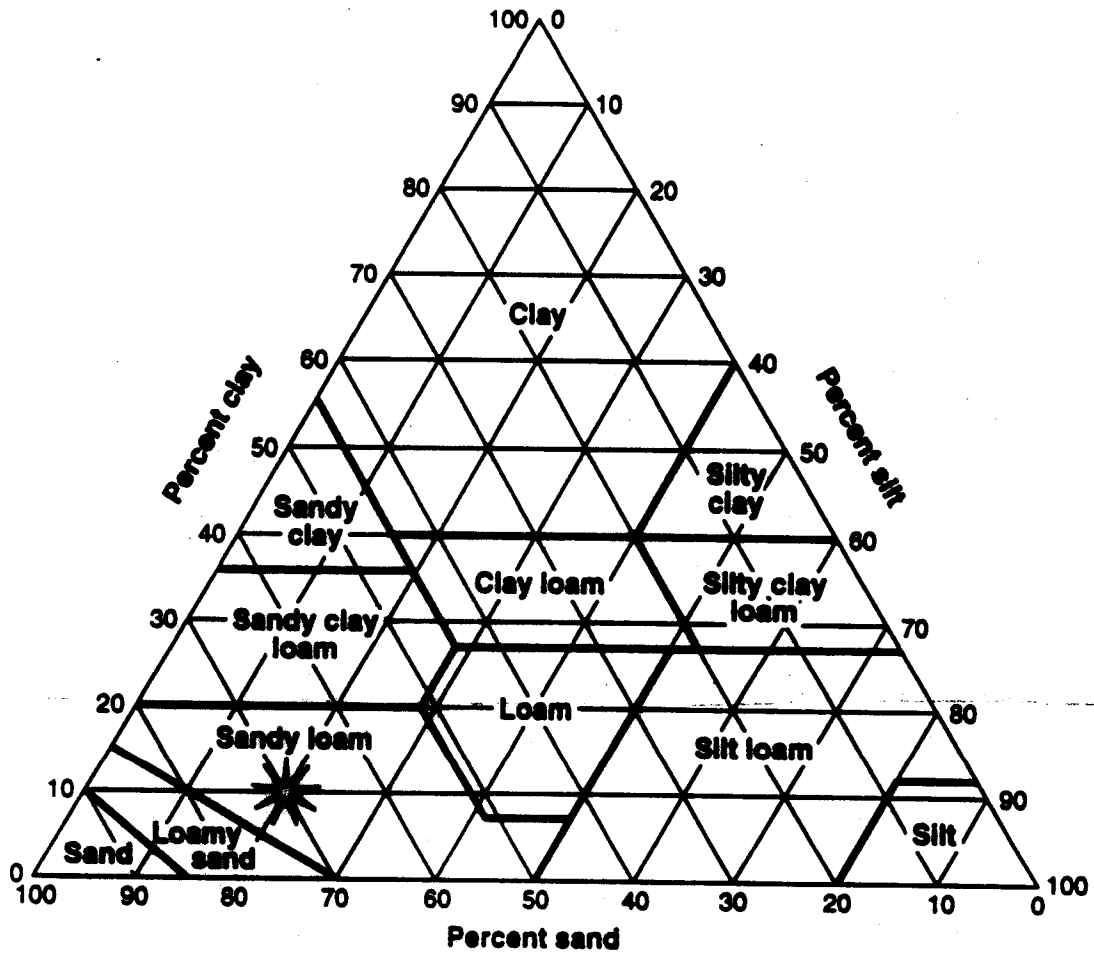
