United States
Department of
Agriculture

Agency for
International
Development

Designations for Master Horizons and Layers in Soils

Working towards better evaluation and utilization of soil resources in developing countries.

produced for

Soil Management Support Services

A project for
international assistance

by
Department of Agronomy
College of Agriculture and Life Sciences
Cornell University

January 1986

Soil Management Support Services

Goal

To increase food production through improved land resource management in the developing nations.

Purpose

To develop the prerequisites for soil conservation, soil fertility, and soil-based agro-technology transfers among tropical and subtropical countries.

Objectives

1. To provide technical assistance to AID and LDC's in problem identification, evaluation of opportunities, planning and utilization of land resources, especially in the subject area of soil survey, soil conservation, and soil fertility and management.

2. To develop worldwide linkages for a more efficient utilization of agricultural information for crop production.

3. To improve the interpretation potential of soil surveys for agricultural development in LDC's.

4. To refine *Soil Taxonomy* for the intertropical areas and assist LDC scientists in its use and application in transferring agrotechnology from one tropical region to another similar region.

What is SMSS?

SMSS, or Soil Management Support Services, is a project of the Agency for International Development (AID) implemented by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA), to provide technical assistance to developing countries in soil survey, soil classification, and use and management of soils.

DESIGNATIONS FOR HORIZONS AND LAYERS

In making soil examinations, every horizon or layer is described separately, regardless of whether it is genetic or all the properties are inherited from the parent material. The descriptions must be completely objective. Laboratory data on collected samples increase the importance of the descriptions; but without objective descriptions the laboratory data cannot be interpreted safely, if indeed the data are relevant at all.

Soils vary widely in the degree to which horizons are expressed. Relatively fresh geologic formations, such as alluvial fans, sand dunes, or blankets of volcanic ash, may have no recognizable genetic horizons, although they may have distinct layers that reflect different modes of deposition. As soil formation proceeds, horizons may be detected in their early stages only by very careful examination. As age increases, horizons generally are more easily identified in the field, though only one or two different horizons may be readily apparent in some very old, deeply weathered soils in tropical areas where annual precipitation is high.

Layers of different kinds are identified by symbols. Designations are provided for layers that have been changed by soil formation and for those that have not. Each horizon designation indicates that the original material has been changed in certain ways. The designation is assigned after comparison of the observed properties of the layer with properties inferred for the material before it was affected by soil formation. The processes that have caused the change need not be known; properties of soils relative to those of an estimated parent material are the criteria for judgment. The parent material inferred for the horizon in question, not the material below the solum, is used as the basis of comparison. The inferred parent material commonly is very similar to or the same as the unaltered material below.

Layers in soil need not be identified by symbols for a good description of the soil. Yet the usefulness of soil descriptions is greatly enhanced by the proper use of designations. These designations show the investigator's interpretations of genetic relationships among the layers within a soil.

These designations are not substitutes for descriptions. A designation tells little about the properties of the horizon or layer, but if both designations and adequate descriptions of a soil are provided, the reader has the interpretation made by the person who described the soil and also the evidence on which the interpretation was based. Additional studies and investigations may indicate the need for a change in designations.

Genetic horizons are not the equivalent of the diagnostic horizons of *Soil Taxonomy*. Designations of genetic horizons express a qualitative judgment about the kind of changes that are believed to have taken place. Diagnostic horizons are quantitatively defined features used to differentiate between taxa. The diagnostic horizons may encompass several genetic horizons, and changes implied by genetic horizon designations may not be large enough to justify recognizing different diagnostic criteria.

Three kinds of symbols are used in various combinations to designate horizons and layers. These are capital letters, lower case letters, and Arabic numerals. Capital letters are used to designate the master horizons and layers; lower case letters are used as suffixes to indicate specific characteristics of the master horizon and layer; and Arabic numerals are used both as suffixes to indicate vertical subdivisions within a horizon or layer and as prefixes to indicate discontinuities.

Some of the symbols for designating horizons and layers and conventions for using them are different from those described in the 1962 supplement to the *Soil Survey Manual.*

MASTER HORIZONS AND LAYERS

The capital letters **O, A, E, B, C,** and **R** represent the master horizons and layers of soils. The capital letters are the base symbols to which other characters are added to complete the designations. Most horizons and layers are given a single capital letter symbol; some require two.

