Soils of the East Takaka District, Takaka Valley

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Introduction

Following previous detailed surveys of the soils of lower Takaka Valley in 2005 and the Puramahoi district in 2006, the soils of the East Takaka district were mapped in 2007/2008 as part of the Tasman District Council upgrading of the basic land resource information for planning purposes. The area covered in the East Takaka District survey included the land on the eastern side of Takaka River from just south of Gorge Creek and including the footslopes of the Pikikiruna Range, as well as the hilly land lying to the south of the Rameka Creek-Central Takaka Road area. Covering approximately 1500 hectares, the area includes primarily river floodplain and terrace lands, remnants of a former older terrace system, some hilly to steep land outliers of Tertiary sediments and adjacent steep lands, primarily the Arthur Marble Formation, which forms the western side of the Pikikiruna Range.

Survey Methods

The field mapping was carried out between late October 2007 and April 2008 over thirty eight days. Early (1943) black and white aerial stereo-photographs were studied to identify the landform units, drainage and vegetation patterns and were used to assist with the positioning of soil observation transect lines. Field observations were made along the transect lines primarily by examining the soil from auger borings up to 1 metre depth as well as from excavated soil pits and from exposures in cuttings. The auger observations provided information on the soil horizon thicknesses, colours and textures, drainage characteristics and depth to underlying gravels while the pits allowed a more detailed assessment of the above soil properties as well as soil structural characteristics, soil strength, plant root distribution and the nature of underlying materials. A total of 391 auger observations were made with detailed observations from 82 pits.

The soil description criteria used were those outlined in Soil Description Handbook (Milne et al. 1995) which gives the official description standards for description of New Zealand soils. Field soil data were electronically recorded and included a digital image for each profile. The position of each observation site was located and recorded using GPS and marked on 1:6500 colour photo field sheets onto which soil boundaries were plotted. The boundaries were later transferred by TDC staff onto a photogrametric base for final map compilation. The field date were analysed in respect of the variation in properties for each of the recognized soil types (horizon sequences and thicknesses, colour, texture, drainage, soil depth etc) and the information was used to assist with positioning of the soil boundaries and determining the variability within the map units.

Previous soil surveys covering the East Takaka District

The area covered by this soil survey was first mapped in the 1950's by Cawthron Institute Staff as part of a soil survey of Takaka County at a scale of 1 mile to 1 inch. At that time, seven soils were distinguished within the east Takaka area.
In the General Survey of the Soils of South Island (Soil Bureau Staff 1968), the mapping which was at a scale of 1: 250,000 simplified the earlier unpublished data and showed only 4 soils (sets) for the area. A review of the soil data for the area was carried out by O'Byrne (1983) in an unpublished Soil Bureau District Office Report but no new soils information was provided.

The present survey of the East Takaka district follows the previous detailed soil surveys of the Lower Takaka area in 2005 and the Puramahoi area in 2006 in which a number of new soils were identified.

Reliability of the information

Soils are inherently variable owing to wide variations in the processes that formed the materials from which the soils have formed and also to subsequent changes in local conditions. Formed in a predominantly alluvial environment, differences in soil texture, stoniness, depth to gravel, drainage occur over short distances as a result of sedimentation, flooding processes and differences in composition of the soil materials etc. In the following soil descriptions, the morphological properties of the various soils are described along with variations that were found within the mapping units.

The accompanying assessment of the productive value for each of the soils is not derived from actual land use within the district but is based on intrinsic soil properties, soil limitations to use, the ease of overcoming the soil limitations and land use experience elsewhere. The Land Use Assessment follows that used earlier by Agriculture New Zealand in a classification of productive land in the Tasman District.

General nature of the East Takaka district

The East Takaka area lies about mid-valley and at a point where the valley widens near the junction of the Takaka and Waingaro Rivers. It is mainly terrace land, bounded on the east by the Pikikiruna Range and to the north by some hilly land comprising Tertiary limestone and mudstone formations. The main terrace surface falls gently northwards from around 45m to 20m above sea level while the elevation difference between this river terrace surface and the lowest floodplain surface is probably < 15m. This lack of significant down-cutting suggests that the region may have been be tectonically stable over recent geological time .

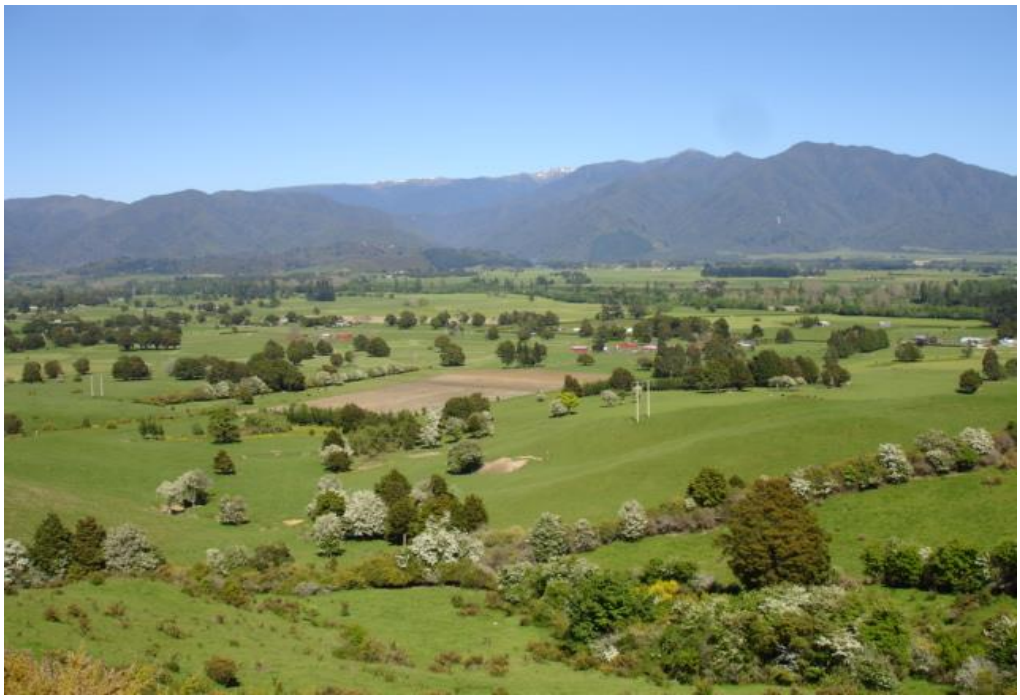
The main terrace surface comprises stony gravels (Hamama soils) which, judged from the limited extent of the soil weathering, probably aggraded near the end of the Late Last Glaciation. About 3m below is another stony gravel terrace which appears to represent a degradational surface formed as the river level lowered after the main terrace surface was formed (Uruwhenua soils). Below these surfaces are the recent

floodplain deposits with Karamea and Takaka soils. Following the main terrace formation period, fine textured sediments derived from erosion on the eastern steep lands were deposited in back channels adjacent to the steep land.

On the younger lower lying terrace surfaces, the depth of fine soil material overlying gravel varies greatly and over short distances due to floodplain and sedimentation processes and except for a few instances, it was not possible to separate out areas of soils of different depth classes.

A significant geomorphic feature of the lower Takaka Valley/Motupipi and Puramahoi areas is the existence of remains of a much older terrace system which formed from the extensive outpourings of coarse sediments during two earlier glacial periods (Kaituna and Rockville Formations). These older terraces are largely absent from the East Takaka area apart from some small remnants of Kaituna formation gravels, having been removed by erosion by the Takaka River.

Rainfall over the area is around 2000 mm (2160 at Uruwhenua, 7 km south of East Takaka) with the months of lowest rainfall from January through to March.



View looking southwest across the East Takaka area. In the foreground are Tadmor soils from Tertiary siltstone. A discontinuous row of trees in the middle distance marks the boundary between Hamama soils on the main terrace surface and younger soils on the terraces and floodplain below.

