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SOILS AND VEGETATION
in the
HARTLAND AREA

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TABLE OF CONTENTS

SECTION I - GENERAL	1
SECTION II - RECONNAISSANCE SURVEY OF THE HARTLAND AREA	2
Unit A1.....	2
Unit A2.....	3
Unit C.....	3
Unit D.....	4
Unit E.....	4
Unit F.....	5
Unit G.....	5
SECTION III - DETAILED SURVEY AT TOSTAREE SOUTH	5
The Soils.....	5

SECTION I - GENERAL

A reconnaissance soil and vegetation survey has been made of approximately 50,000 acres of Crown Land and Permanent State Forest known as the Hartland area in the parishes of Tildesley West, Tildesley East, Waygara and Newmerella, County Tambo. Subsequently a detailed soil survey was made of 1105 acres at Tostaree South within the reconnaissance survey. Interim reports on the reconnaissance and detailed surveys were presented to a Departmental Subcommittee on 6th October and 30th November, respectively. The present report supersedes these.

Location – The areas concerned are in East Gippsland, near the coast, between Nowa Nowa and Orbost. Details are summarised in two maps which accompany this report.

Purpose of the Surveys – The surveys are intended to serve two purposes:

- (i) to provide an overall picture of the distribution of the soils and vegetation of the Hartland area,
- (ii) to provide a detailed soil map of a suitable area to include an experimental farm of about 400 acres.

Summary – The reconnaissance soil map shows seven main landscape units which were recognised and mapped according to their topography and vegetation. Nine soil types, 3 soil phases, and several minor unclassified soils were recognised, which in various combinations characterise the seven landscape units.

Three of the seven units, namely E, F and G occur only near the coast line, and were not expected nor desired on the experimental farm site.

The remaining 4 landscape units, A1, A2, C and D comprise nearly 42,000 acres or 83% of the whole area, and in these 4 units, 6 soil types were recognised.

The steep sided, deep gullies running down into Lake Tyres and into some parts of the north-south dissecting streams were recognised as an eighth distinctive landscape unit, but were not separated on the map.

The composition of the reconnaissance units is indicated in the following list of soils, roughly in order of importance.

The soil types are described in Section III.

- | | |
|----------------|--|
| UNIT A1 | Area: 27,200 acres
Hartland sandy loam,
Hartland sand
Humbug loam
Types C, D, A (very minor)
Soils of the very deep gullies. |
| UNIT A2 | Area: 1200 acres
Humbug loam and its shallow phase
Waygara sandy loam |
| UNIT C | Area: 2000 acres
Tostaree sand, and its shallow phase
Hartland sand and Hartland sandy loam are minor or doubtful constituents. |
| UNIT D | Area: 7400 acres
Waygara sandy loam
Hartland sandy loam
Humbug loam
Types A, C, and some wetter sandy loams nearer to the coast. |

UNIT E Area: 3700 acres
Soils related to Tostaree sand and its shallow phase,
Humber loam, Type D and Waygara sandy loam.

UNIT F Black peaty loams and peaty sandy loams over
impermeable clays. Unidentified flooded soils.

UNIT G Deep pale brown beach sands.

The detailed survey covered 1105 acres near Tostaree South. The detailed soil map shows four soil types, namely Hartland sand, Hartland sandy loam, Humber loam and Tostaree sand typical of reconnaissance Units A1, A2 and C. Waygara sandy loam and Type C, typical of Unit D, occur in considerable areas but are mixed with other soil types. The wetter sandy loams which occur in Unit D nearer the coast are not represented, but there are five minor soils not recorded during the reconnaissance, namely Type A, Type B, Hartland sandy gravelly phase, and shallow phases of Humber loam and Tostaree sand. In addition the map shows two areas of mixed soils, Unit II and Unit III, associated with the deeper gullies.

