

APPENDIX II – Methods of Soil Analysis

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All results are expressed in terms of oven-dry soil passing a 2 mm round-hole sieve, except gravel, which is reported as a percentage of the air-dry field sample.

Particle-size analysis – plummet balance method of Hutton (1956). With sand separation by hand decantation. The I.S.S.S. size fractions were separated: i.e. coarse sand 2 – 0.2 mm; fine sand 0.2 – 0.02 mm, silt 0.02 – 0.002 mm and clay <0.002 mm.

Electrolytic conductivity (EC 25°C) – a 1:5 soil:water suspension was shaken for 1 hour and, after temperature equilibration, conductivity was measured with a dip cell and direct-reading meter. Results are reported as microsiemens per centimetre (μScm^{-1}).

Soil reaction (pH) – by glass electrode and digital pH meter on the above suspension.

Chloride (Cl) – profiles 414 – 606 by electrometric silver nitrate titration of R. J. Best, as described by Piper (1942).

- by solid state selective-ion electrode and millivoltmeter on the same suspension, calibrated with potassium chloride standards.

Organic carbon (Org. C) – wet-combustion technique of Walkley and Black, described by Piper (1942). No recovery factor was applied, but the factor 1.3 C:N was used to calculate carbon:nitrogen ratios.

Total nitrogen (N) – Metson (1956). Semimicro Kjeldahl method, using a Markham still.

Free iron oxide (Fe_2O_3) – Haldane (1956). Finely ground soil was extracted with powdered zinc in ammonium chloride-oxalic acid buffer. Ferrous ion in the treated extract was titrated with potassium dichromate.

Hydrochloric acid extract for phosphorus and potassium (P, K) – 4 g of soil was refluxed for 4 hours with 20 ml constant boiling hydrochloric acid, with subsequent filtration and dilution of the filtrate to 200 ml. Phosphorus was determined by colorimetric method using molybdenum blue and potassium by atomic absorption.

Available phosphorus (Pav. P.p.m.) – Colwell (1963). 1 g soil was shaken with 100 ml 0.5 M sodium bicarbonate at pH 8.5 for 16 hours. Phosphorus was determined in the clarified extract by a colorimetric method (molybdenum blue).

Exchangeable cations – profiles 414 – 606 by the method of Hutton and Bond (unpublished data). Synopsis: soil leached with molar ammonium chloride solution (pH – 7.0) to displace exchangeable cations. Potassium and sodium in leachate determined by flame emission techniques. Calcium and magnesium determined by EDTA titration. Adsorbed ammonium ion was leached from the soil with sodium sulphate solution, and cation exchange capacity was determined from the excess of ammonium ion over chloride in the leachate.

- profiles 607 – 748 by extraction method of Tucker (1974), also described in Loveday (1974). Synopsis: soluble ion removal by 10% ethanediol in ethanol. Cation displacement by ammonium chloride in ethanol-water (2:1) at pH 8.5. Cation determinations by atomic absorption. Cation exchange capacity by measurement of ammonium ion displaced from the treated soil by a potassium nitrate-calcium nitrate solution.

Unified Soil Group (USG) – Engineers' classification, as Bureau of Reclamation (1974).