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Soils of the East Takaka District

	Map Symbol	Use Rating
Soils of the river floodplain and river flats		
Well drained		
Takaka soils	Tk, Tksh	B
Imperfectly to poorly drained		
Harihari soils	Hh	F
Soils of the low river terraces		
Karamea soils	Km, Kmst	A
Soils from quartzitic and basic alluvial stream/fan deposits		
Te Tahu soils	Te	A
Soils from degradational terrace alluvium		
Uruwhenua soils	Ur, Ursh, Urst	A/C
Soils from Late Last Glaciation aggradational alluvium		
Hamama soils	Hash	A
Soils from Late Last Glaciation colluvial sediments		
Moderately well drained		
Rototai soils	Ro	B
Imperfectly drained		
Clifton soils	Cf	D
Poorly drained		
Harwood soils	Hw	E
Soils from mixed alluvial Late last Glaciation fan sediments		
Motupipi soils	Mo	A
Soils from Kaituna Formation terrace deposits		
Rameka soils	Ra, RaR	A/B
Soils from Rockville Formation terrace deposits		
Pisgah soils	Ps	A
Soils from Tarakohe Siltstone Formation		
On easy rolling land		
Tadmor soils	Tm	B
On hilly and steep land		
Tadmor hill soils	TmH	E
Tadmor steepland soils	TmS	E
Soils on Takaka Limestone Formation		
On easy rolling land		
Tarakohe soils	Th	H
On steep land		
Tarakohe steepland soils	ThS	E
Soils on Arthur Marble Formation		
On hilly land		
Pikikiruna hill soils	PkH	H
On steep land		
Pikikiruna steepland soils	PkS	F

Soil name and map symbol: Takaka (Tk, Tksh)

Concept and overview

Takaka soils (Tk) and a small area mapped as Takaka shallow soils (Tksh) cover 183 ha and occur on the lowest surfaces adjacent to the Takaka River.They represent the soils formed on the youngest alluvial deposits of the Takaka River where flooding and sediment deposition is frequent. They are best developed on low river berms and occasionally on low levees where deposition of fresh sediment has taken place but also occur on slightly higher surfaces where past river overflows have occurred.

Relationship to previously named soils

In the unpublished Survey of the soils of Takaka County, Takaka soils were mapped over most of the terrace land in the East Takaka district as Takaka loam, Takaka sands and Takaka gravel and stony loams, while in the General Survey of the Soils of South Island (Soil Bureau Staff 1968) they were included with Karamea soils. They were mapped in the survey of the survey of the lower Takaka Valley and again in the survey of the Puramahoi district where they were of limited extent.

Landform origin and history

The Takaka river floodplain in the East Takaka area has in the past been a relatively unstable zone with several changes in the river course since the 1940's as noted from aerial photos. The changes appear to be due to migration of meander channels rather than to active aggradation. River bank protection appears to have stabilized the main channel but large floods sometimes result in widespread overflows. On higher parts of the flood plain, the surface is undulating with channels that carry water overflows in high flood events. The frequency of flooding has diminished since construction of the Cobb dam which restricts flows in many storm events.

Key soil features

Takaka soils are predominantly deep to moderately deep, well drained and weakly developed soils with little differentiation of horizons beneath the A horizon. Buried A horizons, indicative of recent flooding, were found in 20% of the observation sites. The topsoil colour is predominantly brown to dark brown and the subsoil olive brown. Soil texture is mainly silty in the topsoil but predominantly sandy in the subsurface horizons. Soil structure is weakly developed. The depth to gravel is variable.

Identified variants

Included within Takaka soils are Takaka stony soils (15% of observations) with stones or boulders at the soil surface, Takaka shallow soils (15% of observations) where the depth is <45 cm to gravel, Takaka moderately deep soils (30% of observations) and Takaka deep soils (40% of observations) where the depth to gravel

is >90 cm. Moderately well drained soils are present in some of the lower lying overflow channels where drainage is restricted.

Associated and similar soils

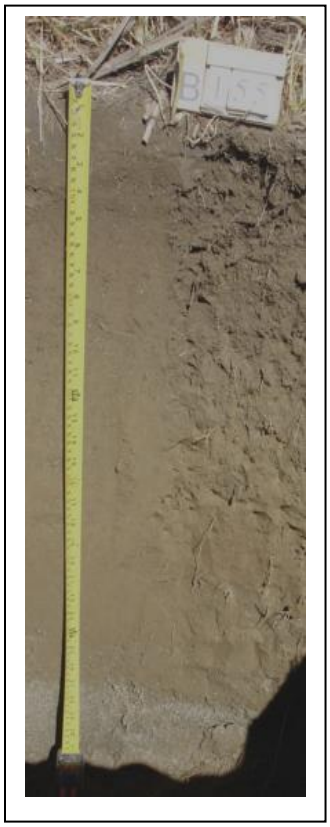
Takaka soils occur in conjunction with Karamea soils which are somewhat older and less frequently flooded soils occurring on more elevated parts of the flood plain. Some small areas of imperfectly drained Harihari soils occur with Takaka soils in some of the previous river courses and lower lying overflow channels.

Key physical properties

Topsoils are predominantly silt loam textured and average 15cm in thickness. B horizons are seldom present and are scarcely distinguishable from the underlying C horizon material. The subsurface textures are predominantly sandy and loose without development of soil structure. There are no impediments to deep rooting but moisture storage is limited, particularly in the shallower soils, where gravel is closer to or at the surface.

Soil versatility and land use rating

Takaka soils are moderately versatile with their potential use at present restricted by susceptibility to flooding and summer moisture deficiency but these limitations could be overcome by flood protection measures and by irrigation. Weak soil structure could lead to compaction under intensive use. The soils are included in Class B of the Tasman District Council land classification scheme.



Horizons	Depth	Description
A	0-18 cm	dark brown (10YR 3/3) silt loam; very weak soil soil strength; moderately developed fine polyhedral structure; many fine and few medium root
AC	18-35 cm	dark brown and olive brown (10YR 3/3 + 2.5Y 4/4) sandy loam; very weak soil strength; weakly developed polyhedral structure; many fine roots
C1	35-52 cm	olive brown (2.5Y 4/4) sand; single grain structure; loose; few fine and medium roots
C2	52-54 cm	olive brown (2.5Y 4/4) medium sand; single grain structure; loose; few fine roots
Cg	54-90	90 cm light grey to grey (10YR 6/1) silt loam; massive

Soil name and map symbol: Harihari soils (Hh)

Concept and overview

Harihari soils occur on the lower levels of the flood plain in the East Takaka area in lower lying river overflow channels and in abandoned courses of the Takaka River. They occur mainly in narrow strips alongside the incipient streams or ponds that occupy these depressions. They are imperfectly to poorly drained recent soils formed as a result of sedimentation and river overflows into these old channels where there are associated high watertables.

Relationship to previously named soils

Harihari soils were not identified in the earlier unpublished soil survey of Golden Bay County and were included within the area mapped as Karamea soils (99c) in the 1:250,000 General Survey of the Soils of South Island (Soil Bureau staff 1968). They were mapped in the 2005 survey of the soils of Lower Takaka Valley and also in the 2006 soil survey of the Puramahoi district. The name originates from the West Coast region where they were separated as imperfectly drained soils from recent alluvium (Mew 1980).

Landform origin and history

The flood plain in the East Takaka district has an undulating surface formed as a result of river overflows and channel formation, with some channels remaining as abandoned river courses. In places these channels are occupied by incipient streams and small ponds which collect local runoff water in wetter conditions. During periods of flooding, river overflows commonly occupy these channels.

Key soil features

Harihari soils are imperfectly to poorly drained. A watertable is commonly present, the position of which varies according to the extent of stream flows. They have grey subsoil colours with brownish mottles resulting from variation in the soil oxidation state. Horizons present in the subsoil are commonly a result of sedimentary flood layering.

Associated and similar soils

Takaka soils occur with Harihari soils on the higher and well drained floodplain surfaces. Waingaro soils are somewhat similar to Harihari soils being associated with Karamea soils in drainage channels. They likewise are imperfectly drained but are less frequently flooded and have greater soil development.

Identified variants

Within the areas mapped as Harihari soils, there is much diversity in the soil properties due to the varied nature of the fluvial environment. Near the streams, watertables are high and the topsoils may be peaty. Textures vary from silt loams to

gravelly sands and the degree of mottling and oxidation/reduction differs over short distances with proximity to streams.

Harihari soils have a shallow A horizon (average 13 cm) predominantly silt loam textures, subsoils that are largely structureless and grey coloured with mottle patterns that reflect variation in oxidation and reducing conditions. The depth to gravel averaged 55 cm. They are imperfectly to poorly drained with a watertable that at times reaches the soil surface.

Soil versatility and land use rating

Harihari soils have a low versatility, largely because of their location along small stream and drainage channels, which gives rise to frequent flooding and poor drainage conditions. They are grouped in class F of the Tasman District Council land classification scheme. They are important, however, for the maintenance of riparian zones and might be considered as non productive land that is managed as carbon sink zones.