O horizons or layers: Layers dominated by organic material, except limnic layers[1] *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

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1. Coprogenous earth, diatomaceous earth, marl.

of these, leaving a concentration of sand and silt particles 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 particles, 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[2] 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[3] whether organic or inorganic, are included. The material of C layers may be either like or unlike that from which the solum presumably*

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2. Rock structure includes fine stratification in unconsolidated or weakly consolidated sediment or pseudomorphs of weathered minerals retaining their positions relative to each other and to unweathered minerals in saprolite from consolidated rocks.

3. Coprogenous earth, diatomaceous earth, marl.

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 obviously affected by pedogenic processes; 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:

(The word "accumulation" is used in many of the definitions. As used here accumulation means that the horizon must have more of the material in question than the parent material is presumed to have had.)

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.

b *Buried genetic horizon*

This symbol is used in mineral soils to indicate identifiable buried genetic horizons if the major features of the buried horizon had been established before it was buried. It is not used in organic soils or to separate an organic layer from a mineral layer. Genetic horizons may or may not have formed in the overlying material, which may be either like or unlike the assumed parent material of the buried soil.

c *Concretions or hard nonconcretionary nodules*

This symbol is used to indicate a significant accumulation of concretions or nonconcretionary nodules cemented by material other than silica. This symbol is not used if concretions or nodules are dolomite or calcite or more soluble salts, but it is used if the nodules or concretions are iron, aluminum, manganese, or titanium. Their consistence is specified in the horizon description.

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.

f *Frozen soil*

This symbol is used to indicate that the horizon or layer contains permanent ice.

Symbol is not used for seasonally frozen layers or for "dry permafrost" (material that is colder than 0 degree C but does not contain ice).

g *Strong gleying*

This symbol is used to indicate either that iron has been reduced and removed during soil formation or that saturation with stagnant water has preserved a reduced state. Most of the affected layers have low chroma and many are mottled. The low chroma can be the color of reduced iron or the color of uncoated sand and silt particles from which iron has been removed. Symbol "g" is not used for soil materials of low chroma, such as some shales or E horizons, unless they have a history of wetness. If "g" is used with "B", pedogenic change in addition to gleying is implied. If no other change has taken place, the horizon is designated Cg.

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 organosesquioxide 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 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.

k *Accumulation of carbonates*

This symbol is used to indicate accumulation of alkaline earth carbonates, commonly calcium carbonate.

m *Cementation or induration*

This symbol is used to indicate continuous or nearly continuous cementation. Symbol is used only for horizons that are more than 90 percent cemented, though they may be fractured. Roots penetrate "m" horizons only through cracks. The cementing material is also symbolized. If 90 percent or

more of the horizon is cemented by carbonates, "km" is used; by silica, "qm"; by iron, "sm"; by gypsum, "ym"; by both lime and silica, "kqm"; by salts more soluble than gypsum, "zm".

n *Accumulation of sodium*

This symbol is used to indicate accumulation of exchangeable sodium.

o *Residual accumulation of sesquioxides*

This symbol is used to indicate residual accumulation of sesquioxides.

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.

q *Accumulation of silica*

This symbol is used to indicate accumulation of secondary silica. If silica cements the layer and cementation is continuous or nearly continuous, "qm" is used.

r *Weathered or soft bedrock*

This symbol is used with "C" to indicate layers of soft bedrock or saprolite, such as weathered igneous rock; partly consolidated soft sandstone, siltstone, or shale; roots cannot enter except along fracture planes. The material can be dug with a spade.

s *Illuvial accumulation of sesquioxides and organic matter*

This symbol is used with "B" to indicate the accumulation of illuvial, amorphous, dispersable 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 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.

v *Plinthite*

This symbol is used to indicate the presence of iron-rich, humus-poor, reddish material that is firm or very firm when moist and that hardens irreversibly when exposed to the atmosphere and to repeated wetting and drying. These properties are characteristic of plinthite.

w *Development of color or structure*

This symbol is used with "B" to indicate development of color and/or structure with little or no apparent illuvial accumulation of material. It should not be used as a substitute for a transitional horizon.

x *Fragipan character*

This symbol is used to indicate genetically developed firmness, brittleness, or high bulk density. These features are characteristic of fragipans, but some horizons designated "x" do not have all properties of a fragipan.

y *Accumulation of gypsum*

This symbol is used to indicate accumulation of gypsum.

z *Accumulation of salts more soluble than gypsum*

This symbol is used to indicate accumulation of salts more soluble than gypsum.

Conventions for using letter suffixes.--Many master horizons and layers that are symbolized by a single capital letter will have one or more lower case letter suffixes. Common exceptions are an undisturbed A horizon and many, if not most, E and C horizons and layers. Seldom are more than three suffixes needed.

