

MASTER HORIZONS AND LAYERS

The capital letters **H**, **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 designation. Most horizons and layers are given a single capital letter symbol, but some require two. Currently seven master horizons and layers are recognized.

The master horizons and their subdivisions represent layers which show evidence of change and some layers which have not been changed. Most are genetic soil horizons, reflecting a qualitative judgement about the kind of changes which have taken place. Genetic horizons are not equivalent to diagnostic horizons, although they may be identical in soil profiles. Diagnostic horizons are quantitatively defined features used in classification.

H horizons or layers: Layers dominated by organic material, formed from accumulations of undecomposed or partially decomposed organic material at the soil surface which may be underwater. All **H** horizons are saturated with water for prolonged periods or were once saturated but are now artificially drained. An **H** horizon may be on top of mineral soils or at any depth beneath the surface if it is buried.

O horizons or layers: Layers dominated by organic material, consisting of undecomposed or partially decomposed litter, such as leaves, needles, twigs, moss, and lichens, which has accumulated on the surface; they may be on top of either mineral or organic soils. **O** horizons are not saturated with water for prolonged periods. 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. An **O** layer may be at the surface of a mineral soil or at any depth beneath the surface if it is buried. An 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 horizons: Mineral horizons which formed at the surface or below an **O** horizon, in which all or much of the original rock structure has been obliterated and which are characterized by one or more of the following:

- an accumulation of humified organic matter intimately mixed with the mineral fraction and not displaying properties characteristic of **E** or **B** horizons (see below);
- properties resulting from cultivation, pasturing, or similar kinds of disturbance; or
- a morphology which is different from the underlying **B** or **C** horizon, resulting from processes related to the surface.

If a surface horizon has properties of both **A** and **E** horizons but the dominant feature is an accumulation of humified organic matter, it is designated an **A** horizon. In some places, such as 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 may be unaltered or only slightly altered by weathering. Such an horizon is designated **A** because it is at the surface. Examples of soils which may have a different structure or morphology due to surface processes are Vertisols, soils in pans or playas with little vegetation, and soils in deserts. However, recent alluvial or aeolian 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 particles, and in which all or much of the original rock structure has been obliterated.

An **E** horizon is usually, but not necessarily, lighter in colour than an underlying **B** horizon. In some soils the colour is that of the sand and silt particles, but in many soils coatings of iron oxides or other compounds mask the colour of the primary particles. An **E** horizon is most commonly differentiated from an underlying **B** horizon in the same soil profile by colour of a higher value or lower chrome, or both; 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**, **O** or **H** horizon, and in which the dominant features are the obliteration of all or much of the original rock structure, together with one or a combination of the following:

- illuvial concentration, alone or in combination, of silicate clay, iron, aluminum, humus, carbonates, gypsum or silica;
- evidence of removal of carbonates;
- residual concentration of sesquioxides;
- coatings of sesquioxides that make the horizon conspicuously lower in value, higher in chrome, or redder in hue than overlying and underlying horizons without apparent illuviation of iron;
- alteration that forms silicate clay or liberates oxides or both and that forms a granular, blocky, or prismatic structure if volume changes accompany changes in moisture content; or

- brittleness.

All kinds of **B** horizons are, or were originally, subsurface horizons. Included as **B** horizons are layers of illuvial concentration of carbonates, gypsum, or silica that are the result of pedogenetic 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 either coat rock fragments or are on finely stratified unconsolidated sediments, whether the films were formed in place or by illuviation; layers into which carbonates have been illuviated but that are not contiguous to an overlying genetic horizon; and layers with gleying but no other pedogenetic changes.

C horizons or layers: Horizons or layers, excluding hard bedrock, that are little affected by pedogenetic processes and lack properties of **H**, **O**, **A**, **E**, or **B** horizons. Most are mineral layers, but some siliceous and calcareous layers such as shells, coral and diatomaceous earth, 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. Plant roots can penetrate **C** horizons, which provide an important growing medium.

Included as **C** layers are sediments, saprolite, and unconsolidated bedrock and other geologic materials that commonly slake within 24 hours when air dry or drier chunks are placed in water and 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 pedogenetic are those not related to overlying horizons. Layers having accumulations of silica, carbonates, or gypsum, even if indurated, may be included in **C** horizons, unless the layer is obviously affected by pedogenetic processes; then it is a **B** horizon.

R layers: Hard bedrock underlying the soil.

