

Sampling and Laboratory Procedures for Characterization Data Texas Agricultural Experiment Station Texas A&M University

Introduction

Soil data provided at this website are the result of soil survey and related research activities of the Soil Characterization Laboratory, Texas Agricultural Experiment Station, in cooperation with the USDA Natural Resources Conservation Service, Texas Cooperative Extension and supported in part in the early years by accelerated soil survey funds through the Texas State Soil and Water Conservation Board. Portions of this data have been released in theses, dissertations, and articles in scientific journals. The majority, however, has been released in unpublished form, and this outlet serves to make the data available to all potential users.

The website will eventually contain essentially all the data from soils that have been sampled, described, and analyzed by the Texas Soil Characterization Laboratory from its inception in 1978 to date. Initially, only the most recent data will be presented. Older data will be added as the data are extracted from older computer formats and the data verified. During this period, two systems of horizon nomenclature were in use, the first based upon the Soil Survey Manual (Soil Survey Staff, 1951) and the second on the revised Chapter 4 of the new Soil Survey Manual first released in 1981 (Soil Survey Staff, 1993). The soil descriptions use the horizon nomenclature format in effect at the time of describing and sampling the respective soils.

Methods

Sampling procedures

Except where indicated in the description, soils were sampled from freshly dug pits. Descriptions of genetic horizons were made using the Soil Survey Manual (Soil Survey Staff, 1951) if sampled before Oct 1, 1981, the new Soil Survey Manual (Soil Survey Staff 1993) if sampled later. Samples of about 4 liters in volume were obtained for each genetic horizon. Three clods of about 200 cm³ each were also obtained, coated with Saran in the field, and transported to the laboratory for water content and bulk density determinations (Brasher et al., 1966).

Laboratory Analyses

The bulk samples were dried in a forced-draft oven at about 35° C and crushed between electric motor-driven wooden rollers, which were spring loaded to allow passage of coarse fragments. The soil fines were passed through a 2-mm diameter sieve and mixed, and a representative sample was stored in a liter cardboard or plastic carton. Any significant quantities of coarse fragments were soaked overnight in water and washed upon a 2mm sieve, collected, dried, weighed and related back to the quantity of soil as a percentage by weight.

Particle-size distribution was obtained in duplicate using the pipette method of Kilmer and Alexander (1949). Samples (10 g) were dispersed in 400 ml of distilled water containing 5 ml of 10 percent sodium hexametaphosphate by shaking overnight on a horizontal oscillating shaker. Aliquots of 5 ml were taken at a 5-cm depth following a settling time as calculated by Stokes' equation (Baver, 1965). Water from the aliquots was evaporated, the fines dried at 105° C and the amount of suspended solids weighed. The remaining dispersed sample was passed through a 300-mesh sieve; the retained sands were washed, dried at 105° C, and fractionated using a nest of sieves (18-, 35-, 60-, 140-, and 300- mesh) mounted on an oscillating shaker.

Any soluble salts or gypsum in the samples were removed prior to particle-size analysis. Gypsum was removed by heating the sample to 105° C and dialysis (Rivers et al., 1982). Soluble salts were removed by dialysis against water.

Soil reaction (pH) was determined in duplicate on 1:1 soil-to-water mixtures. An electronic pH meter equipped with a combination glass-colomel electrode standardized against pH 4.0 and 7.0 buffer solutions was used.

Bases extractable in 1N NH₄OAc (pH 7.0) were determined following procedure 5B5 of the National Soil Survey Laboratory (Soil Survey Staff, 1996); however, Ca and Mg were determined using a nitrous oxide-acetylene flame on the atomic absorption unit. Extractable Al was determined by 30-minute extraction in 1N KC1 (procedure 6G9, Soil Survey Staff, 1996). Effective cation exchange capacity expressed as the sum of extractable bases in 1N, NH₄OAc and exchangeable Al in 1N KC1 was reported only for samples containing measurable KC1, extractable Al, and low quantities of soluble salts. Cation exchange capacity using 1N NaOAc (pH 8.2) was determined by a modified procedure of USDA Handbook 60 (U.S. Salinity Laboratory Staff, 1969). Leachings and extractions were performed using a mechanical, variable-rate extractor (Holmgren et al., 1977).

Percentages of calcite and dolomite were determined using the gasometric procedure of Dreimanis (1962). The CaCO₃ equivalent was calculated from calcite and dolomite percentages. Gypsum percentage was determined by precipitation with acetone (U.S. Salinity Laboratory Staff, 1969).

A saturated paste was prepared (U.S. Salinity Laboratory Staff, 1969), and extracted using an automatic extractor (Holmgren et al., 1977). Electrical conductivity and soluble cation and anion concentrations to include Ca, Mg, Na, K, CO₃, HCO₃, and Cl, and SO₄ were determined on the saturated paste extract. Calcium and Mg were analyzed by atomic adsorption. Flame emission was used for Na and K analyses. The titrimetric procedures of Handbook 60 were used for CO₃, HCO₃, and Cl (U. S. Salinity Laboratory Staff, 1969). Sulfate was determined turbidometrically (Jackson, 1958).

Total carbon was determined by dry combustion in a medium-temperature resistance furnace (Nelson and Sommers, 1982). Organic carbon was calculated as the difference of total carbon and inorganic carbon as quantified in the CaCO₃ equivalent analyses.

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