CHEMICAL AND PHYSICAL PROPERTIES

Particle Size Distribution.

The particle size analyses of Type Profiles are given in Appendix I. From these figures the clay content and the ratio of fine sand to coarse sand are plotted against depth in Figure 3. The chief interest lies in the difference between phases of any one soil type, and in differences between the age groups.

Clay content, and the ratio of fine sand to coarse sand are two ways of expressing the fineness of a soil horizon. The ratio is a characteristic of the sediment, and usually does not alter greatly with time, whereas the clay content changes markedly with weathering and soil formation.

Figure 3 illustrates the fact that in medium textured profiles the ratio of fine to coarse sand is usually almost constant from bottom to top of a profile, or increases steadily indicating a gradual fining of the sediment. On the other hand in a light deep subsoil phase there is a stepped profile. For example in Profile 22 of the Myrtleford series, not illustrated, at 33 inches depth the ratio rises sharply from 0.5 to 6.9. This coincides with the change from point bar or shoal, to over bank deposits. The latter are uniform over an area, the former are not, and a precise definition of the phase in terms of texture is impossible. The very high ratio at the surface of this profile indicates another change in the nature of the sediment, in this case probably from mixed alluvium to mining sludge, though this was not evident in the field. Profile 7, not illustrated, is unusual in showing a very variable ratio profile, indicating several distinct phases in the deposition of the parent material.

The clay content profiles illustrate the differences between the age groups. Clay content roughly parallels the sand ratio for the Group 0 soil, except for one point, and departs more and more from it in the Group 1, 2, 3, and 3f soils. The bulge represents the clay B horizon. It is noticeable that in the oldest soil, Profile 26, the clay content increases to the full depth of greater than 4 feet. This is the soil type in which gravels have been weathered to depths greater than 6 feet.

pH.

The range of pH values recorded in 26 surface soils is from pH 4.8 to 6.7. Management overrides other factors in determining the pH at any particular site, and the only figures above 6.0, namely pH 6.3, 6.4 and 6.7 are attributable to a history of liming. The remaining 23 surface soils have pH values well distributed over the range 4.8 to 6.0, with only a general trend to slightly lower values in the higher rainfall areas. The three lowest values are from relatively unimproved pasture land.

Within profiles the trends are more distinct. Along the lower river, even the youngest soils of Group 0 are distinctly more alkaline in the deep subsoil, with the pH 1 to 2 units higher than the surface in 3 out of 4 profiles examined. In the Group 1 soil on Map 1, profile 7, the rise is nearly 3 units, from pH 5.9 at the surface to pH 8.7 at 48 inches.

Upstream from Myrtleford, on Maps 12 to 18, profiles of Groups 0, 1 and 2 show only a slight rise in pH with depth, generally 0.5 unit or less. The three profiles of Groups 3 and 3f do not show any consistent trend.

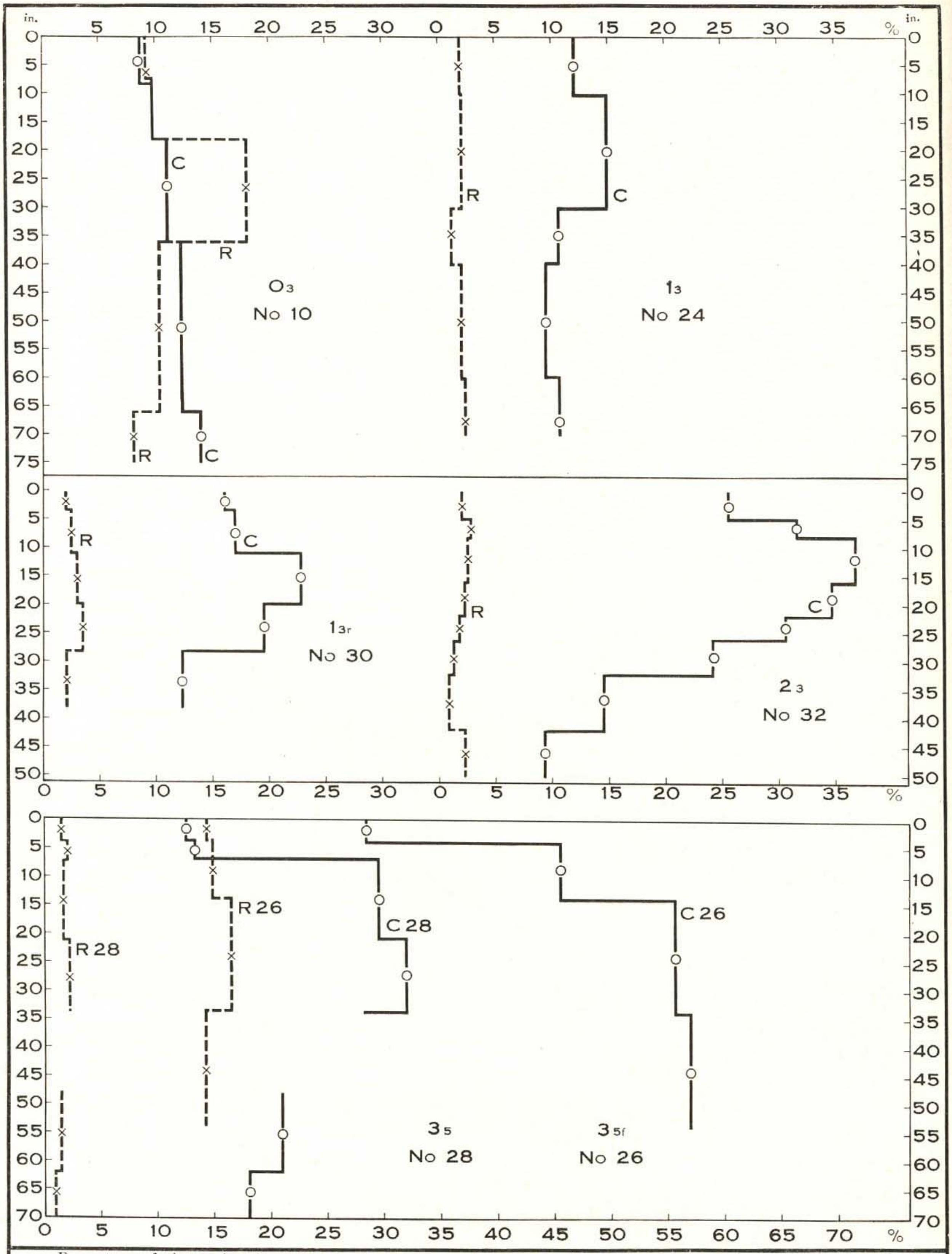
Exchangeable Cations.