Horizon	Depth cm	Description
A	0-6	Brown to dark brown (7.5YR 4/2) silt loam; weak soil strength; weakly developed polyhedral structure; 5% olive brown (2.5Y 4/4) fine mottles; many fine and few coarse roots
Cg1	6-27	greyish brown (2.5Y 5/2) silt loam; massive; 10% olive brown (2.5Y 3/4) fine distinct mottles; many fine and few medium roots
Cg2	27-45	greyish brown (2.5Y 5/2) sand; loose; 30% brown to dark brown (7.5YR 4/4) medium diffuse mottles; few fine roots
Cr	45-68	greyish brown (2.5Y 5/2) fine distinct mottles; few fine roots on moist stony gravel

Soil name and map symbol: Karamea soils (Km, Kmst)

Concept and overview

Karamea soils (Km) and also a small area of Karamea stony soils (Kmst) are mapped over 227 ha on the low terrace surface of the East Takaka district. They comprise well drained and weakly developed soils from Takaka River alluvium and lie above the general flood levels of the Takaka River, although they may be occasionally inundated but without significant sediment deposition. The youthful age of Takaka soils is shown by weak oxidation or colour change and weak development of structure in the subsoil.

Relationship to previously named soils

Karamea soils were not recognized in the earlier unpublished soil survey of Takaka County where they were mapped as Takaka loams and sands. In the 1:250,000 General Survey of the soils of South Island (Soil Bureau staff 1968) all of the lower terraces land of the East Takaka area were shown as Karamea set (99c). Karamea soils were mapped in the 2005 survey of the soils of the Lower Takaka Valley and to a limited extent in the survey of the Puramahoi district.

Landform origin and history

The low terrace land of the east Takaka district was once part of a wide floodplain area of the Takaka River and the land surface for the greater part consists of gently undulating land separated by numerous old flow channels, suggesting that the river was formerly braided. Shallow and sometimes bouldery soils occur on some of the risers. Post European river flooding has resulted in overflows onto the Karamea soil surface giving rise to a patchy distribution of Karamea snd Takaka soils.

Key soil features

Karamea soils are predominantly moderately deep (45-90 cm to gravel; average depth of moderately deep soils 64 cm). The A horizon is brown to dark brown with an average thickness of 18.5 cm and overlies a weakly structured yellowish brown to light olive brown B horizon of about 25 cm before passing into an olive brown C horizon and underlying loose sand or coarse stony gravels. The depth to gravel varies over short distances.

Identified variants

Karamea stony soils (Kmst) with gravels or boulders at the ground surface were found in 6% of the observations, Karamea shallow soils <45 cm to gravel) was found in 20% of the observations, Karamea moderately deep soils (45-90 cm to gravel) in 56% of the observations and Karamea deep soils (>90 cm to gravel) in 18% of the observations. Subsoil mottles, indicative of a slight drainage impedence, (moderately well drained soils) are occasionally found.

Associated and similar soils

Takaka soils occur with Karamea soils in old overflow channel zones. In some overflow channels where drainage is impeded, Waingaro soils are present, although these soils have not been mapped separately in this survey. On a slightly higher terrace surface, Uruwhenua soils are mapped and they are distinguished from Karamea soils in having a distinct and yellowish brown B horizon.

Key physical properties

Karamea soils in this survey area are predominantly moderately deep with silt loam texture in the upper horizons, passing into sandy loam and sand with increasing depth. They have weak soil strength and weakly developed subsoil structures. They are well drained.

Soil versatility and land use rating

There are few limitations for intensive use of Karamea soils, apart from somewhat increased moisture deficiency in the moderately deep and shallower soils although this can be overcome with irrigation. Weak subsoil structure could give rise to some compaction under some forms of intensive use. Flood risk can be overcome with flood control measures. Karamea soils are included in class A of the Tasman District Council land clasification scheme.

Horizon	Depth cm	Description
A	0-18	dark yellowish brown (10YR 4/4) silt loam; moderately developed fine polyhedral structure; weak soil strength; many fine roots
AB	18-22	dark yellowish brown and yellowish brown (10YR 4/4 and 10YR 5/4) sandy loam; weakly developed fine polyhedral structure; weak soil strength; many fine roots
B	22-40	yellowish brown (10YR 5/4) sandy loam; weakly developed fine blocky structure; very weak soil strength; many fine roots
C	40-75	olive brown (2.5Y 4/4) loamy sand; loose; few fine roots
	on	loose stony gravel

Soil name and may symbol: Te Tahu (Te)

Concept and overview

Te Tahu soils (Te) occupy a small area (14 ha) and occur near East Takaka on the alluvial deposits of small streams that flow from the Pikikiruna Range. They have moderately developed profiles with soils that range from shallow and stony to deep. These soils differ from most other soils of the East Takaka district in being formed from marble with some diorite and granite.

Relationship to previously named soils

Te Tahu soils were not identified in any of the previous surveys of the soils of Golden Bay. They were separated in the 2005 soil survey of the lower Takaka Valley and distinguished from the older Rameka soils (from Kaituna Formation deposits with granitic and dioritic alluvium) as soils from similar alluvial materials but of Holocene age.

Landform origin and History

Rocks on the western front of the Pikikiruna Range are marble with diorite and granite further east. Small streams which are incised into the marble have irregular flows owing to loss of water underground. The alluvial materials from which TeTahu soils are formed have probably been deposited as large outflows in former climatic periods forming a somewhat indistinct fan. The deposits are partly terraced indicating repeated aggradational outflow events. The alluvial deposits overlie the main valley terrace gravels and are therefore of a younger age.

Key soil features

Te Tahu soils are well drained and deep soils with a deep dark brown A horizon (average 21 cm). There is little colour difference between the surface and subsurface horizons which are predominantly dark brown to olive brown Subsoil texture is clay loam but passes into sandy gravel with increasing depth.

Identified variants

The main variations noted were in respect of the depth to gravel. In places there are strips where the soils are stony to the surface while elsewhere, the soil depth ranges from shallow to deep. On the lower lying toe slope surfaces, some mottles are present in the lower B horizons indicating slightly impeded drainage conditions.

Associated and similar soils

TeTahu soils occur in conjunction with Rameka soils on old terrace deposits and with Motupipi soils on younger colluvial fan surfaces which are both derived from sediments from the Pikikiruna Range.

Key Physical properties

Te Tahu soils have silty to clayey textures that become sandier with increasing depth. They have strongly developed polyhedral and blocky structure with moderate subsoil strength. A few gravels may be present, increasing in abundance with depth. Oxidised rock fragments in the subsoil may give an appearance of slight mottling while small whitish marble fragments are commonly present.

Soil Versatility and land use rating

TeTahu soils are versatile soils with few limitations for intensive use. They are likely to have a high fertility level and are included in class A of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A	0-21	Dark yellowish brown(10YR 4/4) heavy silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; profuse fine roots
AB	21-32	dark yellowish brown (10YR 4/6 + 10YR 4/4) heavy silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% medium stones; many fine roots
Bw1	32-56	dark yellowish brown (10YR 4/6) clay loam; strongly developed medium and coarse blocky structure; weak soil strength; friable; 1% medium stones; many fine roots
Bw2	56-70	yellowish brown (10YR 4/6-3/4) clay loam; strongly developed blocky coarse structure; slightly firm soil strength; brittle; 3% fine stones; few fine roots
BC	70-95	dark yellowish brown (10YR 4/6-4/4) sandy clay loam; massive; firm soil strength; 7% fine stones; very few fine roots

Soil name and map symbol: Uruwhenua soils (Ur, Ursh, Urst)

Concept and overview

Uruwhenua soils (Ur, Ursh, Urst) cover 212 ha and occur on a terrace surface that is intermediate between the main late glacial outwash surface (Hamama soils) and the lower floodplain surface (Karamea and Takaka soils). They are well drained soils with moderately developed profiles but which range in depth from bouldery and shallow to moderately deep. They are distinguished from Karamea soils in havng a more distinctly developed B horizon but the weathering depth is less than Hamama soils.

Relationship to previously named soils

Uruwhenua soils have not been separated in any of the previous surveys. In the unpublished soil survey of Takaka County by Cawthron Institute, the soils separated here as Uruwhenua were mapped as Takaka loam and stony loam while in the 1:250, 000 General Survey of the Soils of South Island (Soil Bureau Staff 1968) they were mapped with Karamea soils.

Landform origin and history

The terrace gravel deposits of the East Takaka area are correlated by Grindley (1971) with coarse alluvial outwash (Bainham Formation) that accumulated at the end of the last glacial period, probably about 12-15 000 years ago. After the period of maximum terrace gravel accumulation, river downcutting in the coarse gravel deposits resulted in the formation of low degradational surfaces but leaving a thin deposit of sands and silts. Uruwhenua soils have formed on this surface, which is only a few metres lower than the main terrace surface in the East Takaka district. Fluvial channeling is more subdued than on the lower lying floodplain surface but still suggests sedimentation within a wide braided river system.

Key soil features

Uruwhenua soils (Ur) are predominantly moderately deep (36% of observations) with an average depth to gravel of 60 cm but stony soils (Urst), shallow soils (Ursh) and some deep soils are also present. The A horizon thickness averages 19 cm and is dark yellowish brown silt loam. The B horizon is well developed and passes into less weathered yellowish brown silt loam and sandy loam overlying stony gravel. Some stones are commonly present through the soil.