SECTION II - RECONNAISSANCE SURVEY OF THE HARTLAND AREA

The area investigated is bounded on the south by the sea, on the west by Lake Tyers and on the east by the boundaries of private property or selected land adjacent to the Corringale road. The northern boundary is either the highway or the railway line which ever is the further north, except that no selected land or private property was investigated.

There is little variation in topography. Slopes are usually gentle with slightly steeper country in the north rising to 250 ft. Steeper slopes also occur running into the north-south dissecting streams and especially along the western gullies into Lake Tyers. The area consists of Upper Pliocene terrestrial gravels and clays overlying Lower Pliocene and Miocene calcareous marine deposits. These latter have been exposed in several of the deeper gullies.

Little correlation was found between the soil types and the main forest tree species, though the size and form of the trees did form a useful guide to soil type in many cases. The boxes were found to have a restricted distribution, but no definite soil pattern was clearly associated with this, though mid and lower slopes of the deeper gullies were favoured positions. Silver top, white stringybark and mahogany gum were widely spread on different soils. However, some undergrowth species were useful indicators of the soil present. Combinations of soil and vegetation were used to define the mapping units.

Seven units were recognised – A1, A2, C, D, E, F and G, but the majority of the area investigated consists of either Unit A1 or D. Units A1, C and D are examples of Tall Dry Sclerophyll Forest, but the deep gullies within Unit A1, recognised as a different landscape but not separated on the map, are examples of Wet Sclerophyll Forest. The distribution of the units is shown on the reconnaissance map.

In the following descriptions of the units, the general characteristics of the soil are given, and the names of the most typical soil types. However, detailed profile descriptions of these named soils are left to Section III which describes the detailed survey.

Unit A1

This is the most extensive unit of the surveyed area, dominating particularly the western portion. Slopes are gentle to moderate for the most part, though a few of the deeper gullies, particularly those running into Lake Tyers, are steep enough to present special difficulties to farm and forest work.

The tallest trees, and those of best form are in this unit. A characteristic height under present management is around 100 ft. There is always a definite shrub layer of wattles, dog wood, etc., and usually a moderate ground cover of bracken fern. Yacca and Gahnia (*Xanthorrhoea minor* and *Gahnia radula*) are scattered, if present at all.

Three broad groups of soils, apart from those in the steep-sided gullies, can be recognised:

(i) Typified by *Hartland sandy loam*

Dark grey sandy loam, strongly bleached in the subsurface, which merges gradually with brightly mottled yellowish brown sandy clay loam or clay at depths varying from 14 in. to 36 in. The clayey subsoil extends beyond 5 ft.

These are the principal soils and are found on gentle and moderate slopes and extend to the bottom of all but the steepest gullies.

The surfaces of these soils are always highly permeable; the subsoils are variable, but always less permeable than the surface, causing characteristic seepage at mid and lower slope positions.

(ii) Typified by *Hartland sand*

Grey sand, mainly 3 ft., but sometimes 4 or 5 ft. deep, sometimes with ferruginous concretions, overlying sandy clay loam.

These soils occur as numerous small areas high up on the slopes often at the heads of gullies. They usually carry tall *Banksia serrata* and dense bracken under a tree storey similar to that on (i) above.

(iii) Typified by *Humbug loam* (see Unit A2 below).

These soils occur on numerous small area of restricted drainage and reduced slope.

Gullies occur as a minor component of the unit, locally a major component along Lake Tyers. The soils have not been investigated on the steeper slopes beyond establishing a wide range of variation. However, the box or gum dominated flora is quite often on soils apparently similar to those on the upper slopes and ridges.

Unit A2.

This unit is only a minor part of the whole area. It occupies high level flats and saddles, and suffers from extreme water logging in the wet season.

The tree cover is often similar to that of Unit A1 but is more open, and there are large areas of dead timber. The shrub layer is variable, often dense, and the ground cover is a characteristic tangle of *Gahnia* ("cut grass") up to 2 ft high with little or no true grass.