When letter suffixes are used, they immediately follow the capital letter. If a surface horizon is disturbed, only "p" is used except where there are surface accumulations of $CaCO_3$, $CaSO_4$ or more soluble salts.

When more than one suffix is needed, the following letters, if used, are written first: a, e, i, h, r, s, t, and w. Except for Bhs or Crt[4] horizons, none of these letters are used in combination in a single horizon.

A horizon is never designated Bth, Bts, or Btw, though a Bw, Bs, or Bh horizon may be above or below a

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4. Indicating weathered bedrock or saprolite in which clay skins are present.

Bt horizon. A B horizon that has a significant accumulation of clay and also shows evidence of development of color or structure, or both, is designated Bt, ("t" has precedence over "w", "s", and "h"). A B horizon that is gleyed or that has accumulations of carbonates, silica, gypsum, salts more soluble than gypsum, or residual accumulation of sesquioxides carries the appropriate symbol--g, k, q, y, z, or o. If illuvial clay is also present, "t" precedes the other symbol: Bto. Suffixes "h", "s", and "w" are not used with g, k, q, y, z, or o.

If a horizon is buried, the suffix "b" is written last. Suffix "b" is used only for buried mineral soils. If more than one suffix is needed and the horizon is not buried, these symbols, if used, are written last: c, f, g, m, and x. Some examples: Btc, Ckm, and Bsv.

Lower case letter suffixes are not used with transitional horizons unless needed for explanatory purposes; for example, use of "k" is appropriate in the sequence A-ACk1-ACk2-AC-C to indicate an accumulation of carbonates in the upper parts of the AC horizon.

Vertical subdivision.--Commonly a horizon or layer designated by a single combination of letters needs to be subdivided. The Arabic numerals used for this purpose always follow all letters. Within a C, for example, successive layers could be C1, C2, C3, etc.; or if the lower part is gleyed and the upper part is not, the designations could be C1-C2-Cg1-Cg2 or C-Cg1-Cg2-R.

These conventions apply whatever the purpose of subdivision. In many soils, horizons that would be identified by one unique set of letters are subdivided on the basis of evident morphological features, such as structure, color, or texture. These divisions are numbered consecutively. The numbering starts with 1 at whatever level in the profile any element of the letter symbol changes. Thus Bt1-Bt2-Btk1-Btk2 is used, not Bt1-Bt2-Btk3-Btk4. The numbering of vertical subdivisions within a horizon is not interrupted at a discontinuity (indicated by a numerical prefix) if the same letter combination is used in both materials: Bs1-Bs2-2Bs3-2Bs4 is used, not Bs1-Bs2-2Bs1-2Bs2.

Sometimes, thick layers are subdivided during sampling for laboratory analyses even though differences in morphology are not evident in the field. These layers need to be identified, and this is done simply by numbering each subdivision consecutively within a layer having a unique symbol, starting at the top. For example, four layers of a Bt horizon sampled by 10-cm increments would be designated Bt1, Bt2, Bt3, Bt4.

Discontinuities.--In mineral soils Arabic numerals are used as prefixes to indicate discontinuities. Wherever needed, they are used preceding A, E, B, C, and R. These prefixes are distinct from Arabic numerals used as suffixes to denote vertical subdivisions.

A discontinuity is a significant change in particle-size distribution or mineralogy that indicates a difference

in the material from which the horizons formed or, except for some buried soils, a significant difference in age. Symbols to identify discontinuities are used only when they will contribute substantially to the reader's understanding of relationships among horizons. The significance of a given kind of discontinuity may be large in one soil and small in another, or even large in one horizon and small in another of the same profile. Stratification common to soils formed in alluvium is not designated as discontinuities even if particle size distribution differs markedly from layer to layer unless genetic horizons have formed in the contrasting layers.

Where a soil has formed entirely in one kind of material, a prefix is omitted from the symbol; the whole profile is material 1. Similarly, the uppermost material in a profile having two or more contrasting materials is understood to be material 1, but the number is omitted. Numbering starts with the second layer of contrasting material, which is designated "2". Underlying contrasting layers are numbered consecutively. Even though a layer below material 2 is similar to material 1, it is designated "3" in the sequence. The numbers indicate a change in the material, not the type of material. Where there are two or more consecutive horizons in the material, not the type of material. Where two or more consecutive horizons formed in one kind of material, the same prefix number is applied to all of the horizon designations in that material: Ap-E-Bt1-2Bt2-2Bt3-2BC. The number suffixes designating subdivisions of the Bt horizon continue in consecutive order across the discontinuity.

