 0.06; % NaCl, 0.03).
9-22	Yellowish grey and grey clay becoming brownish yellow with depth (pH, 8.6; % T.S.S., 0.22; % NaCl, 0.12).
22-36	Brownish yellow clay with lime from 26 in. (pH, 9.0; % T.S.S., 0.59; % NaCl, 0.34).

(3) On grassy lunette on Goroke-Kaniva road (Profile 18).

Depth (in.)	
0- 3	Brown friable crumbly loamy sand (pH, 6.1; % T.S.S., 0 .02).
3-4/8	Light brown bleached sand, compact.
4/8-12	Dark brown and reddish brown uneven, columnar tough clay (pH, 7.3; % T.S.S., 0.03) gradually changing to
24-30	Brown and yellow-grey friable clay with high content of soft lime (pH, 9.5; % T.S.S., 0.23; % NaCl, 0.08).

(4) On treeless grassy plain between Lake Kanagulk and Kanagulk railway siding (Profile 8).

Depth (in.)	
0- 3	Light grey-brown compact sand breaking to crumbs and small clods (pH, 6.4; % T.S.S., 0.01).
3- 6	Lighter grey-brown sand with rusty smudges, more compact than above.
6-12	Yellow, grey, and red mottled clay in columns with dark grey cleavage faces and brown sandy clay loam capping (pH, 6.8; % T.S.S., 0.03).

12-24	Yellow-grey, red, dark grey, and brown stiff clay (pH, 7.6; % T.S.S., 0.06).
24-34	Light brown and brown more friable sandy clay with visible lime at 34 in. (pH, 8.8; % T.S.S., 0.09; % NaCl, 0.03).

(5) Eucalypt,- grassland fringe to stringybark sandy area north of Lake Kanagulk (Profile 26).

Depth (in.)

0- 3	Light greyish brown weakly coherent sand (pH, 5.4; % T.S.S., 0.01).
3-12	Very light greyish brown loose sand.
12-16	Yellowish brown, yellowish grey, and red-brown stiff columnar clay (pH, 6.1; % T.S.S., 0.03).
16-30	Yellowish brown sandy clay with reddish stripes.
30-40	Yellowish brown, red, and light brown sandy clay (pH, 7.4; % T.S.S., 0.196; % NaCl, 0.10).

(ii) Solodic Soilq

(i) On grassy ridge north-east of Gymbowen (Profile 7).

Depth (in.)

0- 3	Light brown loose lumpy sand (pH, 6.2; % T.S.S., 0.0 1).
3- 9	Greyish brown loose sand.
9-17	Very light brown compacted gravelly (ironstone) sand.
17-19	Light brown and very light brown slightly compact clayey sand with slight gravel.
19-24	Bright red and light yellowish grey mottled massive friable clay (pH, 6.2; % T.S.S., 0.01).
24-36	As for 19-24 in. (pH, 6.0; % T.S.S., 0.02).

(2) In red-gum forest on tableland near Glenelg River system, west of Harrow (Profile 28).

Depth (in.)

0- 3	Grey crumbly loainy sand (pH, 6.6; % T.S.S., 0.02).
3- 6	Light greyish brown coherent sand.
6-18	Very light brownish yellow compact sand.
18-20	Very light brown indurated sand with small amount of ironstone gravel.
20-25	Grey, light yellowish brown, and light red-brown mottled massive clay (pH, 5.6; % T.S.S., 0.05; % NaCl, 0.03).
25-42	Yellowish brown clay with reddish brown and grey mottling.
42-46	Yellowish brown and grey clay with moderate content of free lime (pH, 9.1; % T.S.S., 0.17; % NaCl 0.05).

(iii) Grey Soil of Heavy Texture

On puff in crabhole area between Frances and Neuarpur (Profile 6A).

Depth (in.)

0- 3	Grey crumbly clay, with moderate amount of lime (pH, 8.6; % T.S.S., 0.04; % NaCl, 0.01).
3- 9	Grey and light yellowish grey clay with marked vertical and horizontal cracks. Lime occurrence more patchy than above (pH, 9.0; % T.S.S., 0.04; % NaCl, 0.01).
9-20	Grey and yellowish grey mottled massive clay with lime (pH, 9.4; % T.S.S., 0.09; % NaCl, 0.02).
20-36	Yellowish grey clay with moderate amount of lime (pH, 9.5; % T.S.S., 0.18; % NaCl, 0.05).
36-48	Greyish yellow limy clay (pH, 9.6; % T.S.S., 0.26; % ,NaCl, 0.10).

(b) Range of Soi18 Occurring with Stringybark Vegetation

(1) In stringybark scrub area 2-3 miles south-west of Lake Charlegrark (Profile 4).

Depth (in.)	
0- 3	Light grey sand, spongy to loose (pH, 6.0; % T.SA., 0.01).
3-6	Light brown sand, loose.
6-15	Very light brown loose sand with moderate amount of ironstone gravel.
15-18	Yellow-brown, grey-brown, and red mottled friable columnar clay (pH, 6.0; % T.S.S., 0.02).
18-24	Yellow, red, and red-brown friable clay with low amounts of ironstone gravel.
24-36	Yellow and red clay (pH, 5.9; % T.S.S., 0.11; % NaCl, 0.06).
36-45	Yellow and red clay (pH, 5.9; % T.S.S., 0.16; % NaCl, 0.09).

(2) In stringybark heath area 2-3 miles north of Lake Bringalbert (Profile 5).

