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Measuring soil

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Introduction

An overview of how to measure soil during a survey is provided in this chapter. As with sampling, it is assumed the client's needs and the survey's purpose have already been defined. Decisions about measurement determine the survey's usefulness and directly affect field operations and data analysis.

Most land evaluation in Australia has been based on qualitative descriptions of soil and land resources rather than quantitative measurement. Although there have been undoubted efficiencies, the increasing demand for information on the functional attributes of soil (e.g. permeability, available water capacity, nutrient availability) is changing survey practice.

Preliminaries

Data types

Soil and land attributes are measured or described according to some scale.

Nominal attributes – these are ones that can exist in two or more states. An observation at a site is assigned to a class (x), and for two sites A and B one can only say that $x_A = x_B$ or $x_A \neq x_B$ (e.g. colour of mottles, substrate lithology, plant growth form). A nominal attribute may be binary, which simply records presence or absence (e.g. of a species), or multistate, where more than two states are possible (e.g. type of segregation). Multistate variables may be further divided into exclusive multistates (only one state per site) or non-exclusive multistates (one or more per site).

Ordinal attributes – these have discrete classes that are ordered, though the differences between classes cannot be placed on a constant scale. Ordinal attributes are ranked, where the difference between class 1 and class 4 is greater than between class 1 and class 2, but the intervals between classes are not necessarily equal; only $x_A > x_B$ and $x_A < x_B$ can be distinguished (e.g. soil mottle abundance classes and frequency of inundation as per McDonald et al. 1990).

Interval attributes – these are measured on continuous scales but there is no true zero, although A may be said to be $x_A - x_B$ units different from B (e.g. pH, temperature in °C).

Ratio scale attributes – these are also measured on continuous scales but have a true zero and hence if $x_A > x_B$ then it is possible to say that A is x_A/x_B times larger than B (e.g. soil thickness and temperature in kelvins).

There are more complex types of data that arise in land resource survey. *Serially dependent attributes* occur where a record for a particular attribute depends on the presence of another (e.g. the abundance, size or colour of mottles can be determined only if mottles are present).