SOILS OF SOUTHLAND COUNTY

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INTRODUCTION

Soil Formation

Soil is the product of five soil-forming factors: rock, climate, vegetation, topography, and time. When one considers the wide range of each of these five factors, it is easy to visualise the large number of possible combinations. This is particularly true of New Zealand, where there are wide ranges in climate, vegetation, and, in some areas, parent material.

The soil process may be considered in three parts:

(a) Soil Decay.

(b) The Organic Cycle.

(c) The Inorganic Cycle.

(a) **Soil Decay** consists of the breaking down of rock by many processes: weathering, solution, oxidation, etc., to form a mantle of rock waste. The degree of decay or weathering is closely related to rock type, climate, and topography.

(b) **The Organic Cycle** is concerned with the struggle of soil life to maintain fertility against the wasting effect of downward-moving water. As plant nutrients are washed down through the soil, the roots of trees and grasses absorb them, build them up into their stems and leaves, and in the end return them to the soil surface as litter. Some plants are very efficient in this process of returning nutrients to the soil; others are less efficient and ultimately an impoverished acid soil is produced.

(c) The Inorganic Cycle. In many areas fresh inorganic material is being added to the soil in the form of river alluvium, dust, and, on sloping land, by slipping and soil creep. Material is also being removed from many soils by the process of natural denudation.

Soil Mapping

The soil type is the basic unit of soil mapping and classification. It is established from an examination of the soil profile in cuttings or pits and mapped by using a soil auger or spade.. A soil type is named after the geographical place where it is commonly found, such as Clutha fine sandy loam and Waimumu silt loam. The soil type: can be subdivided where necessary into phases according to topography, stoniness, wetness, and colour of top-soil. Thus we get Clutha silt loam, deep phase, or Waimumu silt loam, grey phase. Closely related soil types which differ in texture are grouped into' a Soil Series with the same geographical name as its component types.

DESCRIPTION

The soils of Southland County are described in three divisions.

A. **Zonal soils,** in which climate and the resulting vegetation are the dominant factors of formation.

Yellow Grey Earths,:

These soils occupy large areas of the lowlands of western and eastern Otago and Canterbury, where rainfalls range from 20in. to 35in. moderately well distributed throughout the year. These soils dry out in summer and are generally saturated in winter, whereas profiles of the brown grey earths and brown grey to yellow grey earths are rarely wet throughout. Topsoils of the yellow grey earths are grey to dark brown grey soft granular to crumbly structured silt loams on gleyed and gammated B horizons. Very compact horizons. or pans are common in the profile of the yellow grey earths. These compact horizons resist weathering in road cuttings and stand out markedly. These soils range from moderately to strongly leached. They were formed under silver tussock and, in colder areas, fescue tussock associations. The following is a profile of Waikoikoi silt loam from the Gore-Waikaka district :—

10in. Grey soft crumbly structured silt loam.
5in. Grey mottled yellow brown silt loam.
9in. Orange and yellow mottled silty clay loam, more compact.
12in. Brown yellow blotched orange and whitish silty clay loam to fine sandy clay loam, compact.
ON Brown yellow fine sandy loam.

Soils transitional between yellow grey earths and yellow brown earths: Soils of this sub-group have characteristics common with both the yellow grey earths and the yellow brown earths, They are more weathered and generally more leached than the yellow grey earths. Their profiles are usually strongly gleyed and seldom dry out. Topsoils are poor structured pale grey to dark grey silt loams ; subsoils tend to be compact, heavy yellow brown clay loams but do not stand out as markedly as the pans of the yellow grey earths. These soils were covered with several types of vegetation, ranging from fescue tussock, red tussock and manuka scrub to broadleaf podocarp forest. This transition group is divided on a basis of gleying into three sub-groups: weakly gleyed Waikaia series; moderately gleyed Mossburn, Hokonui, and Romahapa series; and strongly gleyed including Waimumu and Pukemutu series. Waikaia series occurs on the foothill country between the Mataura River and to the north of Waikaia, developed under tussock and scrub with a rainfall of 30in. to 35in. per annum. A common profile is:—

10in. Grey poor structured fine sandy silt loam.
4in. Pale grey slightly mottled orange silt loam.
10in. Heavier pale grey and pale yellow grey silt loam.
ON slightly compact heavy silts, light yellow brown.

The main unit in the moderately gleyed sub-group occurs in the Dipton and Balfour districts and has developed under red tussocks with a rainfall of 30in. to 35in. per annum. These soils have compact subsoils and are poorly drained. A typical psofile from the Balfour district is:—

8in. Light grey soft granular silt loam.
4in. Paler grey mottled orange heavy silt loam.
7in. Yellow grey mottled orange and whitish grey heavy silt loam, often containing hard iron nodules and in some areas a cemented iron pan.
ON very compact yellow brown silty clay loam, mottled dark brown and yellow and stained black along cracks.