Depth (in.)	
0- 3	Light grey loose sand (pH, 6.1; T.S.S., trace).
3-13	Very light grey loose sand (pH, 5.6; T.S.S., trace).
13-20	Very light grey sand with black smudges.
20-26	Light brown and dark brown sand with soft rusty and organic sandy lumps ("coffee rock"), (pH, 6.7; % T.S.S., 0.0).
26-29	Yellowish brown sandy clay loarn and grey sandy clay forming massive columns 4 in. across with bleached capping ½ in. thick (pH, 7.3; % T.S.S., 0.04).
29-36	Yellowish brown, red, and light grey sandy clay (pH, 8.2; % T.S.S., 0.08; % NaCl, 0.04).
36-47	Dull yellow and yellowish grey firm sandy clay (pH, 8.6; % T.S.S., 0.10; % NaCl, 0.05).
47-58	Yellow and yellow-grey sandy clay with lime visible from 50 in. (pH, 9.7; % T.S.S., 0.18; % NaCl, 0.05).

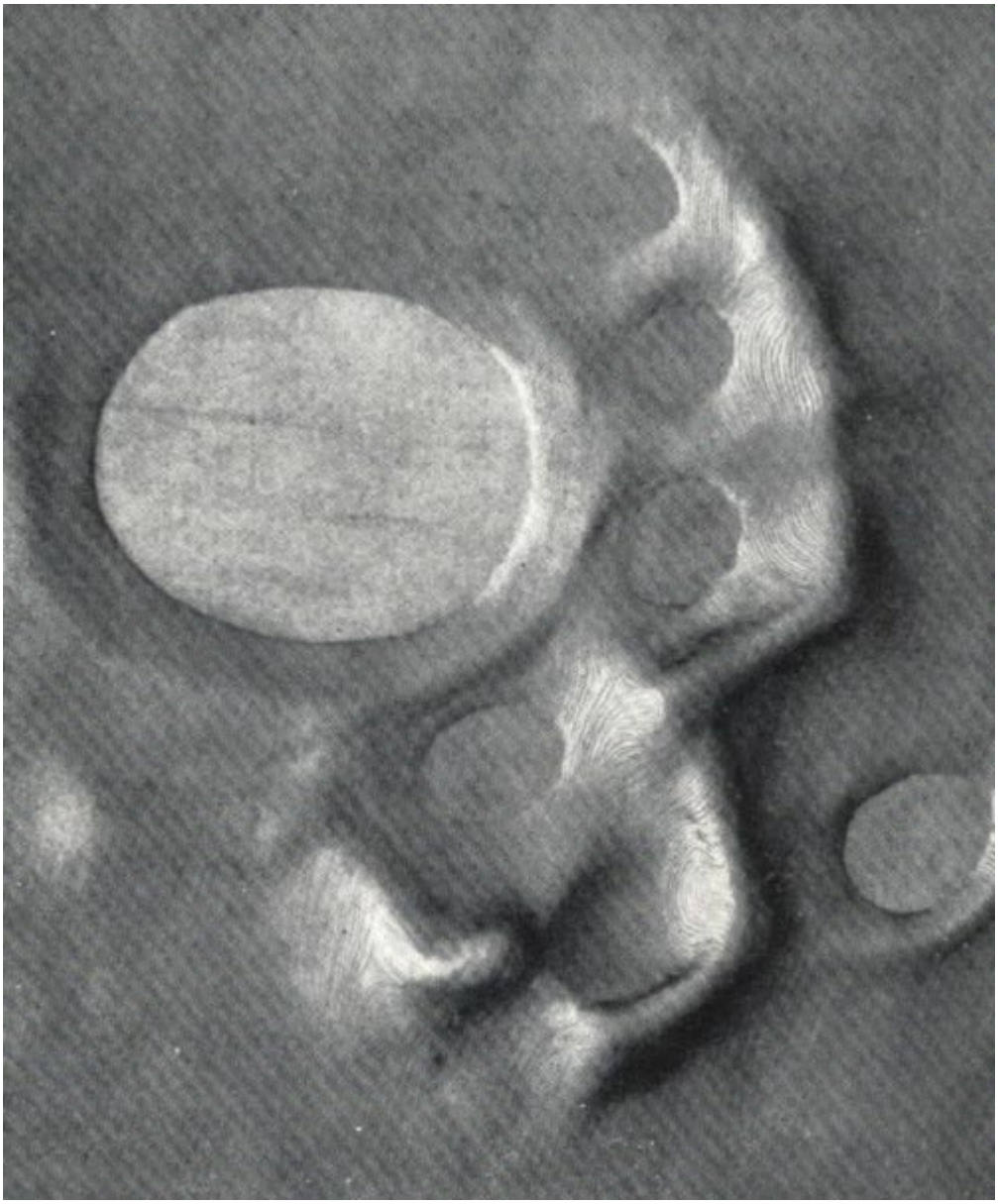
(3) In stringybark forest on Wombelano-Douglas road (Profile 23).

Depth (in.)	
0- 9	Light greyish brown loose sand (pH, 5.4; % T.S.S., 0.01).
9-22	Light greyish brown sand, loose with moderate to heavy amounts of ironstone gravel.
22-24	Light brownish yellow bleached sand, no gravel.
24-26	Yellowish brown and red clay, no gravel.
26-36	Red and grey clay.
36-39	Red and grey sandy clay (pH, 5.5; % T.S.S., 0.04; % NaCl, 0.02).

(4) Originally stringybark forest, 6 miles south-east of Edenhope on Harrow road.

Depth (in.)	
0- 3	Light grey loose sand (pH, 6.0; % T.S.S., 0.01).
3-54	Very light grey loose sand.
54-70	Light yellowish brown sand.
70-96	Grey sand. This was sodden on examination and was so wet at, 96 in. that deeper material could not be removed.

North



A relief drawing of lunettes near Mt Arapiles, 20 miles east of Goroke. (From the original by Major T. L. Mitchell, reproduced from "Three Expeditions into the Interior of Eastern Australia". 2nd Ed. 1839. T. and W. Broone: London).