If an R layer is below a soil that formed in residuum and the material of the R layer is presumed to be like that from which the material of the soil weathered, the Arabic number prefix is not used. If the R layer would not produce material like that in the solum, the number prefix is used, as in A-Bt-C-2R or A-Bt-2R. If part of the solum formed in residuum, "R" is given the appropriate prefix: Ap-Bt1-2Bt2-2Bt3-2C1-2C2-2R.

Buried horizons (designated "b") are special problems. A buried horizon is obviously not in the same deposit as horizons in the overlying deposit. Some buried horizons, however, formed in material lithologically like that of the overlying deposit. A prefix is not used to distinguish material of such buried horizons. If the material in which a horizon of a buried soil formed is lithologically unlike that of the overlying material, the discontinuity is designated by number prefixes and the symbol for a buried horizon is used as well: Ap-Bt1-Bt2-BC-C-2Ab-2Btb1-2Btb2-2C.

In organic soils, discontinuities between different kinds of layers are not identified. In most cases the differences are shown by the letter suffix designations, if the different layers are organic, or by the master symbol if the different layers are mineral.

Use of the prime.--Identical designations may be appropriate for two or more horizons or layers separated by at least one horizon or layer of a different kind in the same pedon. The sequence A-E-Bt-E-Btx-C is an

example: the soil has two E horizons. To make communication easier, the prime is used with the master horizon symbol of the lower of two horizons having identical letter designations: A-E-Bt-E'-Btx-C. The prime is applied to the capital letter designation, and any lower case symbols follow it: B't. The prime is not used unless all letters of the designations of two different layers are identical. Rarely, three layers have identical letter symbols; a double prime can be used: E".

The same principle applies in designating layers of organic soils. The prime is used only to distinguish two or more horizons that have identical symbols: Oi-C-O'i-C' or Oi-C-Oe-C'. The prime is added to the lower C layer to differentiate it from the upper.

Sample Horizon Sequences

The following examples illustrate some common horizon and layer sequences of important kinds of soil and the use of conventions for designations. The examples were selected from soil descriptions on file and modified to reflect present conventions.

Mineral soils:

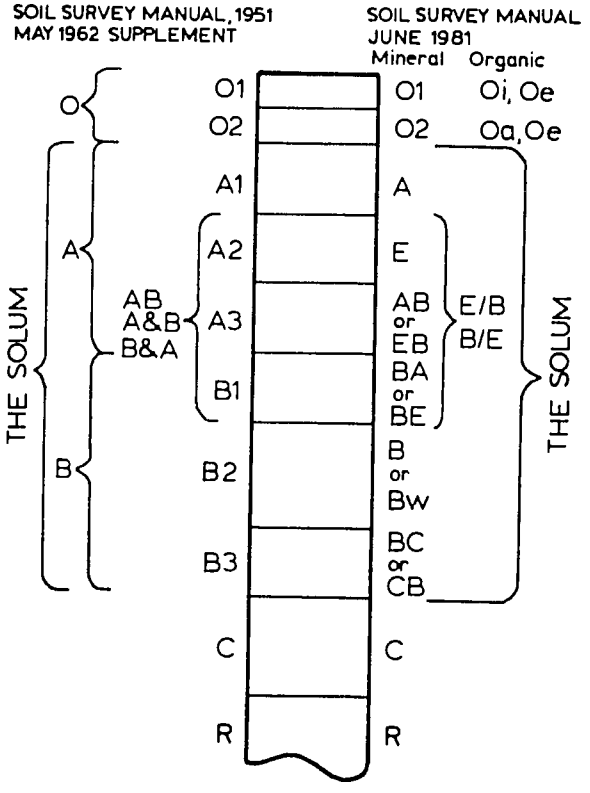
Typic Hapludoll: A1-A2-Bw-BC-C
Typic Haploboroll: Ap-A-Bw-B1-Bky1-Bky2-C
Pachic Haploboroll: Ap-A-Bw1-Bw2-BC-Ab-Bwb1-Bwb2-2C
Typic Argialboll: Ap-A-E-Bt1-Bt2-BC-Ck
Typic Argiaquoll: A-AB-BA-Btg-BCg-Cg
Entic Haplorthod: O1-O2-Bs1-Bs2-BC-C
Typic Haplorthod: Ap-E-Bhs-Bs-BC-C1-C2
Typic Fragiudalf: O-A-E-BE-Bt1-Bt2-B/E-B't1-B't2-Btx1-Btx2-C
Typic Haploxeralf: A1-A2-A3-2Bt1-2Bt2-2Bt3-2BC-2C
Glossoboric Hapludalf: Ap-E-B/E-Bt1-Bt2-C
Typic Hapludult: O-A1-A2-BA-Bt1-Bt2-BC-C
Arenic Plinthic Paleudult: Ap-E-Bt-Btc-Btv1-Btv2-BC-C
Typic Haplargid: A-Bt-Bk1-Bk2-C
Entic Durorthid: A-Bw-Bq-Bqm-2Ab-2Btkb-3Byb-3Bqmb-3Bqkb
Typic Dystrochrept: Ap-Bw1-Bw2-C-R
Typic Fragiochrept: Ap-Bw-E-Bx1-Bx2-C
Typic Haplaquept: Ap-AB-Bg1-Bg2-BCg-Cg
Typic Udifluvent: Ap-C-Ab-C'
Typic Pellustert: Ap-A-AC-C1-C2