Granite, basalt, quartzite and indurated limestone or sandstone are examples of bedrock that are designated **R**. Air dry or drier chunks of an **R** layer when placed in water will not slake within 24 hours. The **R** layer is sufficiently coherent when moist to make hand digging with a spade impractical, although it may be chipped or scraped. Some **R** layers can be ripped with heavy power equipment. The bedrock may contain cracks, but these are so few and so small that few roots can penetrate. The cracks may be coated or filled with clay or other material.

Each master horizon may be subdivided into specific subordinate layers that have a unique identity. These subordinate layers are identified by using lowercase letters as suffixes to the master horizons. Nine of these suffixes are commonly used with master horizons in mineral soil materials and three are used with organic (O) horizons. The letters are a, b, e, g, h, i, p, r, s, t, w, and x. They are defined below. The most common subhorizons in West Virginia are e, g, i, p, t, w, and x.

- a. Highly decomposed organic material - This symbol is used with O (Oa) to indicate the most highly decomposed organic materials, which have a fiber content of less than 17 percent (by volume) after rubbing.
- b. Buried genetic horizon - This symbol is used in mineral soils to indicate identifiable buried horizons with major genetic features that were developed before burial. 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. This symbol is not used in organic soils, nor is it used to separate an organic layer from a mineral layer. (Examples: Ab, Eb, and Btb)
- c. Organic material of intermediate decomposition - This symbol is used with O (Oe) to indicate organic materials of intermediate decomposition. The fiber content of these materials is 17 to 40 percent (by volume) after rubbing.
- d. Strong gleying - This symbol indicates either that iron has been reduced and removed during soil formation or that saturation with stagnant water has preserved it in a reduced state. Most of the affected layers have chroma of 2 or less (gray color) as the predominant color of the horizon, and many have redox concentrations (reddish or brownish spots within the gray). The symbol g is not used for materials of low chroma that have no history of wetness, such as some shales or E horizons. If g is used with B, pedogenic change in addition to gleying is implied. If no other pedogenic change besides gleying has taken place, the horizon is designated Cg. (Examples: Bg, Cg)
- e. Illuvial accumulation of organic matter - This symbol is used with B (Bh) to indicate the accumulation of illuvial, amorphous, dispersible complexes of organic matter and sesquioxides (oxides of Fe and Al) if the sesquioxide component is dominated by aluminum but is present only in very small quantities. The symbol h is also used in combination with s as "Bhs" if the amount of the sesquioxide component is significant but the color value and chroma, moist, of the horizon are 3 or less.

- f. Slightly decomposed organic material - This symbol is used with O (Oi) to indicate the least decomposed of the organic materials. The fiber content of these materials is 40 percent or more (by volume) after rubbing.
- g. Tillage or other disturbance - This symbol indicates a disturbance of the surface layer by mechanical means, pasturing, or similar uses. A disturbed organic horizon is designated Op. A disturbed mineral horizon is designated Ap even though it is clearly a former E, B, or C horizon.
- h. Weathered or soft bedrock - This symbol is used with C (Cr) to indicate cemented layers (moderately cemented or less cemented). Examples are weathered igneous rock and partly consolidated sandstone, siltstone, or shale. The excavation difficulty is low to high.
- i. Illuvial accumulation of sesquioxides and organic matter - This symbol is used with B (Bs) to indicate an accumulation of illuvial, amorphous, dispersible complexes of organic matter and sesquioxides if both the organic-matter and sesquioxide components are significant and if either the color value or chroma, moist, of the horizon is 4 or more. The symbol is also used in combination with h as "Bhs" if both the organic-matter and sesquioxide components are significant and if the color value and chroma, moist, are 3 or less.
- j. Accumulation of silicate clay - This symbol indicates an accumulation of silicate clay that either has formed within a horizon and subsequently has been translocated within the horizon or has been moved into the horizon by illuviation (moved down from horizon above), or both. At least some part of the horizon should show evidence of clay accumulation either as coatings on surfaces of peds or in pores, as lamellae, or as bridges between mineral grains.
- k. Development of color or structure - This symbol is used with B (Bw) to indicate the development of color or structure, or both, with little or no apparent illuvial accumulation of material. It should not be used to indicate a transitional horizon.
- l. Fragipan character - This symbol indicates a genetically developed layer (Bx) that has a combination of firmness and brittleness and commonly a higher bulk density than the adjacent layers. Some part of the layer is physically root-restrictive.