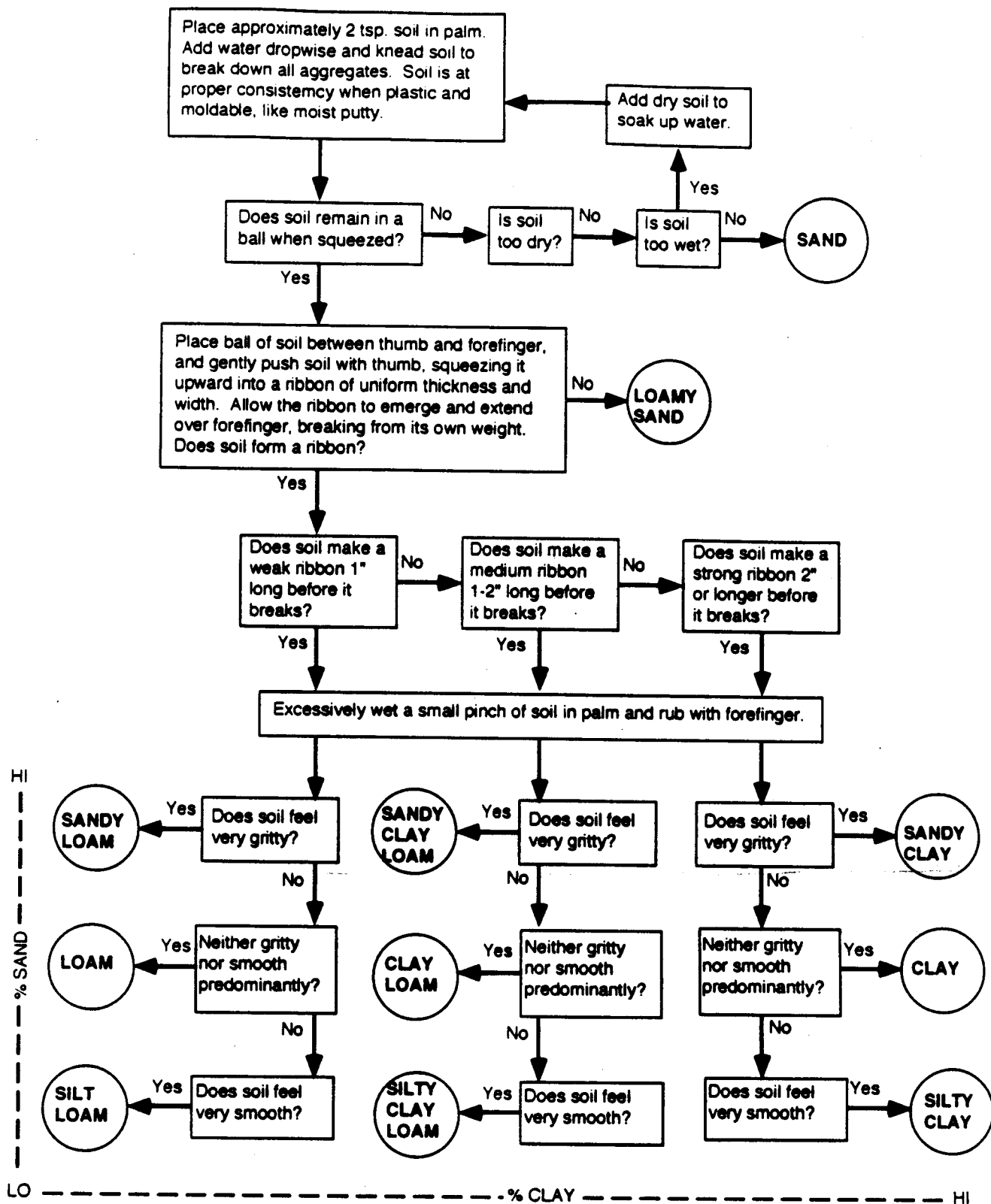