Organic soils:

Typic Medisaprist: Op-Oa1-Oa2-Oa3-C
Typic Sphagnofibrist: Oi1-Oi2-Oi3-Oe
Limnic Borofibrist: Oi-C-Oi1-Oi2-C'-Oe-C"
Lithic Cryofolist: Oi-Oe-R

Single sets of designators do not cover all situations, and some improvising has to be done. For example, Alfic Udipsamments have lamellae that are separated from each other by eluvial layers. Since it is generally not practical to describe each lamella and eluvial layer as a separate horizon, they are combined but the components are described separately. One horizon would then contain several lamellae and eluvial layers and might be designated an **E and Bt** horizon. The complete horizon sequence for this soils could be: Ap-Bw-E and Bt1-E and Bt2-C.

CHANGES IN MASTER HORIZON DESIGNATIONS



Horizon Designations

A comparison of the old and new systems

1. The purpose of using horizon designations remains unchanged. They reflect the describer's interpretations of the genetic relationships between the horizons in a soil.

2. Capital letters, lowercase letters, and Arabic numerals are used to form the horizon designators.

   a. Capital letters are used to designate master horizons. This convention is unchanged.

   b. Lowercase letters are used as suffixes to indicate specific characteristics of the master horizon. This convention is unchanged.

   c. Arabic numerals are used as suffixes to indicate vertical subdivisions within a horizon and as prefixes to indicate discontinuities. This is a change. Previously, Arabic numerals were used as suffixes to indicate a kind of O, A, or B horizon and indicate vertical subdivisions of a horizon, and Roman numerals were used as prefixes to indicate discontinuities.

3. The symbols used for many horizon characteristics have been changed. The comparison of symbols used to designate master horizons and subordinate distinctions within master horizons can be only approximate. Some designations for master horizons in the old system can best be equated with a combination of master horizon symbol and subordinate symbol in the new system.

   a. Master horizons

Old	New
O	O
O1	Oi, Oe
O2	Oa, Oe
A	A
A1	A
A2	E
A3	AB or EB
AB	---
A&B	E/B
AC	AC
B	B
B1	BA or BE
B&A	B/E
B2	B or Bw
B3	BC or CB
C	C
R	R

   b. Subordinate distinctions within master horizons (continued on next page)

Old	New	
---	a	highly decomposed organic matter
b	b	buried soil horizon
cn	c	concretions or nodules
---	e	intermediately decomposed organic matter
f	f	frozen soil
g	g	strong gleying
h	h	illuvial accumulation of organic matter
---	i	slightly decomposed organic matter
ca	k	accumulation of carbonates
m	m	strong cementation
sa	a	accumulation of sodium
---	o	residual accumulation of sesquioxides
p	p	plowing or other disturbance
si	q	accumulation of silica
r	r	weathered or soft bedrock
ir	s	illuvial accumulation of sesquioxides
t	t	accumulation of clay
---	v	plinthite
---	w	color or structural B
x	x	fragipan character
cs	y	accumulation of gypsum
sa	z	accumulation of salts

4. Primes are used in both the old and new systems, but the conventions for using them are different. In the old system primes were used to identify the lower sequum of a soil having two sequa, although not for a buried soil. In the new system it may be appropriate to give the same designation to two or more horizons in a pedon if the horizons are separated by a horizon of a different kind. The prime is used on the lower of the two horizons having identical letter designations. If three horizons have identical designations a double prime is used on the lowest.

To Request Assistance

To request assistance or obtain more information about the Soil Management Support Services (BST-1229-P-AG-2178) ask your AID country mission or write to:

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