Identified variants

In 16% of the observations Uruwhenua soils were found to be stony and at times bouldery (up to 30% stones in the surface horizon), 21% were shallow (<45 cm to gravel); 36% moderately deep (45-90 cm over gravel) and 18% were deep. Soils that are moderately well drained and with some subsoil mottles occur in a few places.

Associated and similar soils

Uruwhenua soils are associated with Hamama soils which occur on the gravels of the Bainham Formation but on a terrace at slightly lower elevation. They are of a similar age to Motupipi soils which are formed from fan sediments deposited on the upper level of the Bainham Terrace formation.

Key Physical properties

Uruwhenua soils are well drained, predominantly moderately deep with silty to sandy textures overlying coarse gravels. They have moderately developed structure in the upper horizons with weak soil strength. The subsoil gravels are not cemented and do not restrict moisture movement or root penetration.

Soil Versatility and land use rating

The deep and moderately deep Uruwhenua soils have few limitations for intensive use apart from a summer seasonal soil moisture deficiency which could be overcome by irrigation. They are included in Class 1 of the Tasman District Council land classification scheme. The stony Uruwhenua soils have a greater summer soil moisture deficiency with a shallow effective rooting depth while boulderiness also restricts cultivation. They are included in class C of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A	0-17	Dark yellowish brown (10YR 4/4) silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; many fine roots
AB	17-28	dark yellowish brown and yellowish brown (10YR 4/4 + 10YR 5/6) silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; many fine roots
Bw	28-48	yellowish brown (10YR 5/6) silt loam; weakly developed fine polyhedral structure; slightly firm soil strength; friable; few fine roots
BC1	48-75	light olive brown (2.5Y 5/6) sandy loam; weakly developed medium to coarse blocky structure; slightly firm soil strength; brittle; very few fine roots
BC2	75-85+	light olive brown (2.5Y 5/6) loamy sand; 15% medium stones; massive breaking to single grain

Soil name and map symbol: Hamama (Ha)

Concept and overview

Hamama soils (Ha) cover 278 ha and are the most widespread of the soils in the East Takaka district. They are dominantly shallow soils formed on the alluvial gravels of the prominent uppermost river terrace and are therefore the oldest of the main terrace soils of the district. The gravels, as seen in various exposures, are predominantly coarse to very coarse comprising a homogeneous mixture of a wide range of rock types. While the soil depth to gravel is mostly shallow, the weathering depth commonly extends from between 80-100 cm.

Relationship to previously named soils

Hamama soils were identified as a separate entity in the unpublished Cawthron Institute soil survey of the soils of Takaka County, but were named as Takaka gravel and stony loams. They were mapped separately in the 1:250,000 General Survey of the soils of South Island (Soil Bureau Staff 1968) as Hamama set (43a). In the 2005 survey of the soils of Lower Takaka Valley they were mapped as predominantly shallow soils.

Landform origin and history

The main terrace formed in the gravels of the Bainham Formation (Grindley 1971) forms a prominent surface in the middle section of Takaka Valley and represents the major deposits of outwash gravels corresponding to the last stage of the Last Glaciation. The terrace surface at East Takaka is not uniform but comprises a gently undulating surface with several small steps and occasional narrow overflow channels. At the eastern margin adjacent to the Pikikiruna Range, there was a distinct broad channel which was subsequently infilled with locally derived sediments.

Key soil features

Hamama soils are predominantly shallow (<45 cm to gravel) and well drained with a moderately deep A horizon (average depth 19cm) commonly with stones. Upper horizon textures are mainly silt loam and the subsoils yellowish brown sandy gravel.

Identified variants

Hamama shallow silt loam, including some stony soils, were found in 75% of the observations and Hamama moderately deep soils in 20%. Deep soils (5%) are occasionally found and along with the soils in some of the drainage channels, they may have some subsoil mottles.

Associated and similar soils

Puramahoi soils, formed from alluvial gravels of similar age in the Puramahoi district, have somewhat similar characteristics but are formed under higher rainfall and commonly have reddish mottles in the subsoil horizons. Motupipi soils are likewise of a similar age but are formed from locally derived materials including marble and diorite.

Key physical properties

The upper horizons are silt loam but where the stone content is high, the texture is sandy. Hamama soils are predominantly shallow soils (< 45 cm to gravel). They are well drained with little restriction to plant rooting. They have moderately developed soil structures and weak soil strength.

Versatility and land use rating

The principal limitation for use of Hamama soils is the restricted water holding capacity due to the gravels in the subsoil. They are successfully used from November to March for maize crops and with irrigation, the productive capacity for a range of crops would be expected to be high. They are included in class A of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A	0-24	Dark yellowish brown (10YR 4/4) silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; 10% medium to very coarse stones; abundant fine roots
AB	24-35	dark yellowish brown and yellowish brown (10YR 4/4+ 10YR 5/6) silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; 10% medium stones; many fine roots
Bw1	35-65	yellowish brown to dark yellowish brown (10YR 5/6-4/6) silt loam; moderately developed fine polyhedral structure; very friable; 15% medium to very coarse stones; 3% yellowish red (5YR 4/8) mottles from oxidizing rock fragments; many fine roots
Bw2	65-75	dark yellowish brown (10YR 4/4) sandy loam; weakly developed fine polyhedral structure; very friable; 25% medium to very coarse stones; many fine roots
BC	75-105	yellowish brown (10YR 5/6) sand; loose; 35% medium to very coarse stones; few fine roots
C	105-130	light brownish grey (2.5Y 6/2) loose sandy gravel; 45% medium to coarse stones; very few fine roots

Soil name and map symbol: Rototai (Ro)

Concept and overview

Rototai soils (Ro) are of limited extent covering approximately 30 ha together with Clifton soils mainly in the northeastern part of the survey area. They occur on land surfaces that form gentle foot slopes or fan surfaces at the base of adjacent hill country and are derived from materials which have eroded from the predominantly sedimentary rocks there. Drainage characteristics of the footslope sedimentary materials, which lie against the margin of the Bainham Formation terrace gravels, are varied and range from moderately well drained to poorly drained with Rototai soils representing the better drained of these soils.

Relationships to previously named soils

Rototai soils were first separated as Clifton soils in the earlier Cawthron Institute unpublished survey of the soils of Takaka County but were not mapped in the later 1:250, 000 General Survey of the Soils of South Island (Soil Bureau Staff 1968). They were however defined in the 2005 survey of the soils of Lower Takaka Valley.

Landform origin and history

The Tertiary rocks of the Tarakohe Mudstone Formation occur mostly to the north and northeast of the East Takaka area and the gently sloping foot slopes of this hilly land have colluvial deposits formed from erosion in the hilly land during and after the last glacial episode. The soil distribution is patchy because of variable landscape drainage patterns.

Key soil features

Rototai soils are deep (>1 m) with a moderately deep topsoil (19 cm average) and silt loam to clayey textures. The subsoils are dominantly olive brown with a few brownish or grayish mottles in the upper subsoil but which increase in the lower subsoil. Sandy or gravelly layers may be present at greater depths.

Identified variants

Rototai soils vary in respect of their subsoil drainage features with mottle patterns indicating drainage conditions ranging from well drained to moderately well drained. They grade into Clifton soils over short distances due to variable drainage conditions.

Associated and similar soils

Rototai soils are associated with Tadmor soils from sedimentary rocks on the rolling and hilly land. They are also closely associated with Clifton soils which are formed on similar colluvial footslope deposits but which have imperfect drainage.

Key physical properties

Rototai soils are moderately well drained and deep soils with clay loam to clayey subsoil textures. They have moderately to strongly developed soils structure and slightly to firm subsoil strength.

Soil limitations and land use rating

Highly intensive use of Rototai soils is limited by their distribution in small areas that merge with soils with less favourable physical characteristics. Their versatility is restricted by clayey subsoil textures and seasonally impeded drainage. They are included in class B of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A1	0-10	Brown to dark brown (10YR 4/3) silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; many fine roots
A2	10-35	dark yellowish brown (10YR 3/4) silt loam; strongly developed medium polyhedral structure; slightly firm soil strength; many fine roots
Bw1	35-54	light olive brown (2.5Y 5/4) heavy silt loam; moderately developed coarse blocky structure; slightly firm soil strength; brittle
Bw2	54-65	light olive brown (2.5Y 5/6) clay loam; moderately developed coarse blocky structure; firm soil strength; brittle; few fine roots
Bw3	65-87	light yellowish brown (2.5Y 6/4) clay loam; 30% brownish yellow (10YR 6/8) distinct medium mottles; firm soil strength; semi deformable; very few fine roots
BC	87-100	light yellowish brown (2.5Y 6/4) clay; 40% light brownish grey (2.5Y 6/2) and 3% brown to dark brown (7.5YR 4/4) medium distinct mottles; very firm soil strength; very few roots

Soil name and map symbol: Clifton (Cf)

Concept and overview

Clifton soils (Cf) along with Rototai soils cover 12 ha along the eastern and northeastern part of the East Takaka survey area. They are formed on the footslope and fan surfaces that lie adjacent to the hilly country formed by the Tertiary sedimentary rocks and are derived from the materials that have eroded from these adjacent hills. Drainage conditions are variable in this topographic situation and Clifton soils are the imperfectly drained soils which mostly lie on the lower surfaces and toeslopes of the small colluvial fans.

