Chapter 1

Sampling Soils for Mineralogical Analyses

D. A. SOUKUP, University of Nevada, Las Vegas
L. R. DREES, deceased, formerly Texas A&M University, College Station
W. C. LYNN, USDA-NRCS, National Soil Survey Center, Lincoln, Nebraska

Soil mineralogy has a profound influence on the chemical characteristics and dynamic behavior of soils. The chemical composition of the soil solution is often maintained by weathering and/or precipitation of minerals. The reactive nature of the surface of many minerals and the ability to form chemical bonds with soluble constituents also serves to maintain the chemical composition of the soil solution. If soils were not capable of binding with chemical elements and compounds, the fertilizers, pesticides, herbicides, and other constituents applied to soils may be leached and eventually transported to groundwater or discharged to surface water bodies. Increasing recognition of the significance of soil mineralogy and its relationship to environmental quality has resulted in the performance of numerous soil mineralogical studies during recent years. Although soil mineralogical studies are primarily performed in the laboratory, it should be emphasized that mineralogical analysis typically begins in the field. Therefore, it is critical that the soil samples collected in the field are representative of the soils being studied. This chapter summarizes general procedures that will ensure the collected samples are appropriate for the specific objectives of the soil mineralogical study.

PURPOSE OF SAMPLING

Soil samples may be collected for a variety of different objectives. The number and types of samples ultimately collected from a site will be determined by the objectives of the study. The following sections discuss some potential study objectives, the role of soil variability in achieving those objectives, and some considerations when selecting a site.

Objectives

There are three general types of projects for which sampling objectives are developed. These include reference, characterization, and geomorphic and/or stratigraphic projects (Natural Resources Conservation Service [NRCS], 1996). Reference projects are those projects that are designed to answer specific questions or for collection of calibration standards. A reference project, for example, may focus on establishing the variation in clay mineralogy in soils in a given mapping unit. In this situation, samples may be collected from specific horizons in three to five locations that are representative of the map unit. A