Related soils are Mossburn series in the western parts of the Five Rivers Plain, Romahapa series near Gore developed originally under mixed broadleaf podocarp forest, and Hokonui series developed on a heavier parent material along the lower northern slopes of the Hokonui Hills.

The soils of the strongly gleyed subgroup have very poor drainage and were developed under dense

red tussock with a rainfall of 35in. to 40in. per annum. Waimumu series which is typical of this subgroup occurs south of Gore on the higher terraces. Pukemutu series is extensive **on** higher terraces in the Winton district. A typical profile of Waimumu series is :—

8in. Grey to dark grey- silt loam, poor crumb- structure.
3in. Pale grey moderately mottled (yellow brown) heavy silt loam.
15in. Tighter yellow brown moderately mottled silty clay loam.
ON brown yellow compact silty clay loam, somewhat cheesy.

Yellow Brown Earths:

The yellow brown earths are developed under rainfalls of over 40in. on the lowlands and 35in. in the uplands, and wide ranges of temperature from the lowlands near the coast to high mountain climates. Dark grey browns and yellow browns are the dominant colours of these soils, the structure ranging from granular and nutty to fluffy single grain in the colder mountains. Yellow brown earths are developed under a wide range of mull- and some mor-forming natural vegetation, from red tussock and snowgrass to beech,, broadleaf, and podocarp forest. All the lowland yellow brown earths of Southland fall into the sub-moderately weathered group. This group is then subdivided on the degree of leaching, from moderately leached to weakly podzolized. Owaka series developed under matai-totara-broadleaf forest ; Kaiwera series developed under red tussock. A typical profile of Kaiwera series is :—

9in. Dark brown to blackish good crumbly silt loam.
10in. Brownish yellow sometimes slightly mottled heavy silt loam.
ON yellow brown heavy silt loam to silty clay loam, sometimes slightly compact.

Waikiwi series is the most important member of the moderate to strongly leached group of the yellow brown earths. It was probably developed originally under rimu-podocarp forest, but apart from small remnants of bush was under red tussock when the pakeha settlers arrived. A typical profile of Waikiwi series is :—

7in. Brownish to grey brown crumbly silt loam.
8in. Moderately crumbly yellow brown silt to heavy silt loam.

ON slightly compact paler yellow brown silts to heavy silts.

Chaslands series is a related soil from the valleys of the Chaslands and Catlins. Waianiwa series is a gleyed soil closely related to Waikiwi series and Lillburn series is a gleyed hill soil developed under beech forest in the Chaslands and in Western Southland. Pukepahi and Waimahaka are mostly hill-complex soils of the Chaslands developed under rimu forest and showing signs of weak podzolisation. Small areas of Pukepahi series occur at Kamahi and near Makarewa. A profile of Pukepahi hill-complex from the Chaslands is:—

3in. Blackish peaty silt loam.
5in. Dark brown crumbly silt loam.
15in. Dull yellow brown moderately compact silty clay loam.
ON Gre ywacke.

Rimu series is the most extensive soil in the weakly podzolised subgroup, occuring to the north and south of Waikiwi series on the Southland Plains. It is a moderately poorly drained soil developed under forest originally, but was under manuka scrub and red tussock when settlement commenced. A common profile is :—

7in. Dark grey silt loam, slightly crumbly.
5in. Light grey silt loam, slightly crumbly.
8in. Yellow brown strongly flecked orange heavy silt loam.
ON Light yellow brown heavy silt loam.

Podzols :

A large area of podzols occurs in the Chaslands and Catlins where the rainfall is over 45in. and where mor-forming rimu-kamahi forests are dominant. The "eggcup" podzols formed under these trees are noticeable features in the road cuttings in the Chaslands. A profile of Tautuku series is:—

6in. Dark brown loamy neat.
1⅜in. Black peat stained silt loam.
2½in. Grey brown drying whitish heavy silt loam.
4in. Brownish black peaty silty clay loam.
ON Yellow brown moderately compact silty clay loam.

Gley Podzols :

Mokatua complex consists of podzols and associated yellow brown earths like the Tautuku series, which have high water-tables and are strongly gleyed. They cover a large area from Tisbury to Gorge Road.

B. INTRAZONAL SOILS, which owe their principal characteristics to their parent material or high ground water.

Rendzinas and associated yellow brown earths: Rendzinas and associated moderately leached yellow brown earths (Owaka series) developed in limestone under broadleaf-podocarp forest have been mapped as Kauana complex, in the Winton district. A common profile of the rendzina is:—

10in. Dark brown to blackish strong nutty heavy silt loam.

10in. Bright brown small cloddy sticky clay loam.

ON limestone.