Relationship to previously named soils

At Clifton in the lower Takaka Valley, the soils formed on older fan deposits were originally separated as undifferentiated Clifton sands, loams and clay loams in the unpublished Cawthron Institute survey of the soils of Takaka County. These soils but were not separated in the 1:250,000 General Survey of the Soils of South Island (Soil Bureau Staff 1968) but were included with Puramahoi soils (set 53b). In the 2005 survey of the soils of the Lower Takaka Valley, Clifton soils were restricted to the moderately to imperfectly drained soils from colluvial materials.

Landform origin and history

The deposits on the gently sloping lands on the foot slopes of the land formed from the Tertiary sedimentary rocks have formed through erosion and sedimentation processes which probably took place after the last glacial period. The gently sloping land below the fan surfaces do not appear to extend out over the Bainham Gravel Formation (Grindley 1971) indicating that they are predominantly post glacial in age. As the grade of the land decreases away from the hills, soil drainage becomes more impaired with Clifton soils being the least well drained of the soils on the hill footslopes.

Key soil features

Clifton soils are deep (>90 cm to a contrasting layer) and have an A horizon with an average thickness of 18 cm. The subsoil has predominantly olive brown colours with paler colours and mottling in the lower horizons. The soil texture is clayey. A water table may be present in the lower subsoil during the wetter months of the year.

Associated and similar soils

Clifton soils are associated with Rototai soils which occur within the same landform units but which are have better drainage (moderately well drained). Soils with intermediate drainage characteristics (moderately well drained to imperfectly drained) resemble Pohara soils which were mapped in the lower Takaka Valley. Clifton soils are also associated with Harwood soils where the ground surface merges into low lying poorly drained land.

Key physical properties

Clifton soils are imperfectly drained with low chroma mottles and iron segregations extending into the upper subsoil. They have strongly to moderately developed structure with slightly firm to firm soil strength. Root penetration is somewhat restricted by the clayey subsoil textures and the impeded subsoil drainage.

Soil limitations and land use rating

There are moderate limitations for intensive use of Clifton soils. Their imperfect drainage and heavy subsoil texture inhibit early cultivation and root penetration thus restricting their suitability for use as cropping soils. On some sloping land, drainage improvements have assisted runoff and fodder crops (maize) are successfully grown. These soils are included in class D of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A	0-16	Brown to dark brown (10YR 4/3) heavy silt loam; 5% dark yellowish brown (10YR3/4) fine distinct mottles; strongly developed fine polyhedral structure; weak soil strength; friable; many fine roots
Bw	16-32	light olive brown (2.5Y 5/4) clay loam; 10% strong brown (7.5YR 5/6) fine distinct mottles; strongly developed fine polyhedral and blocky structure; slightly firm soil strength; friable; many fine roots
Bg	32-50	olive (5Y 4/3) clay loam; 40% brownish yellow (10YR 6/8) medium distinct mottles; moderately developed medium to coarse blocky structure; slightly firm; brittle; few roots
B(g)1	50-70	brownish yellow (10YR 6/8) clay loam; 40% light brownish grey to light yellowish brown (2.5Y 6/2-6/4) medium distinct mottles and 10% dark yellowish brown (10YR 3/4) fine distinct mottles; moderately developed coarse prismatic structure; slightly firm; brittle very few fine roots
B(g)2	70-90	yellowish brown (10YR 5/6) clay; 30% light brownish grey (2.5Y 6/2) and dark yellowish brown (19YR 3/4) fine distinct mottles; moderately developed medium prismatic structure; firm soil strength; semi deformable; very few fine roots

Soil name and map symbol: Harwood (Hw)

Concept and overview

Harwood soils (Hw) have been mapped over approximately 40 ha and occur in low lying areas on the eastern margin of the terrace formed by the Bainham Gravels (Grindley 1971) adjacent to the foot slopes of the Pikikiruna Range. These are soils that have formed in low lying poorly drained land. They are formed from the sediments that have been eroded from the adjacent hill and steep slopes and deposited in depressions adjacent to the hills.

Relationships to previously named soils

Part of the area of here mapped as Harwood soils was recognized as alluvial soil in the unpublished soil survey of Takaka County by Cawthron Institute but was included with the younger soils of the Takaka district, probably because of their wet swampy nature. Harwood soils were not mapped in the 1:250,000 General Survey of the soils of South Island (Soil Bureau Staff 1968) but were included within the Hamama set (43a).

Landform origin and history

At the time of formation of the main valley terrace in the East Takaka district, a shallow broad drainage channel existed at the base of the eastern hilly and steep land. Drainage waters from the hilly and steep slopes of the Pikikiruna Range were captured and flowed north along the margin of the hills before joining with the Takaka River. This low lying ground has subsequently been modified by infilling with fine textured fan deposits from local streams and colluvial deposits from adjacent hill slopes, giving rise to a pattern of intermittent occurrences of Harwood soils. Land drainage work changed the original characteristics of this land but a water table persists in places.

Key soil features

Harwood soils are deep (>90 cm to gravel) with a moderately deep A horizon averaging 17 cm thick. The subsoil colours are predominantly grey and the subsoil textures are clayey. A water table commonly present at variable depth, depending on seasonal conditions. Buried peaty layers may occasionally be found.

Identified variants

Shallow soils with gravel at approximately 40 cm are present in some places and at times, the soil is underlain by compact sands. Where the water table is near the surface, the topsoil may be peaty

Associated and similar soils

Harwood soils are associated with the imperfectly drained Clifton soils which are formed on the lower slopes of adjacent colluvial surfaces. They merge with Hamama soils as the fine textured alluvium becomes thinner and drainage conditions improve. Harwood soils have similarities with Dogan soils, which were mapped in low lying

swampy land in the Puramahoi district. However, organic layers which are common in Dogan soils are infrequent in Harwood soils. Harwood soils have predominantly clayey textures while there is greater mottling in the subsoils, which may be a reflection of a lower rainfall environment compared to that of Dogan soils.

Key physical properties

Harwood soils are deep clayey textured soils with poor drainage and resulting slow permeability. In the subsoil, blocky and prismatic and prismatic structures are strongly developed and soil strength is firm. Root penetration is mainly shallow.

Soil limitations and land use rating

Harwood soils have significant limitations for intensive use. Their poor drainage, heavy subsoil textures and slow permeability are impediments to cultivation except in drier conditions while some surface flooding also occurs in periods of intense or prolonged rainfall. The installation of drainage ditches has improved the soil drainage so that fodder crops are possible in some locations. The soils are included in class E of the Tasman District Council land classification scheme.

Horizon	Depth cm	Description
A	0-20	Dark brown (10YR 3/3) heavy silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; many fine roots
Bg	20-30	light brownish grey (10YR 6/2) clay; 2% strong brown (7.5YR 5/8) fine distinct mottles; strongly developed medium blocky structure; firm soil strength; semi-deformable; few fine roots
B(g)1	30-52	light yellowish brown (2.5 6/4) clay; 20% strong brown (7.5YR 5/8) and 30% light brownish grey(10YR 6/2) fine diffuse mottles; strongly developed coarse prismatic structure; firm; semi-deformable; very few roots
B(g)2	52-72	light yellowish brown (2.5Y 6/4) clay; 30% strong brown (7.5YR 5/8) and 10% light brownish grey (10YR 6/2) fine diffuse mottles; strongly developed prismatic structure; firm soil strength; semi-deformable; very few roots
BC(g)	72-95+	pale olive (5Y 6/3) sandy clay loam; 55% strong brown (7.5Y 5/6) medium diffuse mottles; massive

Soil name and map symbol: Motupipi (Mo)

Concept and overview

Motupipi soils (Mo) cover approximately 41 ha and occur in several small areas on gently sloping land adjacent to the Pikikiruna Range. They are soils which have formed on sediments that accumulated as small fans and that have been built by stream flows from the Pikikiruna Range. The soils are for the most part moderately deep passing into gravels that are partly weathered at first but unweathered at greater depth.

