



Towards a Taxonomic Classification of Humus Forms: Third Approximation

The importance of humus form or forest floor as a principal component of terrestrial forest ecosystems has led to the development of a taxonomic classification of humus forms for BC (first approximation: Klinka *et al.* 1981; second approximation: Green *et al.* 1993). This classification, as all others, is based on the field-observable (morphological) features because we expect that they reflect differences in the nature and development of humus forms. However, there is a continuing need to test (1) whether humus forms that appear different are in fact different in their physical, chemical, and biotic properties, and (2) the portability of the classification outside the area in which it was developed. As a result of recent studies of the biotic component of humus forms and recent testing of the classification outside British Columbia (Scandinavia, southeastern Russia, and northeastern China), we have recognized several new diagnostic horizons, and hence new taxa. In this pamphlet, we present synopsis of the third approximation of the classification for review and testing. For more detailed information on the background, methodology, and classification of humus forms, the readers should consult Green *et al.* (1993).

Each humus form is represented by the sequence of organic and mineral horizons that constitute the humus form profile. Identification of a humus form, *i.e.*, giving it a name, requires description of the humus form profile – the identification of master and subordinate horizons. For this reason we have included a description of the horizon designations as well as a synopsis of the classification and a key to the identification of humus forms.

Horizon designations and definitions

Master horizon

Subordinate horizon

Freely-drained upland horizons

- L** (litter); a surface horizon that consists of relatively fresh plant residues readily identifiable as to their origin.
 Ln (new); an L horizon that consists of newly accreted and essentially fresh, non-fragmented plant residues.
 Lv (variative); an L horizon that consists of the plant residues showing initial decay and strong discolouration.
- S** (bryophytes); a surface horizon that consists of tissues of living bryophytes (commonly *Sphagnum* spp.) intermixed to a minor extent with litter.
- G** (graminoid); a thin surface horizon that consists of tissues of living graminoids intermixed to various extents with their residues.
- F** (fermented); an organic horizon in which partly decomposed plant residues predominate; the partial structures of plant residues are macroscopically discernible.
 Fm (mycogeneous); an F horizon in which more or less disintegrated plant residues are aggregated in a compact-matted, banded fabric interwoven by fungal hyphae (mycelia), with a tenacious consistence. If present, faunal droppings are very infrequent and localized.
 Fr (root residues); an F horizon in which fine root residues constitute nearly all fabric; fungal mycelia are infrequent and localized.
 Frm (root residue, mycogeneous); an Fm horizon in which fine root residues constitute nearly all fabric; fungal mycelia are common and frequently abundant.
 Fs (bryophytes); an F horizon that consists of partly disintegrated tissues of *Sphagnum* spp.; residues are weakly aggregated, fungal mycelia absent or very infrequent and localized.
 Fsm (bryophytes, mycogeneous); an Fs horizon with fungal mycelia but rarely as common and frequent as in the Fm horizon.
 Fz (zoogenous); an F horizon in which residues are weakly aggregated with a loose or friable consistency as result fragmentation and comminution by soil fauna; faunal droppings and dropping residues are numerous, fungal mycelia are infrequent and localized.
 Fsz (bryophytes, zoogeneous); an Fs horizon with faunal droppings but rarely as common and frequent as in the Fz horizon.
 Fa (amphi); an F horizon that has the characteristics of both Fm and Fz horizons; plant residues are aggregated into a weak to moderate, non-compact-matted fabric.
 Fsa (bryophytes, amphi); an Fs horizon with both fungal mycelia and faunal droppings but rarely as common and frequent as in the Fa horizon.
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Freely-drained upland horizons continued

H (humic); an organic horizon in which well decomposed plant residues (fine substances) predominate; the original plant structures are not macroscopically discernible.

Hf (fine); an H horizon that has a very fine granular structure; very small faunal droppings predominate in the fabric.

Hg (granular); an H horizon that has a fine (to medium) granular structure; small faunal droppings predominate in the fabric.

Hh (humic); an H horizon that has a massive (ancient) or weak, coarse, blocky structure; the colour is typically dark gray (black), the material is greasy and stains fingers when rubbed.

Hc (recalcitrant); an H horizon that contains macroscopically recognizable plant residues (roots, bark, and/or wood) imposing yellow, brown, or particularly red colours; fine substances predominate and the material is slightly greasy but does stain fingers when rubbed.

Poorly-drained, waterlogged, wetland horizons

O (organic); a wetland organic horizon

Of (fibric); a surface O horizon that consists of poorly decomposed plant residues readily identifiable as to their origin.