I. Physical Properties - Soil Texture, Structure, and Color

The Textural Triangle



What is the texture of a soil that is 10% clay, 20% silt and 70% sand?



Structure of Mineral Soils

Plate-like



Platy— leafy and flaky also found

May occur in any part of profile. At times inherited from the soil material.

Prism-like



Prismatic
(Level tops)



Columnar
(Rounded tops)

Both usually subsoil manifestations. Common in soils of arid and semiarid regions.

Block-like



Blocky
(Cube-like)



Blocky
(Subangular)

Common in heavy subsoils, particularly those of humid regions.

Spheroidal

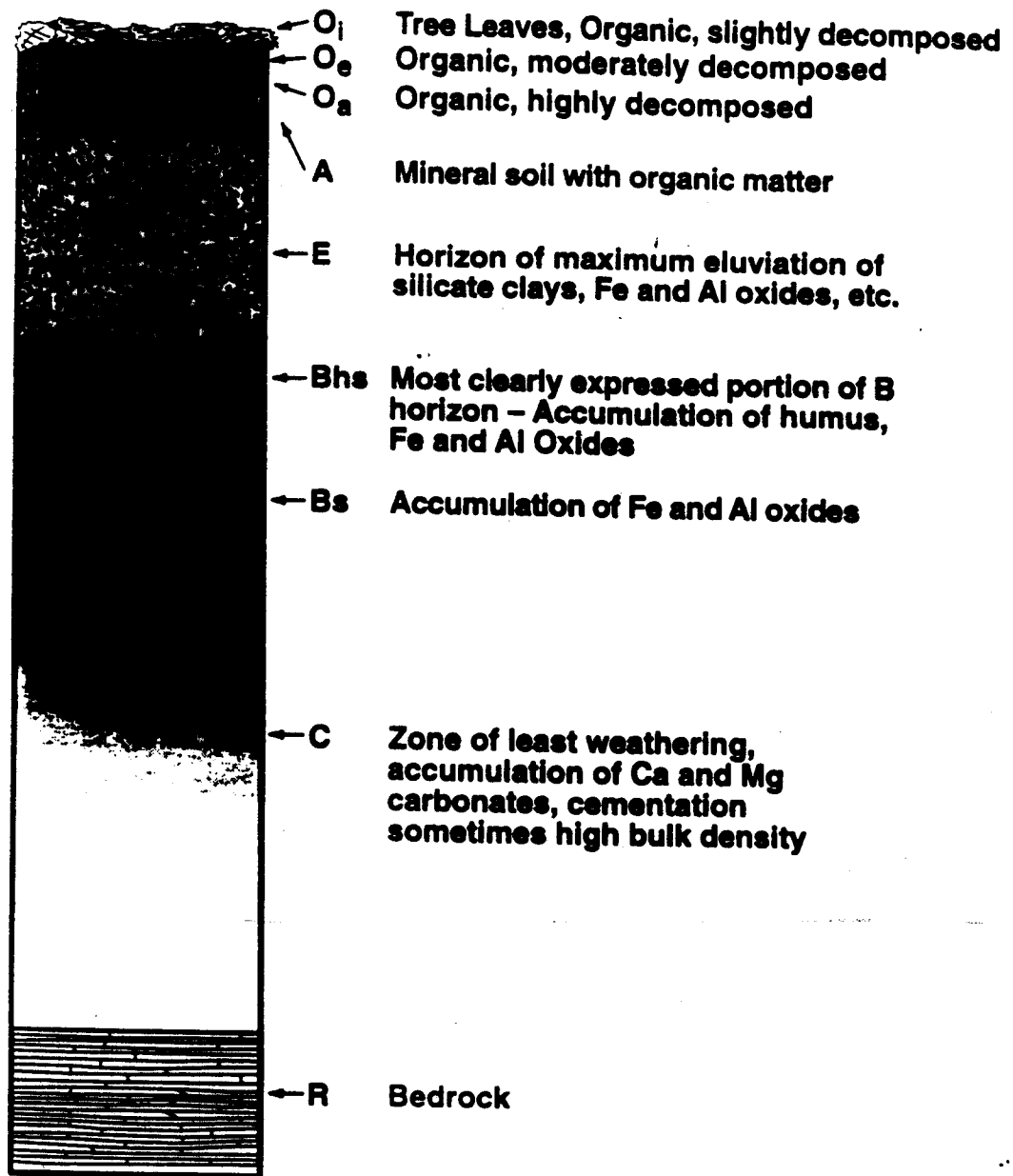


Granular
(Porous)



Crumb
(Very porous)

Characteristic of the furrow slice. Subject to wide and rapid changes.



Soil Horizon Designations

O horizons or layers: Layers dominated by organic material, except limnic layers 10/ that are organic. Some are saturated with water for long periods or were once saturated but are now artificially drained; others have never been saturated.