The soils are typified by Humbug loam.

Grey loam or sandy loam to light sandy clay loam, conspicuously bleached in the lower part, overlying mottled grey and yellow-brown clay before 12 in. The clay is dense and very plastic when moist, and extends to at least 3 ft.

Unit C.

This is a topographical unit of sand dunes.

The tree cover is similar to that of Unit A1, but Unit C is indicated by a second storey of tall *Banksia serrata* and a dense ground cover of tall bracken fern. *Banksia marginata* occurs widely but is not restricted to this Unit.

The soils are typified by Tostaree sand.

Grey sands deeper than 48 in. and often deeper than 84 in., and overlying coffee rock and soft ferruginous concretions.

Fringe sandy soils as shallow as 36 in. are included.

These are like soils described under Unit A1 (ii) but occupy low, instead of high positions on the slopes.

Unit D

This is the second most extensive unit in the area, and is more variable in soils than Units A1, A2 and C.

In the western part of the area Unit D is confined to the southern fringe, but in Waygara and Newmerella it is more generally distributed.

Where units A1 and D intermingle, the Unit A1 soils and timber occur more often in the valleys, and Unit D on higher ground. However, it was not possible to record this separation on the reconnaissance map.

The height of the tree cover on Unit D is usually greater than 60 ft but compared with Units A1 and A2 the trees are smaller, and of poorer form. Against this it is said that there is a greater proportion of sound logs in Unit D than in Unit A1 areas. There are often more shrub species present and a moderate bracken cover, but also Gahnia and yacca in significant amounts. However Gahnia is never dense and tangled as in the Unit A2 areas. In other situations there is little ground cover.

Whilst Unit D contains areas of the three soils described under Unit A1, and, in particular, merges with Humberg loam, two other broad groups of soils have been recognised, viz.,

(i) Soils typified by *Waygara sandy loam*

Brownish grey sand loams which pass sharply to mainly brown medium clay before 12 in. The clay extends beyond 4 ft.

The surfaces of these soils are finer textured than Hartland sandy loam and usually show no evidence of waterlogging.

(ii) Grey sandy loams about 18 in. deep overlying grey clay.

These soils occur on flatter areas near the coast and are more poorly drained than (i) above.

Unit E

This is a minor unit, variable in soils, drainage and vegetation. It is characterised by the small size and poor form of the eucalypts, if present, or by typically coastal plant communities. The eucalypts are usually less than 50 ft and often less than 30 ft high.

The soils have not been investigated to any extent but four landscape features are evident:

1. Grey sand hills and sand sheets with stunted mahogany gum, white stringy bark, but *Banksia serrata*, *Banksia integrifolia* and bracken fern. The soils look like those of Unit C.
2. Rises with shallow soils over uniformly coloured brown clays not unlike the soils of Unit D (i), but carrying a very stunted tree cover.
3. Flats with variable soils carrying stringy bark.
4. Flats carrying chiefly stunted paperbarks.

Unit F

This is the subcoastal area of flat land, permanently or frequently flooded, called Ewing's Marsh. The higher parts carry stunted paperbarks, and tea-tree with a variable ground cover. The soils include black peaty sands or sandy loams over impermeable clays, with or without an intermediate horizon of pale coloured sand.

The soils and vegetation of permanently flooded areas were not investigated.

Unit G

Beach dunes of pale brown sands carrying *Banksia*, *Leptospermum* and a few salt tolerant species.

SECTION III - DETAILED SURVEY AT TOSTAREE SOUTH

Most of the soil types encountered in the reconnaissance survey are included in this area, with the exception of those of the coastal fringe in Units E, F and G. These units rarely extend more than 30 chains inland from Ewing's Marsh.

Soils of Unit A1, by far the most extensive throughout Hartland, are well presented in the surveyed area. The soils of Unit C (grey sand dunes) are a very minor part of the area south of Tildesley River, but are well represented in allotments 22G and 22H just north of the river, bordering the Orbost Old Road.