Relationship to previously named soils

Motupipi soils were mapped in the earlier unpublished survey of the soils of Takaka County by Cawthron Institute as the soils of fan deposits in the Motupipi district. They were not separated in the 1:250,000 survey of the Soil of South Island (Soil Bureau Staff 1968) being included within Puramahoi set (43b) and Rameka set (80b). They were mapped in the Motupipi and Pohara areas in the 2005 soil survey of the Lower Takaka Valley

Landform origin and history

The small fans lie geomorphically at about, or just above the main terrace level of the Bainham Formation (Grindley 1971). At one location, the fan surface has a small scarp just above the main terrace surface indicating that it dates from about the same time as the terrace surface, while elsewhere, the fan deposits thin and overlie the terrace gravels indicating an age that is a little younger than that of the Bainham Formation. The fan sediments are locally derived and include marble and some diorite from the Pikikiruna Range.

Key soil features

Motupipi soils are moderately deep (45-90 cm) and deep soils (> 90 cm) with depth to gravel in the moderately deep soils averaging 67 cm. Topsoil thickness averages 21 cm with dark yellowish brown colours. B horizons are yellowish brown to dark brown and pass into a transitional BC horizon at around 80 cm and into underlying gravel.

Identified variants

Motupipi moderately deep soils were found in 45% of the observations, Motupipi deep soils in 40% of the observations and shallow soils in 15%. Soils with brownish mottles are sometimes found on the lower parts of the fan surfaces.

Associated and similar soils

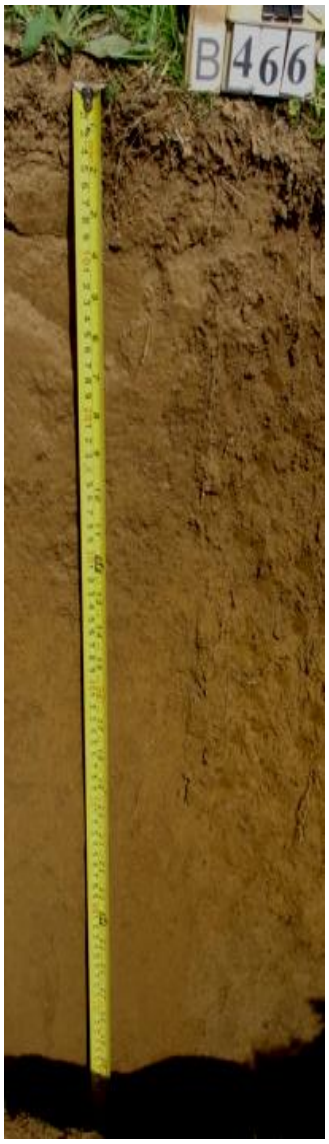
Uruwhenua soils are somewhat similar to Motupipi soils but occur on lower elevation terrace surfaces and are less weathered. Hamama soils are also similar to Motupipi soils but they are predominantly shallow and gravilly being derived from river alluvium with only small amounts of marble or ferromagnesian rich rocks present.

Key physical properties

Motupipi soils are well drained and moderately deep to deep. Their textures are predominantly silt loam with sandy loam or sand texture deeper in the subsoil. They have well developed soil structure, weak to slightly firm soil strength and deep rooting depth. Some stones may be present through the profile.

Soil limitations and land use rating

There are no significant soil limitations to intensive use of Motupipi soils which would be expected to have a moderately high natural soil fertility level. Some soil moisture deficiency is experienced in the drier summer months. They are included in class A of the Tasman District Council land classification scheme.



Horizon	Depth cm	Description
A	0-23	Dark yellowish brown (10YR 4/6) silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% medium to coarse stones; abundant fine roots
AB	23-34	dark yellowish brown (10YR 4/4 + 10YR 4/6) silt loam; strongly developed medium polyhedral structure; weak soil strength; very friable; 1% medium and coarse stones; many fine roots
Bw1	34-53	dark yellowish brown to yellowish brown (10YR 4/6-5/6) sandy silt loam; strongly developed coarse blocky structure; weak soil strength; brittle; 1% medium and coarse stones; many fine roots
Bw2	53-68	dark yellowish brown to yellowish brown (10YR 4/6-5/6) sandy loam; moderately developed coarse blocky structure; weak soil strength; brittle; 1% medium and coarse stones; few fine roots
BC	68-100	light olive brown to dark yellowish brown(2.5Y 5/6-10YR 4/6) sand; massive; loose; very few fine roots

Soil name and map symbol: Rameka (Ra, RaR)

Concept and overview

Rameka soils (Ra, RaR) cover approximately 30 ha and are well weathered soils formed on old alluvial deposits and terrace remnants dating to an earlier glacial period. To the north of the survey area in lower Takaka Valley, Rameka soils are formed on a partly dissected extensive terrace surface. In the east Takaka area however, the terrace surface remains only as small dissected remnants adjacent to the footslopes of the Pikikiruna Range. The land surface varies from undulating to rolling (5º-15º) with some hilly slopes in gullies. The terrace gravels are bouldery and are characterized by the presence of appreciable amounts of dioritic rocks, the weathering of which results in characteristic brown friable soils.

Relationship to previously named soils

Rameka soils were identified and mapped in the earlier unpublished soil map of Takaka County by Cawthron Institute and also in the 1:250,000 General Survey of the Soils of South Island (Soil Bureau Staff 1968) (Rameka set 80b). However, detailed mapping in the 2005 soil survey of the Lower Takaka Valley restricted their distribution to Kaituna Formation terraces.

Landform origin and history

Kaituna Formation deposits (Grindley 1971) represent the alluvial materials that were deposited in the second to last major glaciatial period (Waimean Glaciation). In the Lower Takaka Valley, the Kaituna terrace was formed by stream deposition from extensive cold climate erosion in the Pikikiruna Range. In the East Takaka area, streams that drain from the Pikikiruna Range (for example Gorge Creek) are much smaller than those to the north and the Kaituna Formation deposits were more limited in their extent. Subsequent erosion of these coarse gravels has reduced the East Takaka Kaituna terrace deposits to only a few small dissected terrace remnants, mostly with an undulating or rolling landscape (Ra, RaR).

Key soil features

Rameka soils have a moderately deep, dark brown A horizon overlying yellowish brown heavy silt loam to clay loam subsoils. Weathering may extend to greater than 1.5 m and partly weathered stones are common through the subsoil, which in places is gravelly. The soils are bouldery to the surface in a few places.

Identified variants

Rameka shallow, moderately deep and Rameka bouldery soils are found in patches on some ridges or gully sides.

Associated and similar soils

Pisgah soils are similar to Rameka soils. They are formed from similar dioritic alluvial materials but they occur on an older and higher terrace surface while coarse material

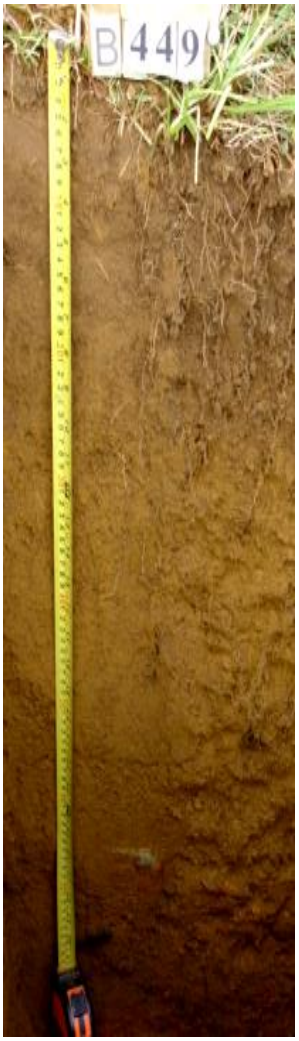
within the profile is more weathered with residual reddish iron concretions usually present.

Key physical properties

Rameka soils are deep well drained and friable soils with a high natural fertility level. They have silt loam to clay texture with well developed soil structure and weak to moderate soil strength. Some weathered stones as well as fresh stones may be present through the profile and the stone content generally increases with depth. Rameka soils have a deep rooting depth and good soil moisture storage.

Soil versatility and land use rating

Rameka soils on gently sloping land have few limitations to intensive use apart from a short summer moisture deficiency. They are included in class A of the Tasman District Council Land classification scheme. On rolling land or in areas where the soils are shallow and there are surface boulders, soil versatility is lower owing to cultivation limitations and increased erosion risk under intensive use.