Om (mesic); an O horizon that consists of partly decomposed plant residues at a stage of decomposition intermediate between Of and Oh horizons.

Oh (humic); an O horizon that consists of well decomposed plant residues which for the most part have been transformed into humic materials.

Mineral horizons

A the uppermost mineral horizon that contains < 17% organic C (about 30% organic matter) by weight.

Ah (humic); an Ah horizon enriched with-organic matter.

Other designations

w (wood); any organic horizon containing >35% of the volume of solids) of coarse woody debris in various stages of decomposition.

Third Approximation: Synopsis of humus form taxa

Order Group	Characteristic humus form profiles ¹	Variation from the Orthic or true form
Mor		
Lignomor	L, Fmw or Fsw , Hw	Tenuic, Pachic, Hemic, Humic
Hemimor	L, Fm , (H)	Tenuic, Pachic
Rhizomor	L, Frm , (H)	Tenuic, Pachic
Sphagnomor	S, Fs and/or Fsm , H	Tenuic, Pachic
Humimor	L, Fm , Hh	Pachic, Hemic, Perhumic
Resimor	L, Fm , Hc	Pachic, Hemic
Modermor	L, Fm and/or Frm , Hf and/or Hg	Hemic, Humic
Lamimor	L, Fm and/or Frm , Hf and/or Hg and Hh and/or Hc	Hemic, Humic
Fibrimor	S, (F, H), Of , Om, Oh	Hemic, Sapric
Mesimor	S, (F, H), Of, Om , Oh	Fibric, Sapric
Moder		
Lignomoder	L, Faw and/or Fzw , Hw	Tenuic, Pachic, Hemic, Humic
Mormoder	L or G, Fa , H	Tenuic, Pachic, Hemic, Humic
Sphagnomoder	S, Fs and/or Fsa and/or Fsz , H	Hemic, Humic
Lamimoder	L, Fm , Frm , Fs and/or Fsm , Fa , Fsa , Fz and/or Fsz , H L, Fa , Fsa , Fz , and/or Fsz , Fm , Frm , and/or Fsm , H	Hemic, Humic, Sphagno
Leptomoder	L or G, Fz , H	Tenuic, Pachic, Hemic, Humic
Mullmoder	L or G, Fa and/or Fz , H, Ah	Hemic, Humic
Saprimoder	S or G, (Of, Om), Oh	Fibric, Mesic
Mull		
Vermimull	(L, F), Ahz	Tenuic, Pachic, Ochric, Pellic, Micro, Meso, Micro
Rhizomull	G, (F), Ahg	Tenuic, Pachic, Ochric, Pellic
Paramull	(L, F), Ah	Tenuic, Pachic, Ochric, Pellic

¹ Diagnostic horizons are printed in bold fonts; less commonly occurring, non-diagnostic horizons are given in parentheses.

Explanation of adjectives used to designate variations from the Orthic (true) variation that is thought to typify a humus form group

Adjective	Connotation
Pachic	Relatively thick humus forms.
Tenuic	Relatively thin humus forms.
Hemic	F horizons predominate in the humus form profile.
Humic	H horizons predominate in the humus form profile.
Perhumic	Humimors that have a black, massive (ancient) Hh horizon.
Sphagno	Lamimoders that have Fs and/or Fsm and Fsa and/or Fsz horizon.
Fibric	Mesimors (Saprimoders) and Hydro humus forms that have a well developed Of horizon.
Mesic	Fibrimors (Saprimoders) and Hydro humus forms that have a well developed Om horizon.
Sapric	Fibrimors, Mesimors, and Hydro humus forms that have a well developed Oh horizon.
Ochric	Mulls that have light coloured Ah horizons (moist colour value >3).
Pellic	Mulls that have dark coloured Ah horizons (moist colour value ≤3).
Macro	Mulls that have granular aggregates >5 mm.
Meso	Mulls that have granular aggregates >1 mm but ≤5 mm.
Micro	Mulls that have granular aggregates ≤1 mm.

