4.8 Horizon Descriptions (CSSC)

Definitions

O horizons: These horizons occur in Organic soils and commonly at the surface of mineral soils. They contain more than 17 percent organic carbon. Two groups of these horizons are recognized, the O horizons (peat materials) and the L, F, and H horizons (folic materials), which develop in soil under forest vegetation. (CSSC)

A horizon: This mineral horizon forms at or near the surface in the zone of leaching or eluviation of materials in solution or suspension, or of maximum in situ accumulation of organic matter, or both. (CSSC)

B horizon: This mineral horizon is characterized by enrichment in organic matter, sesquioxides, or clay; or by the development of soil structure; or by a change of color denoting hydrolysis, reduction, or oxidation. (CSSC)

C horizon: This mineral horizon is comparatively unaffected by the pedogenic processes operative in A and B horizons, except the process of gleying, and the accumulation of calcium and magnesium carbonates and the more soluble salts. (CSSC)

R layer: This consolidated bedrock layer is too hard to break by hand or to dig with a spade when moist. It does not meet the requirements of a C horizon. The boundary between the R layer and any overlying unconsolidated material is called a lithic contact. (CSSC)

W layer: This layer of water may occur in Gleysolic, Organic, or Cryosolic soils. Hydric layers in Organic soils are a kind of W layer as is segregated ice formation in Cryosolic soil. (CSSC)

Concepts

The Canadian System of Soil Classification (CSSC) recognizes organic and mineral horizons. The organic horizons occur in Organic soils and at the surface of mineral soils. The organic horizons contain more than 17% organic carbon (about 30% or more organic matter) by weight compared to mineral horizons enriched with organic matter, which, by definition, contain less than 17% organic carbon by weight.

Organic horizons (**O** horizons) develop from mosses, rushes, and woody materials, and are commonly found in swamps, bogs, and poorly drained areas (Table 4.4). They are further classified into **Of, Om,** and **Oh** horizons, according to the degree of decomposition that has occurred. These horizons are generally refered to as peat materials. Soils with **O** horizons belong to the Organic order.

The **L, F,** and **H** layers are the “litter layers” found on forest floors (Table 4.4). They are normally associated with upland forested soils. The classification is based on the amount of de-

composition of the litter material that has taken place. These horizons are generally refered to as folic materials. They are found in forested soils belonging to all soil orders, except the Organic order, in the Canadian System of Soil Classification.

Table 4.4. Names and descriptions of common organic horizons found in Canadian soils

Organic Horizons

Of: fibrous

Om: mesic

Oh: humic

L: plant structures are still identifiable

F: plant structures are partially decomposed by soil fauna and/or fungi

H: well humified, original structures are not identifiable

The mineral horizons of the soil that have been altered by surface-related soil forming processes are called **A** horizons. These horizons are at the top of the soil profile. The **B** horizons are normally found below the **A** horizon(s), and above the **C** horizon(s). Many kinds of B horizons can be identified. The bottom of a soil pit will have material that has not been modified much by soil forming processes. This material is called the **C** horizon.

It is possible to encounter different kinds of parent materials under the control section, which is 40 cm deep in mineral soils and 160 cm deep in organic soils in the Canadian System of Soil Classification. In this case, the different kinds of parent materials are identified by placing a Roman numeral before the letter C. Thus, it is possible to have **IC**, **IIC**, **IIIC** and so on. These layers are all unconsolidated mineral layers but have markedly different properties.

Lowercase horizon suffixes are used to further differentiate soil master horizons. For example, **Bm**, **Bt**, **Bn**, **Bnt**, **Bf**, **Bhf**, **Bfh** and **Bg** are different kinds of B horizons which occur in distinctly different pedons. The list of lowercase suffixes and their descriptions are presented in Table 4.5, and the names and descriptions of common mineral horizons found in Canadian soils are presented in Table 4.6.

It is possible to have horizons which have more than one distinct characteristic. In such cases, the lowercase suffixes are listed sequentially. The dominant characteristic is listed first. For example, **Ae** is a surface, eluvial horizon, **Ag** is a surface horizon which is gleyed, and **Aeg** is a surface, eluvial horizon which is also gleyed. The suffix **j** is a modifier of suffixes **e**, **f**, **g**, **n**, **t**, and **v**. It is used to denote an expression of, but failure to meet, the specified limits of the suffix it modifies. For example, **Aej** denotes a surface eluvial horizon that is thin, discontinous, or slightly discernible. It is also possible to describe two characteristics which are not fully expressed. For example, **Bfjgj** means a **B** horizon with weak expressions of **f** and **g**.