Horizon	Depth cm	Description
A	0-23	Dark yellowish brown (10YR 4/4) silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% medium weathered stones; many fine roots
AB	23-31	yellowish brown and dark yellowish brown (10YR 5/6 + 10YR 4/4) silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% coarse to very coarse weathered stones; many fine roots
Bw1	31-54	yellowish brown (10YR 5/6) clay loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 3% coarse and very coarse weathered stones; many fine roots
Bw2	54-68	yellowish brown (10YR 5/6) clay loam; moderately developed medium blocky and fine polyhedral structure; slightly firm soil strength; friable; 3% medium to coarse partly weathered stones; few fine roots
Bw3	68-90+	strong brown (7.5YR 5/8) clay to clay loam; moderately developed coarse blocky and medium polyhedral structure; slightly firm soil strength; brittle; 15% coarse to very coarse partly weathered stones; very few fine roots

Soil name and map symbol: Pisgah (Ps)

Concept and overview

Pisgah soils (Ps) have been mapped in a small area covering 4.5 ha in the northern margin of the survey area. They are the soils that occur on the highest and oldest identified terrace remnant that forms a broadish ridge between the lower Takaka Valley and East Takaka districts. They are formed from weathered coarse gravels deposited by Rameka Creek in the Pikikiruna Range.

Relationship to previously named soils

Soils on diorite in the Pikikiruna Range were initially mapped in the unpublished survey of Takaka County by Cawthron Institute as Pisgah loams and as Brooklyn soils (set 77d) in the 1:250,000 General Survey of the Soils of South Island (Soil Bureau Staff 1968). In the 2005 soil survey of the lower Takaka Valley, the soils on Rockville Formation gravels containing diorite were named Pisgah soils, having previously been included within the Rameka set (80b).

Landform origin and history

Pisgah soils are formed on terrace deposits mapped as Rockville Formation (Grindley 1971). They are outwash gravels of the third last glaciation (Waimaungan Glaciation 2-3 hundred thousand years ago) and were deposited on top of the Tarakohe Formation forming an extensive plain. The gravels include granite, marble and diorite and their composition along with their coarse texture indicates that they were derived from the Pikikiruna Range under cold climate conditions. Subsequent downcutting and landscape erosion have left only small areas of this terrace formation in this part of Takaka Valley. Small pockets of the gravels remain on the broad ridge surface south of Rameka Creek.

Key soil features

Pisgah soils are deeply weathered with clayey subsoil textures and some weathered stones throughout the profile. Weathered gravels increase in abundance with increasing depth where rock fragments may have reddish colours and iron/manganese concretions may be present.

Identified variants

Pisgah soils are deep soils but are moderately deep in places where weathered gravels are closer to the surface.

Associated and similar soils

On adjacent hilly land where Tadmor Hill soils are found, there are small occurrences of Pisgah soils where erosion of the Tertiary rocks has resulted in downslope drift of the terrace gravels. Pisgah soils have similarities with Rameka soils but they occur on

lower elevation terrace remnants and are less weathered with subsoil gravels being less altered.

Key physical properties

Pisgah are deep and well drained. They have strongly developed soil structure, clayey subsoil texture and deep rooting depth. Rock particles may occur through the profile but these are generally well weathered.

Soil versatility and land use rating

Pisgah deep soils have few limitations to intensive use. They are included in class A of the Tasman District Council land classification system.

Horizon	Depth cm	Description
A	0-20	Dark yellowish brown (10YR 4/6) silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% medium moderately weathered stones; abundant fine roots;
AB	20-30	dark yellowish brown and yellowish brown (10YR 4/6 + 10YR 5/6) silt loam; strongly developed fine polyhedral structure; weak soil strength; very friable; 1% medium and coarse stones; many fine roots
Bw1	30-55	yellowish brown (10YR 5/6) clay loam; strongly developed coarse blocky structure and medium polyhedral structure; weak soil strength; friable; 2% medium and coarse stones; few fine roots
Bw2	55-75	yellowish brown to dark yellowish brown (10YR 5/6-4/6) clay loam; moderately developed medium polyhedral structure breaking to polyhedral structure; weak soil strength; friable; 2% coarse and very coarse stones; few red oxidised rock particles; few fine roots
Bw3	75-95+	yellowish brown (10YR 5/8) clay; moderately developed coarse blocky structure; weak soil strength; brittle; 5% medium and very coarse stones; few red oxidised rock particles; few fine roots

Soil name and map symbol: Tadmor (Tm, TmH, TmS)

Concept and overview

Tadmor soils (Tm, TmH, TmS) cover approximately 215 ha in the East Takaka survey area. They are soils formed on predominantly hilly land (TmH; hill soils with slopes predominantly between 16º and 25º) but include some Steepland soils (TmS; slopes exceeding 25º) as well some soils on rolling and undulating land (Tm; slopes between 4º and 15º). They are formed on the silty to sandy textured rocks of the Miocene aged Tarakohe Mudstone Formation (Grindley 1971). They are found chiefly to the north of the East Takaka survey area but also in several smaller occurrences where the sedimentary rocks outcrop along the western footslopes of the Pikikiruna range.

Relationship to previously named soils

A small area of Tadmor soils was mapped as Tadmor loams in the previous unpublished survey of the soils of Takaka County, although they were not mapped in the East Takaka survey area in the 1:250,000 Survey of the Soils of South Island (Soil Bureau Staff 1968). Tadmor soils have been mapped more extensively elsewhere in the Tasman District in the soil survey of Waimea County (Chittenden et al. 1966) as soils from siltstones and sandstones. They were also mapped in the 2005 soil survey of lower Takaka Valley as well as in the 2006 survey of the soils of the Puramahoi district.

Landform origin and history

The Tarakohe Mudstone Formation comprises predominantly silty to sandy textured rocks which overlie the Takaka Limestone. They are predominantly firmly consolidated with a massive rather than shattered or rubbly habit, consequently they are not subject to extensive or deep-seated earthflows. In the northern boundary of the Takaka East survey area, the Tarakohe Mudstone is capped with old terrace gravels while along the eastern margin of the survey area, the sediments are in fault contact against the Arthur Marble of the Pikikiruna Range. The Tarakohe Mudstone Formation was previously more extensive in central and southern Takaka Valley but being a comparatively soft rock, it has largely been removed by river downcutting.

Key soil features

Tadmor soils are mainly deep (>90 cm to underlying bedrock) with a moderately deep brown to dark brown A horizon overlying a yellowish brown silt loam to clay loam subsoil. Siltstone rock fragments are usually present in the subsoil and increase in abundance with increasing depth, before passing into fragmented bedrock. On lower undulating or rolling slopes, soil drainage may be impeded by the underlying sedimentary rock and the lower soil horizons are commonly mottled.

Identified variants

Tadmor soils sometimes have some stones originating from former terrace gravel deposits or from marble outcrops. Tadmor soils grade into Pikikiruna soils where

appreciable quantities of marble are present. At a few localities, the subsoils have a pronounced reddish colour indicating prolonged stable weathering conditions, while moderately well drained soils are present on some lower slopes.

Associated and similar soils

Otere soils from mudstone and Waitapu soils from sandstone have similarities with Tadmor soils although do not occur within the survey area. Some patches of Pisgah or Rameka soils occur where terrace gravels have been re-deposited or rafted down slope.

Key physical properties

Tadmor soils are well drained, except on some lower slopes where they may be moderately well drained. They are deep soils with slightly firm to moderately firm subsoil strength and predominantly silty to clayey subsoil textures. Root penetration is deep and may extend into the underling fragmented bedrock.

Soil Limitations and land use rating

Slope is the principal limitation to use on Tadmore Steepland and Tadmor Hill soils with a potential for sheet or slip erosion. On the undulating to rolling land, slope is less restrictive for more intensive use. Tadmor Steepland and Hill soils are included in class E of the Tasman District Council land classification scheme and Tadmor soils on rolling land in class C.

Horizon	Depth cm	Description
A	0-20	Brown to dark brown (10YR 4/3) silt loam; strongly developed fine polyhedral structure; weak soil strength; friable; 5% coarse siltstone clasts; many fine roots
Bw	20-35	yellowish brown (10YR 5/4) silt loam; strongly developed fine polyhedral structure; slightly firm; very friable;10% coarse siltstone clasts; many fine roots
Bw2	35-64	yellowish brown (10YR 5/6) heavy silt loam to clay loam; strongly developed fine polyhedral structure; friable; 30% coarse siltstone clasts; many fine roots
BC	64-95+	yellowish brown (10YR 5/6) clay loam; strongly developed fine polyhedral structure; friable; few fine roots
	on	partly weathered siltstone

Soil name and map symbol Tarakohe (Th, ThS)

Concept and overview

Tarakohe soils (Th, ThS) are mapped over approximately 40 ha in the northwestern part of the east Takaka survey area. They are the soils from the Takaka Limestone Formation and include the soils on the steep and precipitous land that forms a prominent escarpment alongside the Takaka River near Paynes Ford and are also mapped on the broad area of undulating to rolling land that lies above the escarpment. Elsewhere, there are a few small Takaka Limestone outcrops which are bare rock and not soil forming.