The soils of Unit D and Unit A2 of the reconnaissance are represented by several small, but adequate, areas of 3 soil types occurring in 2 complexes, and by small areas of a fourth type occurring unmixed with others.

In all, nine soil types have been defined, and three additional phases. In addition, a small area of soils having lime visible in the profile is marked on the map.

The soils are described below. A generalised profile, reference and soil type sample sites, and notes on topographical situation and drainage are given, with present vegetation and extent of each soil type. Analytical data for the soil type samples are not included in this report. Botanical species mentioned in the report are listed as an appendix.

The Soils

Tostaree sand (TS), area: 41 acres. Grey sand over sand to more than 7 ft.

This is a minor soil type both within the survey and throughout Hartland. It is the major soil of the grey sand dunes, being associated with typical steep sided ridges; a rather open tree storey of large white stringy bark, mahogany gum, with some silver top and messmate; a very noticeable under storey of *Banksia serrata*, mid-dense to 20 ft, a scattering of other shrubs and moderate to dense bracken to 3 or 4 ft and very little grass.

Reference and sample site No. 1.

Generalised profile:

0-6 in. Grey or dark grey loamy sand or sand;

6-10 in. Grey loamy sand or sand;

10-26 in. Very light grey sand;

26-50 in. Brown sand;

50-85 + in. Bright brown sand.

Variant:- Below 50 in. very pale brown sand may occur, and/or bright brown clayey sand.

Tostaree sand, shallow phase (TS), area: 5 acres. Sandy clay loam before 7 ft.

- 0-10 in. Dark grey loamy sand;
- 10-24 in. Light grey sand;
- 24-50 in. Pale brown sand, iron-organic accumulations at 30 in.;
- 50-60 in. Yellowish brown sand;
- 60-80 in. Yellowish brown and brown moderately mottled sandy clay loam;
- 80-84 + in. Sandy loam or sand (dominantly brown coloured).

The horizon boundaries are gradual.

Hartland sand (Hs), area: 14 acres. More than 3 ft of grey sand over clay usually occurring before 5 ft.

This is a minor soil type throughout the survey, occurring at the heads of gullies, not distinguished topographically from Hartland sandy loam. Slopes are moderate to steep. A dense stand of tall Eucalyptus (white stringy bark, mahogany, silver top, etc) with often an understorey of Banksia serrata, dense small shrubs and dense bracken. In one instance near site B4, this soil runs up to a subdued dune carrying tall messmate (130 ft.)

Reference site No. 9. Allotment 22^C near site B4.

- 0-4 in. Dark grey loamy sand or sand;
- 4-24 in. Light grey sand, passing gradually into;
- 24-46 in. Pale brown sand or sandy loam with ferruginous nodules;
- 46-50 in. Mottled brown sandy clay loam;
- 50+ in. Mottled brown sandy clay.

Hartland sand, gravelly phase (Hs), area 17 acres. A minor soil type, with river gravel in the profile.

Reference and sample site No. 2.

Generalised profile:

- 0-8 in. Brownish grey, coarse loamy sand, with some gravel;
- 8-24 in. Pale brown coarse loamy sand with increasing gravel to 1½ in. size; passing gradually into;
- 24-36 in. Brown coarse loamy sand; passing gradually into;
- 36-72 + in. Brown, passing into strongly mottled brown, brownish red and grey gravelly clay.

Hartland sandy loam (Hsl), area: 66 acres. A grey sandy loam 14 to 36 in. deep over mottled brown clay, somewhat friable when moist.

This is the most extensive soil type throughout Hartland, and in the area covered by detailed survey. In the northern part of the area, it occurs on both crests and slopes on the ridges, while in the southern part

it is confined mainly to the slopes below the shallower soils of the ridges. Gentle to steep slopes; vigorous dense tree cover of mixed eucalypt species in which white stringy bark and silver top are commonest. A moderately dense cover of bracken is usual with an open shrub layer on the upper slopes and crests, dense on the lower and wetter slopes. Grasses are wide spread, but conspicuous only in some wetter situations.

