SOIL SURVEY METHODOLOGY

Aims

The main aim of the project was to produce a soils distribution map of the Reefton catchments taking into account a number of constraints. These considerations were the time limit given for the survey and access in the survey area given the rugged terrain, and the slow rate of traversing in such country and the amount of equipment that could be carried into the field. A secondary aim was that given a relatively quick assessment of the distributions of soil-type in the field, a sampling routine could be adopted which would concentrate on obtaining hydrologically significant data for the various soils.

To achieve these aims, field investigations and sampling were carried out following aerial photographic interpretation of the survey area. Map 3 indicates the distribution of sampling sites and traverses.

Photo Interpretation

Colour aerial photographs a scale of approximately 1:15, 000 were used. Other black and white photography at 1:8000 scale was available but large distortions due to topographical variation and short focal length limited their usefulness. The colour photographs used has a longer focal length of 12 inches and provided a very sound base for mapping due to reduced edge distortion.

The tonal variations between different vegetation types were evident as were colour differences. These were particularly noticeable between the Mountain Ash association and the mixed species 9dry sclerophyll) associations and also gully-type vegetation where the overstorey was absent.

Topographic trends were obvious using aerial photography but the precise location of ground level was often difficult to determine due to dense vegetation cover, particularly on the lower and southern slopes of the catchments.

An initial interpretation of the photographs was made using the vegetation patterns together with topographic information and a guide to soil units was formulated.

A catena sequence of soil types varying with elevation and aspects was established. This sequence of ‘wet’ southern aspects, lower slopes and gullies where soils were known to be generally well-developed with deep surface organic horizons, often colluvial in nature, and being the deepest soils in the survey area. A gradation upslope occurred, culminating in ‘dry’ skeletal soils on crests, ridges and northerly facing slopes. Though a continuum from ‘wet’ to ‘dry’ would exist, it was felt that given aspect and vegetation information there would be definite changes between pre-dominantly ‘wet’ soils and those soils predominantly dry.

Sampling Design

Given the above considerations a sampling design for the survey area was constructed to minimise possible variation and verify the assumed catena sequences.

A number of transects were established as an initial stratification for sampling usually at right-angles to the main drainage lines in all the catchments (see map 3). Due to access difficulties these transects would be linked so that a circular path could be followed, returning close to the initial starting point.

The transects also dissected the basic pre-determined units at right angles to get an indication of the rate of parameter changes including soil, vegetation and slope variations. For more specific data accumulation, points within each predetermined unit along a transect were nominated as possible sampling sites. Because of difficulties in accurately fixing site location from the aerial photographs, points were nominated for sampling in approximately the centre of the predetermined units. The density of point samples were influenced by the number of topographic soil units identified and the time available.

Initially over 90 points were designated as sampling sites, most along the 21 transects. Eventually 85 sites were recorded together with extra information fathered along the transects between sites (See map 3).

Information collected

Information collected at the sampling sites included site information and soil information.

Site information consists of slope, relief, aspect, surface, stones, surface condition, site drainage hazards such as erosion and mass movement, vegetation and location data.

Soil information was collected for each horizon in the profile, describing depths, boundary distinctiveness, colour, mottling, texture, coarse material, structure, fabric, consistency, pH, dispersibility, drainage and permeability.

A compass, clinometer and relevant maps were used to determine site location and traverse position for recording inter-site information.

Due to access difficulties associated with the very steep terrain and dense vegetation a hand operated soil auger was the only practical means of examining soil profiles and for collecting samples for laboratory analyses. Some difficulty was encountered in determining soil depth because of stone and gravel in some profiles.

Colour was recorded for moist soil using Munsell notation.

Field texture was estimated by hand texturing.

Soil pH was estimated using an Inoculo field pH test kit.

Dispersibility was estimated by placing an aggregate of soil small beaker of water and estimating the degree of slaking and degree of dispersion after several minutes.

Soil drainage, structure, mottles and visible soil pores were estimated visually.

Information was recorded as a standardised card (Appendix 1). Extra information such as stoniness and amount of organic matter was also noted.

Laboratory Analysis

Soil information from laboratory analysis included laboratory pH and electrical conductivity (all 1:5 soil extract). Other information determined was particle size analysis, organic carbon, exchangeable cations, cation exchange capacity, free iron oxides, linear shrinkage and dispersion (Emerson tests).

Soil hydrological data

Laboratory measurements

Soil hydrology data required included bulk density, porosity, wilting point (15 bar) and field capacity (0.1 bar) which were determined using laboratory methods. Samples for the above were either core (undisturbed) samples or disturbed samples – both kinds being required for the water retentivity measurements of wilting point and field capacity. These samples were collected after the initial exploration on foot, using the determined soil units in a sampling base for the hydrological studies.

Field Measurements

At selected sites infiltration and hydraulic conductivity tests were carried out, together with core-sampling where appropriate. These tests were initially carried out at existing soil sample sites for cross referencing of soils information with the water behaviour information. Other sites were subsequently used for hydrological field measurements to gain a greater understanding of the particular soil types.

Infiltration measurements were taken using of a soil ring infiltrometer with a diameter of 30 cm and height of 30 cm to estimate surface infiltration of water.

Hydraulic conductivity was estimated in the field using the shallow well pump-in method (Talsma and Hallam, 1980). Holes were augered to an average depth of 50 cm, some deeper where permitted by lack of stones. Further information is given in the section on infiltration and hydraulic conductivity.