Relationship to previously named soils

Soils on the Takaka Limestone Formation were previously identified as Pohara soils in the early unpublished soil survey of Takaka County by Cawthron Institute but were mapped as Tarakohe set (73bH) in the 1:250,000 General Survey of the Soils of South Island (Soil Bureau Staff 1968). In the 2005 soil survey of the soils of lower Takaka Valley, soils formed on the Takaka Limestone were mapped as Tarakohe soils.

Landform origin and history

The Takaka Limestone is a thin (<75 m) formation of hard, calcareous and crystalline rock. Although it is resistant to weathering, in the vicinity of Paynes Ford it forms a prominent escarpment with largely precipitous slopes, probably due to erosion and downcutting by the Takaka River. Dissolution by chemical weathering has resulted in pronounced landsurface fragmentation in the vicinity of the escarpment with steep sided outcrops separated by narrow gullies. There are also numerous sink holes on the upper undulating surface of the limestone. In between the rock outcrops that are scattered over the area, deep soils are found. Much of this area of Tarakohe soils was earlier cleared of indigenous forest but since the 1940's, significant regeneration has taken place.

Key soil features

In places where the soils are deeper, there may be a litter overlying a moderately deep brown to dark brown A horizon, which in turn overlies yellowish brown to strong brown coloured heavy silt loam to clay loam. Limestone fragments or rocks typically increase in abundance with increasing depth. The thickness of the soil varies greatly from rock outcrop to deep, often within a few metres.

Identified variants

The main variation recognized is in respect of soil depth with shallow soils on rock and deep soils between rock outcrops occurring over short distances. Tarakohe steepland soils (ThS) have many precipitous rock outcrops while on the undulating to rolling land (Th), the soil mantle is less broken by rock outcrops.

Associated and similar soils

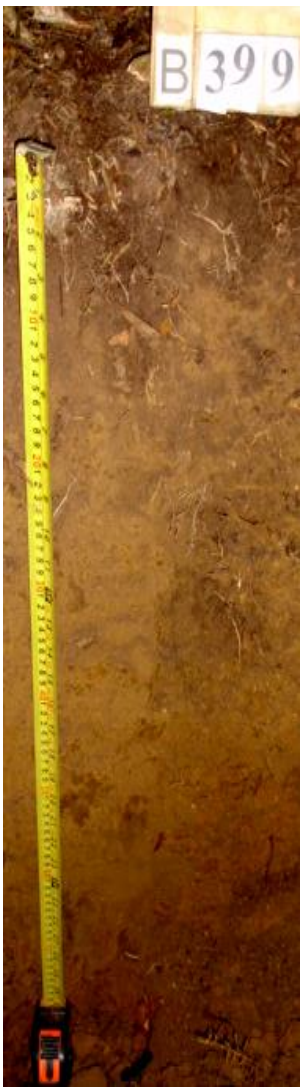
Pikikiruna soils formed on calcareous rocks of the Arthur Marble Formation are similar to Tarakohe soils. Tadmor soils occur with Tarakohe soils in places where pockets of siltstone rock are present. On the undulating to rolling surface, there are a few small patches Pisgah soils where there are some Bainham Gravel deposits.

Key soil properties

Where there are significant accumulations of weathering products, Tarakohe soils are deep and well drained with heavy silt loam to clay loam textures and strongly developed soil structure. Depth to underlying rock is highly variable ranging from surface to greater than a metre.

Soil limitations and land use rating

Much of this area of Tarakohe soils is reserve and is not considered for intensive use. Use of Tarakohe soils is restricted by rock outcrops and or slopes. Tarakohe steepland soils are included in class H and Tarakohe soils in class E.



Horizon	Depth cm	Description
L/O	0-8	Dark reddish brown (5YR 3/3) loam; weakly developed very fine polyhedral structure; very friable; abundant medium and coarse roots
A	8-19	brown to dark brown (7.5YR 4/2) heavy silt loam; strongly developed medium polyhedral structure; weak soil strength; friable; abundant coarse roots
AB	19-28	dark brown and yellowish brown (7.5YR 4/2+ 10YR 5/4) heavy silt loam; strongly developed medium polyhedral structure; firm soil strength; brittle; abundant coarse roots;
Bw1	28-50	yellowish brown (10YR 5/6 + 5/8) heavy silt loam; strongly developed medium blocky structure; firm soil strength; brittle; 1% fine limestone stones; many coarse roots
Bw2	50-80	strong brown (7.5YR 5/8) clay loam; strongly developed coarse polyhedral structure; semi deformable; 1% fine limestone stones; many medium roots
Bw3	80-95	yellowish red (5YR 5/6) clay loam; 10% dark reddish brown (5YR 3/2) organic accumulations; moderately developed medium blocky structure; brittle; slightly sticky; few medium roots

Soil name and map symbol: Pikikiruna (PkS, PkH)

Concept and overview

Pikikiruna soils (PkH, PkS) occur extensively on the steep and hilly slopes of the Pikikiruna Range on the valley side next to the plains and footslopes of the East Takaka soil survey area. Pikikiruna hill soils occur on land where slopes are predominantly between 16º and 25º and Pikikiruna steepland soils (PkS) on slopes predominantly above 25º. They were not subject to a detailed study in this survey although were examined in a few locations, primarily where moderately steeply sloping land with Pikikiruna Hill soils (PkH) adjoins the plains. Pikikiruna soils are formed on the hard crystalline Silurian to Upper Ordovician aged rocks of the Arthur Marble Formation.

Relationship to previously named soils

The soils formed on rocks of the Arthur Marble Formation were separated as Pikikiruna loams in the earlier unpublished survey of the soils of Takaka County by Cawthron Institute and mapped as Pikikiruna steepland and hill soils (74c, 74cH) in the 1:250,000 Survey of the Soils of South Island (Soil Bureau Staff 1968). Pikikiruna soils were also mapped in the survey of the soils of Waimea County (Chittenden et al. 1966).

Landform origin and history

The lower slopes of the Pikikiruna Range are for the most part steeply to very steeply sloping and in fault contact with the much younger Tarakohe Mudstone Formation. They are cut in several places by steep sided valleys but because the marble is soluble, dissolution has resulted in a highly variable topography with extensive rock outcrops separated by areas of accumulated weathering detritus.

Key soil features

Pikikiruna soils are variable in depth ranging from very deep to shallow, depending on proximity to rock outcrops. The A horizon is moderately deep to deep (average 24 cm) dark brown while the subsoils are also predominantly dark brown coloured with predominantly clayey textures. Marble stones and small particles are commonly present. The transition to underlying bedrock may be abrupt but irregular in depth.

Identified variants

Pikikiruna soils range from shallow and stony to very deep. In places, the soils have predominantly grayish brown subsoil colours.

Associated and similar soils

Kairuru soils, also formed from Arthur Marble Formation, occur on higher surfaces of the Pikikiruna Range mainly on rolling and hilly land and under a higher rainfall.

Key physical properties

Pikikiruna soils are predominantly deep and well drained with clayey subsoil textures. They have moderately to strongly developed soil structure and stones are present in variable proportions. The transition into underlying rock may be either abrupt or gradual.

Versatility and land use rating

The use of Pikikiruna soils is restricted by slope and the relatively high and variable proportions of rock outcrops. The soils on these slopes, which are predominantly west facing, have a summer moisture deficiency. There is a moderate to high risk of erosion in extreme climatic events. They could be considered for storage of carbon through regeneration of native vegetation. On the easier slopes, the soils are grouped in class F of the Tasman District Council land classification scheme with the soils on the steepest slopes included in class H.

Horizon	Depth cm	Description
A	0-23	Dark brown (10YR 3/3) silt loam; moderately developed fine and medium polyhedral structure; weak soil strength; very friable; many fine and few medium roots
AB	23-35	dark brown and brown to dark brown (10YR 3/3 +7.5YR4/4) silt loam; moderately developed medium and coarse polyhedral structure; weak soil strength; very friable; 1% medium stones; many fine roots
Bw1	35-60	dark brown (7.5YR 4/4) heavy silt loam; moderately developed fine polyhedral structure; weak soil strength; friable; 1% medium stones; many fine roots
Bw2	60-85	dark yellowish brown to yellowish brown (10YR 4/4-5/6) clay loam; moderately developed coarse blocky structure; slightly firm soil strength; brittle; 2% medium stones; few fine roots
Bw3	85-100+	dark yellowish brown (10YR 4/4) silt loam; massive; firm soil strength; 4% medium to very coarse stones; very few fine roots