Brown Granular Soils are developed on olivine, serpentine, and gabbro in the Five Rivers district. Pahia complex at Greenhills consists of brown granular clays, yellow brown loams, and podzolised yellow brown earths. A typical profile is:—

4in. Brown strong granular to strong crumbly heavy silt loam.

ON rocky clay.

ON rock.

Yellow Brown Loams: In the Drummond-Oreti area to Waimatuku there are yellow brown loams derived from a mixture of greywacke and diorite sediments. A common profile of Drummond series is:—

7in. Soft crumbly friable dark grey brown silt loam.

4in. Transitional browner zone.

8in. Slightly tighter but still good crumbly brown heavy silt loam.

ON stones.

Waimatuku series is a deep soil related to the Drummond series.

Yellow Brown Sands: Soils on the coastal dunes have been grouped into three series: Recent sandhills —Oreti series ; stabilised moderately-strongly leached sands-Otatara series ; and podzolised sands-Toetoe series. At Otatara we get the following profile:—

12in. Blackish crumbly sandy loam.

10in. Reddish brown to blackish moderately granular sandy loam.

ON yellow brown sands or gravels.

Gravsols: Very stony soils are classed as gravsols and related to zonal or intrazonal groups. There are three series of gravsols in Northern Southland-Hakea on the Waikaia plains, Kaweku on the Waimea Plains

and Acton on the Five Rivers plains—all related to the soils transitional between yellow grey and yellow brown earths. A typical profile of Kaweku series at Kingston Crossing is ;—

9in. Brownish grey silt loam, soft crumb structure.
4in. Transitional zone, slightly heavier and paler coloured.
5in. Gravelly yellow brown silt loam, mottled orange.
ON compact strongly mottled gravelly clay loam.

Gley Soils: Soils which have a permanent high water-table are grouped as glev soils. A small area of immature stony gley soils at Riversdale are grouped with Taitapu series of Canterbury. Along the Makarewa and small streams flowing across the Southland Plains are young gley soils which are still sometimes flooded. These soils are grouped as Makarewa series and the following is a profile:—

llin. Grey brown silt loam.
6in. Pale yellow brown heavy silt loam.
ON tighter, brighter yellow brown heavy silt loam.

Otapiri series is an older soil related to the better drained Pukemutu series of the Winton district.

Organic Soils: Large areas of intrazonal peats occur throughout Southland, especially between Invercargill and Waituna. These are strongly acid rush and sphagnum peats mapped as Otanomomo series. Small areas of mixed peats and alluvial silts occur in the swamps in the lower reaches of the Mataura and Oreti Rivers..

Saline Soils: A very small area of saline sands occurs near the Invercargill aerodrome and is mapped as Motukarara series.

C. AZONAL SOILS, in which the inorganic cycle dominates the soil process.

Recent Soils :

Large areas of fertile deep silt loams occur along the Mataura and Oreti Rivers mapped as Mataura series. These soils were all subject to flooding prior to settlement and have weakly developed soil profiles. A common profile of Mataura series is:—

10in. Dark grey sandy silt loam, loose structure.
6in. Pale grey slightly mottled sandy silt loam.
ON pale yellow grey silts moderately to strongly mottled.

Small areas of older alluvial soils, Puerua series, occur in the Chaslands.

Skeletal Soils :

Skeletal soils related to soils transitional between yellow grey earths and yellow brown earths. The northern faces of the Hokonui and Kaihiku Hills contain large areas of steep skeletal soils under good fescue tussock cover. They are moderately leached and weakly gleyed and are mapped as Kaikihu series. Large areas of Hurunui series occur in northern Southland between Waikaka and Garston. They are covered in fescue tussock and scrub with small patches of beech forest in some of the gullies. They are more leached and gleyed than the Kaihiku series. A typical profile near Lumsden is:—

6in. Light brownish grey rocky silt loam.
3in. Transitional zone.
ON light yellow brown to yellow silt loam drying to pale yellow colour.

Skeletal Soils related to Yellow Brown Earths:

(a) **Submoderately weathered.** Soils of the Tuapeka' series occur under beech forest and scrub in the Waikaia Valley and between Five Rivers Plains and the upper Oreti River. They are moderately to strongly leached. A typical profile is:-

6in. Friable soft granular grey brown silt loam.
10in. Brownish yellow soft crumbly silt loam to heavy silt loam.
ON Grey yellow or in some places brown yellow silts.

(b) **Weakly weathered.:** Large areas of Kaikoura soils occur above the Hurunui and Tuapeka series. These soils are weakly weathered, shallow, and strongly leached. A common profile is:—

4in. to 6in. Dark brown loam loose and powdery when dry.
12in. to 18in. Dark buff-yellow loam, mellow.
ON greywacke.

Skeletal Brown Granular Soils:

A small area occurs on the West Dome. They are grouped as Windley series. A typical profile is:—

5in. Grey brown granular stony clay loam.
ON Light brown very stony clay loam.