Some O layers consist of undecomposed or partially decomposed litter, such as leaves, needles, twigs, moss, and lichens, that has been deposited on the surface; they may be on top of either mineral or organic soils. Other O layers, called peat, muck, or mucky peat, are organic material that was deposited underwater and that has decomposed to varying stages. The mineral fraction of such material is only a small percentage of the volume of the material and generally is much less than half of the weight. Some soils consist entirely of material designated as O horizons or layers.

An O layer may be on the surface of a mineral soil or at any depth beneath the surface if it is buried. A horizon formed by illuviation of organic material into a mineral subsoil is not an O horizon, though some horizons formed in this manner contain much organic matter.

A limnic layer that is organic is designated a C layer.

A horizons: Mineral horizons that formed at the surface or below an O horizon and (1) are characterized by an accumulation of humified organic matter intimately mixed with the mineral fraction and not dominated by properties characteristic of E or B horizons (defined below) or (2) have properties resulting from cultivation, pasturing, or similar kinds of disturbance.

If a surface horizon has properties of both A and E horizons but the feature emphasized is an accumulation of humified organic matter, it is designated an A horizon. In some places, as in warm arid climates, the undisturbed surface horizon is less dark than the adjacent underlying horizon and contains only small amounts of organic matter. It has a morphology distinct from the C layer, though the mineral fraction is unaltered or only slightly altered by weathering. Such a horizon is designated A because it is at the surface. However, recent alluvial or eolian deposits that retain fine stratification are not considered to be an A horizon unless cultivated.

E horizons: Mineral horizons in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, leaving a concentration of sand and silt particules of quartz or other resistant minerals.

An E horizon is usually, but not necessarily, lighter in color than an underlying B horizon. In some soils the color is that of the sand and silt particules, but in many soils coats of iron or other compounds mask the color of the primary particles. An E horizon is most commonly differentiated from an overlying A horizon by lighter color and generally has measurably less organic matter than the A horizon. An E horizon is most commonly differentiated from an underlying B horizon in the same sequum by color of higher value or lower chroma, by coarser texture, or by a combination of these properties. An E horizon is commonly near the surface below an O or A horizon and above a B horizon, but the symbol E may be used without regard to position in the profile for any horizon that meets the requirements and that has resulted from soil genesis.

B horizons: Horizons that formed below an A, E, or O horizon and are dominated by obliteration of all or much of the original rock structure 11/ and by (1) illuvial concentration of silicate clay, iron, aluminum, humus, carbonates, gypsum, or silica, alone or in combination; (2) evidence of removal of carbonates; (3) residual concentration of sesquioxides; (4) coatings of sesquioxides that make the horizon conspicuously lower in value, higher in chroma, or redder in hue than overlying and underlying horizons without apparent illuviation of iron; (5) alteration that forms

silicate clay or liberates oxides or both and that forms granular, blocky, or prismatic structure if volume changes accompany changes in moisture content; or (6) any combination of these.

Obviously there are several kinds of B horizon. No common location within the soil characterizes them, but all are subsurface horizons or were originally. Included as B horizons where contiguous to another genetic horizon are layers of illuvial concentration of carbonates, gypsum, or silica that are the result of pedogenic processes (these layers may or may not be cemented) and brittle layers that have other evidence of alteration, such as prismatic structure or illuvial accumulation of clay.

Examples of layers that are not B horizons are layers in which clay films coat rock fragments or are on finely stratified unconsolidated sediments, whether the films were formed in place or by illuviation, and layers into which carbonates have been illuviated unless contiguous to an overlying genetic horizon.

C horizons or layers: Horizons or layers, excluding hard bedrock, that are little affected by pedogenic processes and lack properties of O, A, E, or B horizons. Most are mineral layers, but limnic layers, 10/ whether organic or inorganic, are included. The material of C layers may be either like or unlike that from which the solum presumably formed. A C horizon may have been modified even if there is no evidence of pedogenesis.

Included as C layers are sediments, saprolite, and consolidated bedrock that when moist can be dug with a spade. Some soils form in material that is already highly weathered, and such material that does not meet the requirements of A, E, or B horizons is designated C. Changes not considered pedogenic are those not related to overlying horizons. Layers having accumulations of silica, carbonates, or gypsum or more soluble salts are included in C horizons, even if indurated, unless these layers are contiguous to an overlying genetic horizon; then they are a B horizon.