Reference site No. 10: Sample sites Nos. 3 and 4.

Generalised profile:

- 0-6 in. Dark grey sandy loam, sometimes dark brownish grey;
- 6-22 in. Light grey sandy loam, sometimes light brownish grey; at 14 to 36 in. passes to;
- 22-48 + in. Mottled brown, light or medium clay, friable when moist.

Variants: Usually the B1 horizon has a slight yellowish brown and reddish brown mottle, becoming redder with depth, and with some light grey below 3 ft. Soils with a grey mottle and more plastic clay in the B1 horizon do occur, and have been included within the type at this stage. They warrant defining as a separate soil type in some cases, but are difficult to map except at a very detailed scale.

Waygara sandy loam (Wsl), area: part of 162 acres of complexes with Humbug loam. Eight to 14 in. of grey sandy loam over brown plastic clay.

This is a minor type in the present survey, being more important elsewhere in reconnaissance Unit D. It occupies well drained slopes and crests, or as in this survey, may be closely associated with Humbug loam. Tall stringy bark, etc. sometimes with scattered box and iron bark with or without an understorey of black sheoke. Usually with a moderate ground cover of bracken and grasses. Death and/or clearing of timber may account for the dense shrub and Gahnia cover on some areas adjacent to Humbug loam.

Reference site No. 11: Sample site No. 6.

- 0-3 in. Dark grey or dark brownish grey sandy loam;
- 3-10 in. Light brownish grey sandy loam;
- 10-48 + in. Brown or brown mottled medium clay; plastic when moist. Any greying of the top of this horizon should not extend to a depth of more than 3 in.

Humbug loam (H^bI), area: 65 acres plus part of 156 acres complexes with Waygara sandy loam. Eight to 14 in. of grey loam to sandy loam over grey-mottled plastic clay; the wettest shallow soil of the area.

This soil occurs on the very gently sloping crests of ridges, and in some local depressions and saddles. The original tree cover of tall white stringy bark and silver top has usually been thinned by death and/or logging, resulting in a very patchy shrub layer of Melaleuca, Callistemon Leptospermum, Acacia species and others. Tangled Gahnia ("cut grass") is the commonest ground cover.

Reference site No. 12: Sample site No. 7

Generalised profile:

- 0-4 in. Dark grey to brownish grey sandy loam to loam;
- 4-10 in. Light grey or light brownish grey sandy loam, sometimes with slight ferruginous gravel; at 8 to 14 in. passes to;
- 10-21 in. Dull yellowish brown to grey with brown mottling, medium clay, tough and plastic when moist, passing at 18 to 24 in. to;

21-48 + in. Brown or yellowish brown medium clay.

Humbug loam, shallow phase (H^b1), area: 22 acres.

Reference site No. 13: Sample site No. 8

Generalised profile:

0-5 in. Grey sandy loam to loam, (the deeper occurrences are bleached); at 1 to 8 in. passes to:

5 in. Grey with a brown mottle, or dull yellowish brown, medium clay, very plastic when wet, very hard and blocky when dry.

Continued as in Humbug loam.

Unnamed soil types:

Type A (A), area: 7 acres. A brown soil of very minor extent, occurring as small patchers associated with Hartland sandy loam, Waygara sandy loam and Humbug loam.

Reference site No. 14.

Generalised profile:

0-5 in. Brown or dull reddish brown sandy loam, or fine sandy loam;

5-18 in. Pale brown sandy loam or fine sandy loam;

18-30 in. Reddish brown or brown medium clay; friable; passing gradually into;

30 + in. Brown and reddish brown diffusely mottled medium clay; friable.