Key to humus form groups

1a	Growing-season water table is absent, or if present, is >40 cm deep; soil is mineral but not gleysolic, or upland organic (Folisol).....	2
1b	Growing-season water table is present and ≤ 40 cm deep; soil is organic; if water table is absent, soil is gleysolic.....	16
2a	Ah horizon ≥2 cm thick is absent, if present, thickness of F and H horizons is >Ah horizon.....	3
2b	Ah horizon ≥2 cm thick is present and thickness of F and H horizons is <Ah horizon.....	15
3a	F horizon includes mycogeneous (Fm and/or Frm) horizons, other F horizons, if present, are either ≤2 cm thick or ≤25% of thickness of F horizon.....	4
3b	F horizon includes sphaginic mycogeneous (Fs and/or Fsm) horizons; other F horizons, if present, are either ≤2 cm thick or ≤25% of thickness of F horizon.....	9
3c	F horizon includes amphimorphic and/or zoogeneous (Fa and/or Fz horizons), other F horizons, if present, are either ≤2 cm thick or ≤25% of thickness of F horizon.....	10
3d	F horizon includes sphaginic amphimorphic and/or zoogeneous (Fsa and/or Fsz horizons), other F horizons, if present, are either ≤2 cm thick or ≤25% of thickness of F horizon.....	13
3e	F horizon includes both mycogeneous and amphimorphic or zoogeneous horizons with each set of horizons >2cm thick or >25% of thickness of F horizon.....	14
4a	Decaying wood comprises >35% volume in humus form profile.....	Lignomor
4b	Decaying wood comprises ≤35% volume in humus form profile.....	5
5a	H horizon is absent, or if present, is either ≤2 cm thick or ≤25% of thickness of F and H horizons.....	6
5b	H horizon >2 cm thick is present and >25% of thickness of F and H horizons.....	7
6a	Thickness of Fm horizon is >Frm horizon.....	Hemimor
6b	Thickness of Fm horizon is ≤Frm horizon.....	Resimor
7a	Hf and/or Hg horizons are present; other H horizons, if present, are either ≤2 cm thick or ≤25% of thickness of H horizon.....	Modermor
7b	Hh and/or Hr horizons are present; other H horizons, if present, are either ≤2 cm thick or ≤25% of thickness of H horizon.....	8
7c	H horizon is comprised by both sets of horizons (Hf and/or Hg and Hh and/or Hr) with each set of horizons >2cm thick or >25% of thickness of H horizon.....	Lamimor
8a	Thickness of Hh horizon is >Hc horizon.....	Humimor
8b	Thickness of Hh horizon is ≤Hc horizon.....	Rhodomor

9a	Decaying wood comprises >35% volume in humus form profile.....	Lignomor
9b	Decaying wood comprises ≤35% volume in humus form profile.....	Sphagnomor
10a	Decaying wood has >35% volume in humus form profile.....	Lignomoder
10b	Decaying wood has ≤35% volume in humus form profile.....	11
11a	Ah horizon ≥2 cm thick is present, thickness of F and H horizons is >Ah horizon	Mullmoder
11b	Ah horizon is absent or, if present, is <2cm thick	12
12a	Thickness of Fa horizon is >Fz horizon	Mormoder
12c	Thickness of Fa horizon is ≤Fz horizon	Leptomoder
13a	Decaying wood has >35% volume in humus form profile.....	Lignomoder
13b	Decaying wood has ≤35% volume in humus form profile.....	Sphagnomoder
14a	Decaying wood has >35% volume in humus form profile.....	Lignomoder
14b	Decaying wood has ≤35% volume in humus form profile.....	Lamimoder
15a	Granular (earthworm casts), zoogeneous Ah horizon is present	Vermimull
15b	Sward or turf, rhizogenous Ah horizon is present	Rhizomull
15c	Ah horizon formed by infiltration, or accumulation of organic materials by mechanical intermixing (colluvial, eolian, cryoturbation or silvoturbation).....	Paramull
16a	Soil has an organic layer >40 cm thick or ≤ 40 cm thick if a lithic, parolithic, permafrost or fragmental layer is present (recognize wetland organic horizons).....	17
16a	Soil is mineral (organic layer is ≤40 cm thick), (recognize upland organic (LFH) horizons) Return to couplet number 2 and add the prefix Hydro to the identified group	2
17a	Thickness of upland organic (L,F,H) horizons is >O horizon Return to couplet number 2 and add the prefix Hydro to the identified group	2
17b	Thickness of upland organic (L,F,H) horizons is ≤O horizon	18
18a	Oh horizon is absent, or if present, thickness of other O horizons is >Oh horizon	19
18b	Oh horizon is present and thickness of other O horizons, if present, is ≤Oh horizon	Saprimoder
19a	Thickness of Of horizon is ≤Om horizon	Fibrimor
19b	Thickness of Om horizon is ≤Of horizon	Mesimor

Reference

Green, R.N., R.L. Trowbridge, and K. Klinka. 1993. Towards a taxonomic classification of humus forms. Forest Science Monograph. 29: 1-48.

Scientia Silvica is published by the Forest Sciences Department,
The University of British Columbia, ISSN 1209-952X

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Financial support: Forest Renewal British Columbia and the Spanish Government (Ministerio de Education y Ciencia)

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