Table 4.5. Lowercase horizon suffixes in the Canadian System of Soil Classification

b A buried soil horizon.

c A cemented (irreversible) pedogenic horizon such as ortstein, placic or duric horizons.

ca A horizon with secondary carbonate enrichment where the concentration of lime exceeds that in the unenriched parent material.

cc Cemented (irreversible) pedogenic concretions.

e A horizon characterized by the removal of clay, iron, aluminum or organic matter.

f A horizon enriched with amorphous material, principally Fe and Al, combined with organic matter. It usually has a chroma of 3 or more.

g A horizon characterized by gray colors, or by prominent mottling indicative of permanent or periodic intensive reduction. Some examples of gleyed horizons are Aeg, Btg, Bg and Cg.

h A horizon enriched with organic matter.

j This is used as a modifer of lowercase suffixes (e, g, n and t) to denote an expression of, but a failure to meet, the specified limit of the suffix it modifies. For example, Aej is an eluvial horizon that is thin, discontinuous, or faintly discernible.

k Presence of carbonate.

m A horizon slightly altered by hydrolysis, oxidation or solution, or all three, to give a change in color, or structure, or both.

n A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less.

p A layer disturbed by human activites. For example, a cultivated surface horizon is Ap.

s A horizon containing detectable soluble salts.

sa A horizon of secondary enrichment of salts more soluble than Ca and Mg carbonates, where the concentration of salts exceeds that in the unenriched parent material.

ss Denotes the presence of several (more than two) slickensides.

t A horizon enriched with silicate clay, as indicated by a higher clay content (by specified amounts) than the overlying eluvial horizon. It must have a thickness of at least 5 cm, with oriented clay in some pores or on ped surfaces or both. It usually has a higher ratio of fine (less than 0.2 um) to total clay than in the C horizon.

u A horizon that is markedly disrupted by physical or faunal processes other than cryoturbation or argillipedoturbation caused by Vertisolic processes.

v A horizon affected by argillipedoturbation as manifested by disruption and mixing caused by shrinking and swelling of the soil mass.

x A horizon of fragipan character.

y A horizon affected by cryoturbation.

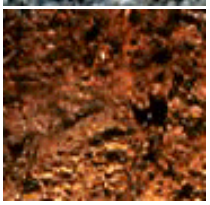
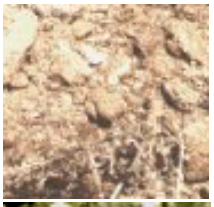
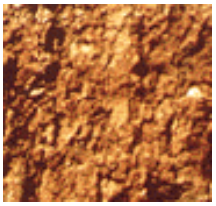
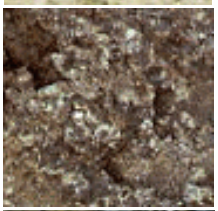
z A perennially frozen layer.

Some examples of horizons with more than one characteristic which are commonly encountered in the Canadian System of Soil Classification, are:

- **Ahe**, **Aeg**, and **Aej**;
- **Bhf**, **Bfg**, **Bhfg**, **Btg**, **Btj**, **Bfgj**, **Bmgj**, **Bfj**, **Btnj**, **Bnj**, **Bvj**, **Bvk**, **Bmy**, and **Bmz**;
- **Ckg**, **Ccag**, **Csg**, **Csag**, **Csk**, **Cgy**, and **Cygj**.

It is important to note that the suffixes vary between different classification systems. For example, in the Canadian System, the suffix **y** is a horizon affected by cryoturbation and **z** is a perennially frozen layer, but, in the U. S. Soil Classification System and the World Reference Base for

Table 4.6. Names and descriptions of common mineral horizons found in Canadian soils

	**Ah:** enriched in organic carbon, because of root decay and/ or soil microbial and faunal activity		**Bg:** gleyed due to frequent saturation
	**Ae:** depleted of clay, iron or organic matter. Has a platy structure and an ash-white color when dry		**Bfh:** enriched in iron (Fe) and organic materials from Ae horizon
	**Ahe:** a transition between Ah and Ae. This horizon has organic matter enrichment and clay depletion		**Ck:** contains free carbonates from parent material
	**Bm:** slightly modified structure and/or color		**Cca:** enriched in carbonates from horizons above
	**Bt:** enriched in clay from Ae horizon from above		**Csk:** contains carbonates and salts, normally gypsum
	**Bn:** high concentration of exchangeable Na^+ on clay surfaces		**Cg:** gleyed and mottled because it is normally saturated

Soil Resources, the suffix **y** represents a horizon which indicates an accumulation of gypsum and **z** represents a horizon which indicates an accumulation of salts which are more soluble than gypsum.

Another reason for differences in horizon suffixes is related to the type of soils which are classified. For example, the Canadian System of Soil Classifcation only describes soils which occur in Canada and does not have suffixes for tropical soils. On the other hand, the U. S. Classification System and the World Reference Base for Soil Resources have been used to classify soils of the whole world and have a larger number of horizon suffixes. Correlation tables for master horizons (Table 4.10) and horizon suffixes (Table 4.11) for the Canadian and U. S. Classification Systems, and the World Reference Base for Soil Resources are presented in Section 4.11. Horizon suffixes represent different kinds of horizons, which are critical in classifying soils (Section 5).