LABORATORY 3

SOIL CLASSIFICATION AND PROFILE DESCRIPTION

I Objectives

Introduce soil classification. Describe profiles of two different soils in the field.

II Introduction

A Soil Formation

Soils are different from one place to another because the geologic parent materials in which soils form vary across the landscape. Furthermore, different parent materials have been in place and subject to ***pedogenic processes*** for different lengths of time. Pedogenic processes also vary from one location to another depending on climate, soil organisms and topography. Parent material, time, climate, organisms and topography are considered the ***five factors of soil formation*** and these five factors control those processes directly responsible for soil formation.

The degree of soil horizon development is the direct result of one or more of the following pedogenic processes: 1) accumulation of organic matter; 2) leaching of soluble salts, carbonates and bases; 3) reduction, solution and transfer of Fe; and 4) formation and translocation of colloidal material, especially, clay.

B Soil Classification

The classification system used in the US is called ***Soil Taxonomy***. Soil Taxonomy uses measurable soil properties as the basis for classification. There are six categories of increasing specificity in Soil Taxonomy, from ***order***, the most general category, to ***series***, the most specific. Table 1 lists and describes these six categories. There are 12 soil orders (see Table 2 for a list and major features of each) and over 18,000 soil series.

In this system, the series name of a soil is given, followed by family and subgroup. The subgroup includes great group and the latter also indicates both suborder and order. For example, there is the series Loring (fine-silty, mixed, thermic Typic Fragiudalf). Loring is the soil series name. Fine-silty, mixed, thermic is the family. Typic Fragiudalf is the subgroup. The great group is Fragiudalf. The latter includes suborder, Udalf, and indicates order, Alfisol, in abbreviation.

Although this and any other subgroup name may seem only a string of nonsense syllables, each part (Typic, Fragi-, ud- and -alf) has a well-defined meaning and gives qualitative or semiquantitative information about the Loring series soil. The family name includes similar information.

Continuing with the Loring example, the trailing -alf means that this soil belongs to the Order, Alfisol (see Table 2). The ud- indicates the moisture regime of this soil (Udic, meaning that there is usually adequate moisture throughout the year). Thus, the Loring is a fertile forest soil that typically does not suffer from drought. The Fragi- part of the great group name indicates that this soil has a fragipan, a dense and brittle subsoil horizon. The Typic indicates that this Fragiudalf is typical of Fragiudalfs.

Since this is an introductory course, however, we won't go any further into classification than the most general category, Order.

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see relationships among different soils and to the environment, and understand their behavior and response to management. First, through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

In Louisiana, there are soils from seven of the 12 orders –Alfisols, Entisols, Inceptisols, Histosols, Mollisols, Ultisols and Vertisols. In East Baton Rouge Parish, there are Alfisols, Entisols, Inceptisols, Mollisols and Ultisols.

Table 1. Categories in Soil Taxonomy.

Classification Level	**Description**
Order	Most general category. All soils belong to one of 12 orders.
Suborder	Differentiate soils within an order due to effects of soil moisture, soil temperature and chemical or textural features. Types and number of suborders vary with different orders.
Great Group	Differentiate soils within a suborder due to existence of particular horizons or other features. Types and number of great groups vary with different suborders.
Subgroup	Each great group divided into subgroups that are either typical of the great group or that are intergrades to other great groups, suborders or orders. Also, extragrades that are neither typical nor intergrades.
Family	Differentiate soils within a subgroup on the basis of soil properties that are important to plant growth or engineering applications. Such properties include texture, mineralogy, pH and so forth.
Series	Several series per family. Name comes from some geographic feature near where series was first described and has no pedogenic significance.

Table 2. Twelve soil orders of Soil Taxonomy. See glossary (Table 3).

Order	**Formative Element**	**Brief Description**
Entisols	***Ent-*** recent	Little profile development –A horizon only. Either very young soil or pedogenesis retarded by environmental conditions.
Inceptisols	***Incept-*** inception	Somewhat more profile development than in Entisols. ***Cambic*** horizon usually present.
Andisols	***And-*** volcanic ash	Weakly developed soils formed in volcanic debris. These soils have a ***melanic epipedon***. More developed than Entisols.
Aridisols	***Arid***- arid	Arid region soils. Profile development limited due to little water movement through soil. Salt or carbonate layers present.
Mollisols	***Moll-*** mollic horizon	Grassland soils with ***mollic*** epipedon. Usually with well-developed B horizon. These are highly fertile soils.
Vertisols	***Vert-*** invert	Soils with a high content of shrink-swell clay and dry sufficiently long for deep cracks to develop. ***Pedoturbation*** limits development.
Alfisols	***Alf-*** forest soil	Forest soils with an E and ***argillic*** B horizon but no mollic epipedon or spodic horizon. Less acid and more fertile than Ultisols.
Spodosols	***Spod-*** spodic horizon	Sandy and acidic forest soils. Contain a dark ***spodic*** horizon beneath an E horizon.
Ultisols	***Ult-*** ultimate	Forest soils similar to Alfisols but more weathered. Differentiated from Alfisols by low content of base cations.
Oxisols	***Oxi-*** oxic horizon	Highly weathered soils of tropical regions. Exhibit an ***oxic*** horizon. Low fertility.
Histosols	***Hist-*** tissue	Organic soils. Exhibit a ***histic*** epipedon. Minimum organic matter content > 20 % if clay content low or > 30 % if clay content high.
Gelisols	***Gel-*** gelid, cold	Cold soils. Exhibit ***permafrost*** within 1 m of the surface or evidence of ***cryoturbation*** and permafrost within 2 m of the surface.

Table 3. Glossary of terms.

Term	Brief Definition
Albic horizon	E horizon. Light colored and leached.
Argillic horizon	B horizon. Secondary accumulation of clay.
Cambic horizon	B horizon. Weakly developed. Insufficient to qualify as an argillic or a spodic horizon.
Cryoturbation	Disturbance of soil due to freezing and thawing.
Epipedon	Surface diagnostic horizon.
Histic epipedon	O horizon. Organic matter > 20 - 30 % and thickness > 20 cm.
Melanic epipedon	A horizon. Thick, dark and high organic matter. From volcanic ash.
Mollic epipedon	A horizon. Thick, dark and high organic matter. In prairie soils.
Oxic horizon	B horizon. Highly weathered. Mostly Al and Fe oxides.
Pedon	Smallest body of a soil with all the properties of that soil.
Pedoturbation	Natural mechanical disturbance of a soil as in shrink-swell soils.
Permafrost	Frozen soil.
Spodic horizon	B horizon. Secondary accumulation of organic matter and oxides.
Umbric epipedon	A horizon. Thick, dark and moderate organic matter. In forest soils.

Soil		**Vegetative Cover**	
Location		**Parent Material**	
Physiographic Position		**Drainage**	
Slope		**Other**	

Horizon	Depth	Matrix Color	Mottles			Texture	Structure			Consistence	pH	Horizon	
			Abundance	Size	Contrast		Grade	Type	Class			Boundary	Topography

Mottles

Abundance		Few	Common	Many
Size		Fine	Medium	Coarse
Contrast		Faint	Distinct	Prominent

Structure

Grade	Strength of cohesion	Weak	Moderate	Strong	
Class	Size (see attached chart)				

Consistence When moist: Loose | Very Friable | Friable | Very Firm | Extremely Firm

Horizon

Boundary Thickness	Abrupt	Clear	Gradual	Diffuse	
	< 1 in	1- 2½ in	2½ - 5 in	> 5 in	
Topography		Smooth	Wavy	Irregular	Broken

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