Type B (B), area: 30 acres. A minor soil of some wet depressions. A texture profile not unlike Hartland sandy loam, but with an impermeable, compact (or weakly cemented) horizon within 15 in. of the surface.

Reference site No. 15: Sample site No. 5.

Generalised profile:

0-5 in. Grey sandy loam;

5-10 in. Light grey sandy loam;

10-14 in. Light grey sandy loam compacted; impermeable;

14-32 in. Light grey and pale brown, diffusely mottled sandy clay loam.

22 + in. Grey and brown strongly mottled medium clay; plastic.

Type C (C), area: unknown. A soil which occurs fairly extensively on the slopes of the deeper gullies.

Type C often merges with, and is difficult to separate from Hartland sandy loam, but usually is drier through the profile in the wet seasons. Gentle to moderate slopes, tree storey dominated by fuzzy box or other boxes of fair size. Mid-dense shrub layer to 15 or 20 ft. and perennial grasses. In addition, there may be a sparse ground cover of smaller shrubs, *Hibbertia ovata*, or a moderate cover of bracken fern.

Reference Site No. 16.

Generalised profile:

0-8 in.	Grey-brown fine sandy loam, (or loam to sandy loam); at 6 to 10 in. passes to;
8-20 in.	Light or very light grey-brown sandy loam; at 13 to 27 in. passes to;
20-30 in.	Brown, or brown and grey mottled, medium or heavy clay; dense and with moderate structure; plastic when moist;
30-48 in.	Variable textures due to dissection of the original sediments.

Type D (D), Area: 17 acres. A wet, deep, black sandy loam of minor extent, but widespread near the water courses of the larger gullies. It carries a dense, tall tree cover similar to that on nearby slopes, dense paperbark and other shrubs to 15 or 20 ft, and a moderate ground cover of bracken and grasses.

Reference site No. 17.

Generalised profile:

0-24 in.	Very dark grey brown or very dark grey (“black”) sandy loam, with a dense fibrous root layer in the upper part;
24-42 in.	Light grey sand;
42-48 in.	Brown medium clay with pockets of grey sand;
40 + in.	Brown and grey strongly mottled medium clay.

Complexes of Soils

Two areas are shown on the maps as complexes. These contain Humbug loam and Waygara sandy loam, each complex being dominated by one or the other of these soils.

Miscellaneous Units

In three areas shown on the soil map, the main soil types were identified, but the extent of each was not estimated.

Unit I (I), area: 123 acres. This is a gently sloping area containing Humbug loam, Waygara sandy loam, Hartland sandy loam and Type A.

Unit II (II), area: 124 acres. Lower, moderate to steep slopes. Tree storey dominated by fuzzy box and other boxes with increasing mountain grey gum in the lower parts. It contains Type C, Type D, Hartland sandy loam, and unidentified shallow soils.

Unit III (III), area: 12 acres. A complex of calcareous soils. These soils are formed on an exposure of calcareous marine sediments. The vegetation is similar to that of Unit II, with tussock grasses more prominent on this unit than anywhere else in the district. Near the creek a dense shrub layer to 20 ft of Pomaderris and Acacias, and some mountain grey gum and candlebark gum towering over all. The following three profiles were noted near site D6.

Ca.1 (near the creek)

0-4 in.	Dark dull reddish brown loam or clay loam;
4 + in.	Dark red-brown clay; with visible lime at 6 in. and increasing with depth; very friable.

Ca.2 (mid-slope)

0-6 in. Dark dull reddish brown loam, with grit; very friable;

6-8 in. Dark dull reddish brown clay; very friable;

8-22 in. Bright light clay;

22 + in. Brown light clay with visible lime.

Ca.3 (upper slope)

0-8 in. Very dark grey-brown fine sandy loam;

8-15 in. Dull reddish brown fine sandy loam;

15-33 in. Brown with reddish brown, diffusely mottled light clay;

33-48 + in. Yellow-brown clay loam; very brittle; traces of visible lime from 40 in.