The exchangeable cations calcium, magnesium, potassium, sodium and hydrogen were determined on selected horizons from all groups except Group 2. The methods used are and the results are as milli-equivalents of listed in Appendix II, tabulated in Appendix I each cation per 100 grams as per cent of the cation of air-dry soil, and exchange capacity (C.E.C.) which is the sum of the separate cations. The C.E.C. depends primarily on the percentages of clay and organic. matter in the soil, and on the nature of the clay minerals present, although in these soils the slit fraction may also make a significant contribution. The influence of the organic matter is shown in the high figures for the surface horizons. However, this influence of organic matter is brought out more clearly by calculating the cation exchange capacity per 100 grams of clay. In practically every profile there is a consistent trend from high to low figures down the profile. The figures for the third horizon, where the effect of organic matter is small, give an indication of the nature of the clay minerals. The figures for C.E.C. per 100 grams of clay are as follows:

Group 0 soils	65, 64, 63
Group 1 soils	59, 70, 54, 43, 51
Group 3 and 3f	42, 46, 50

This relatively narrow range indicates a fairly constant clay mineral composition throughout the groups. However, the trend to lower values with increasing age does suggest that there are some differences between the groups.

Fig. 3 – Particle size grading of profiles.



Percentage of clay and ratio of fine sand to coarse sand plotted against depth in inches, from the surface to the centre of each horizon.

Fig. 3 Particle size grading of profiles

As regards the separate cation species, the hydrogen ion is dominant in all horizons with the exception of Profile 3 on Map 8. The three highest surface soil values of 79, 86 and 89 per cent. are from profiles in the higher rainfall areas, whereas the two lowest values, 40 and 44 per cent. from profiles 2 and 3 on Map 8 'have had a long history of liming.

Exchangeable calcium and magnesium are both very variable in the surface soils, especially in regard to the absolute amounts "present. With a couple of exceptions, calcium and magnesium, plus hydrogen account for more than 95 per cent of the exchange capacity, and therefore the sum of calcium and magnesium is in inverse relationship to the hydrogen. High absolute values for calcium of .10. 1 and 11 .6 milli-equivalents per 100 grams of soil occur in Profiles 2 and 3, and an undesirably low exchangeable magnesium content of 0.5 milli-equivalent per 100 grams of soil occurs in Profile 15. Profiles 26 and 29 of Group 3 also show low values for exchangeable magnesium. Within profiles, the general tendency in Group 0 and Group 1 soils is for calcium to decrease and for magnesium to increase as a percentage of the C.E.C. with depth. In Groups 3 and 3f this trend is reduced or reversed.

The exchangeable potassium is concentrated in the surface horizons with the exception of Group 3f soils, and is not very variable. The range in Groups 0, 1 and 3f is from 0.2 to 0.6 milli-equivalent per 100 grams of soil. The single value from Group 3 is ' higher at 1. 6 milli-equivalent per 100 grams of soil. These figures are from type samples collected in 1964 and 1965, and it is likely that higher values for exchangeable potassium would be found in the district in 1970, due to the greatly increased use of potassium fertilizers on tobacco crops since 1965.

Exchangeable sodium is very low in all profiles examined, rising above 1 milli-equivalent per 100 grams of soil only in the subsoils of Profiles 7 and 28.