R Layers: Hard Bedrock.

Granite, basalt, quartzite, and indurated limestone or sandstone are examples of bedrock that are designated R. The bedrock of an R layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scraped with a spade. Some R layers can be ripped with heavy power equipment. The bedrock may contain cracks, but these are few enough and small enough that few roots can penetrate. The cracks may be coated or filled with clay or other material.

Transitional Horizons

There are two kinds of transitional horizon. In one, the properties of an underlying or overlying horizon are superimposed on properties of the other horizon throughout the transition zone. In the other, parts that are characteristic of an overlying or underlying horizon are enclosed by parts that are characteristic of the other horizon. Special conventions are used to designate these kinds of horizons.

Horizons dominated by properties of one master horizon but having subordinate properties of another. Two capital letter symbols are used, as AB, EB, BE, BC. The master horizon symbol that is given first designates the kind of horizon whose properties dominate the transitional horizon. An AB horizon, for example, has characteristics of both an overlying A horizon and an underlying B horizon, but is more like the A than like the B.

In some cases, a horizon can be designated as transitional even if one of the master horizons to which it is apparently transitional is not present. A BE horizon may be recognized in a truncated soil if its properties are similar to those of a BE horizon in a soil in which the overlying E horizon has not been removed by erosion. An AB or a BA horizon may be

recognized where bedrock underlies the transitional horizon. A BC horizon may be recognized even if no underlying C horizon is present; it is transitional to assumed parent material.

Horizons in which distinct parts have recognizable properties of the two kinds of master horizons indicated by the capital letters. The two capital letters are separated by a virgule (/), as E/B, B/E, B/C. Most of the individual parts of at least one of the components are surrounded by the other.

The designation may be used even though horizons similar to one or both of the components are not present, if the separate components can be recognized in the transitional horizon. The first symbol is that of the horizon that makes up the greater volume.

Subordinate Distinctions Within Master Horizons and Layers

Lower case letters are used as suffixes to designate specific kinds of master horizons and layers. The symbols and their meanings are as follows:

- a** **Highly decomposed organic material**
This symbol is used with "O" to indicate the most highly decomposed of the organic materials. Rubbed fiber content averages less than about 1/6 of the volume.
- e** **Organic material of intermediate decomposition**
This symbol is used with "O" to indicate organic materials of intermediate decomposition. Rubbed fiber content is 1/6 to 2/5 of the volume.
- h** **Illuvial accumulation of organic matter**
This symbol is used with "B" to indicate the accumulation of illuvial, amorphous, dispersible organic matter – sesquioxide complexes if the sesquioxide component is dominated by aluminum but is present only in very small quantities. The organos sesquioxide material coats sand and silt particles or may occur as discrete pellets. In some horizons, coatings have coalesced, filled pores, and cemented the horizon. The symbol "h" is also used in combination with "s" as "Bhs" if the amount of sesquioxide component is significant but value and chroma of the horizon are approximately 3 or less.
- i** **Slightly decomposed organic material**
This symbol is used with "O" to indicate the least decomposed of the organic materials. Rubbed fiber content is more than about 2/5 of the volume.
- p** **Plowing or other disturbance**
This symbol is used to indicate disturbance of the surface layer by cultivation, pasturing, or similar uses. A disturbed organic horizon is designated Op. A disturbed mineral horizon, even though clearly once a E, B, or C horizon, is designated Ap.
- s** **Illuvial accumulation of sesquioxides and organic matter**
This symbol is used with "B" to indicate the accumulation of illuvial, amorphous, dispersible organic matter – sesquioxide complexes if both the organic matter and sesquioxide components are significant and the value and chroma of the horizon is more than 3. The symbol is also used in combination with "h" as "Bhs" if both the organic matter and sesquioxide components are significant and the value and chroma are approximately 3 or less.
- t** **Accumulation of silicate clay**
This symbol is used to indicate an accumulation of silicate clay that either has formed in the horizon or has been moved into it by illuviation. The clay can be in the form of coatings on ped surfaces or in pores, lamellae, or bridges between mineral grains.