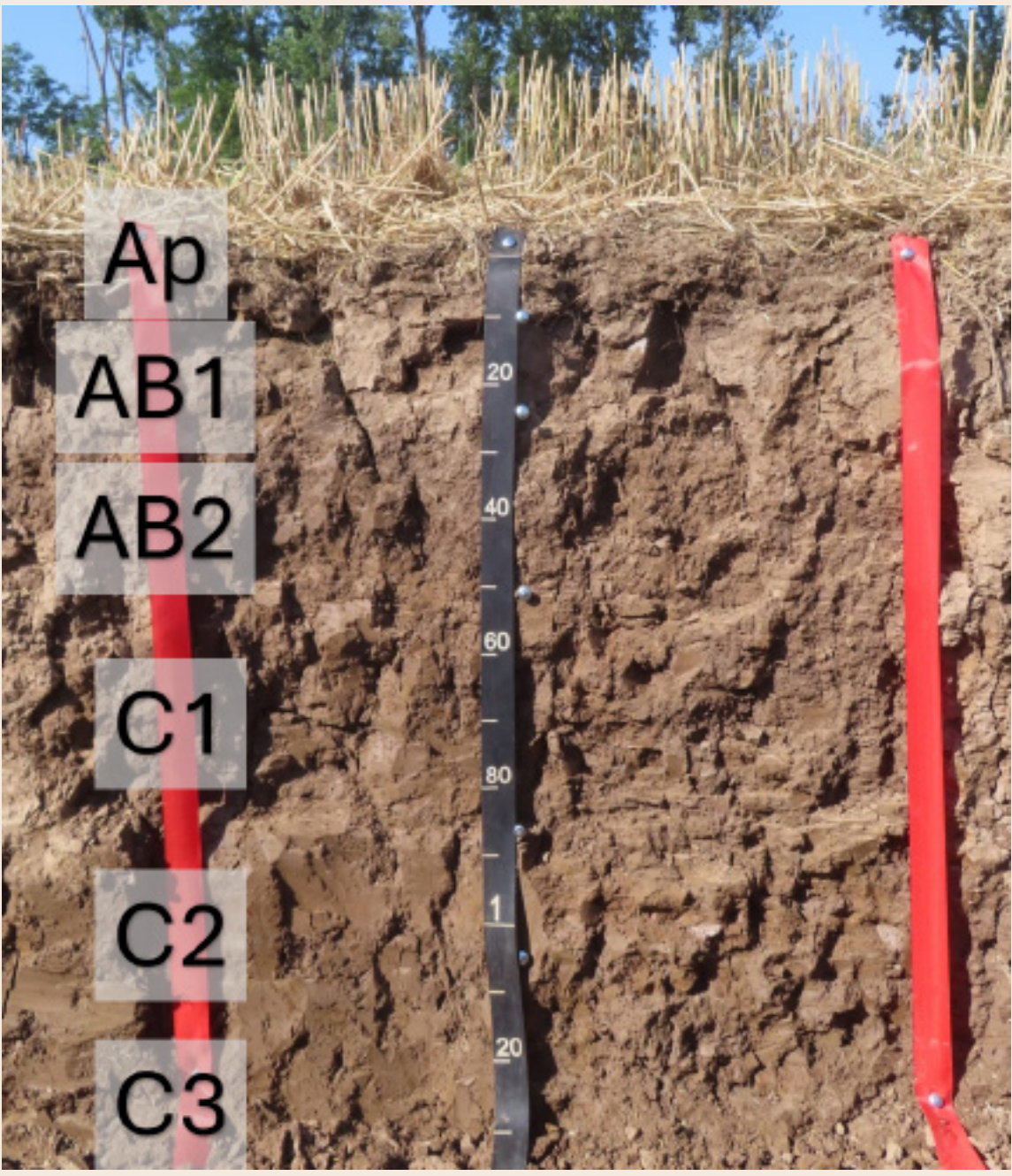
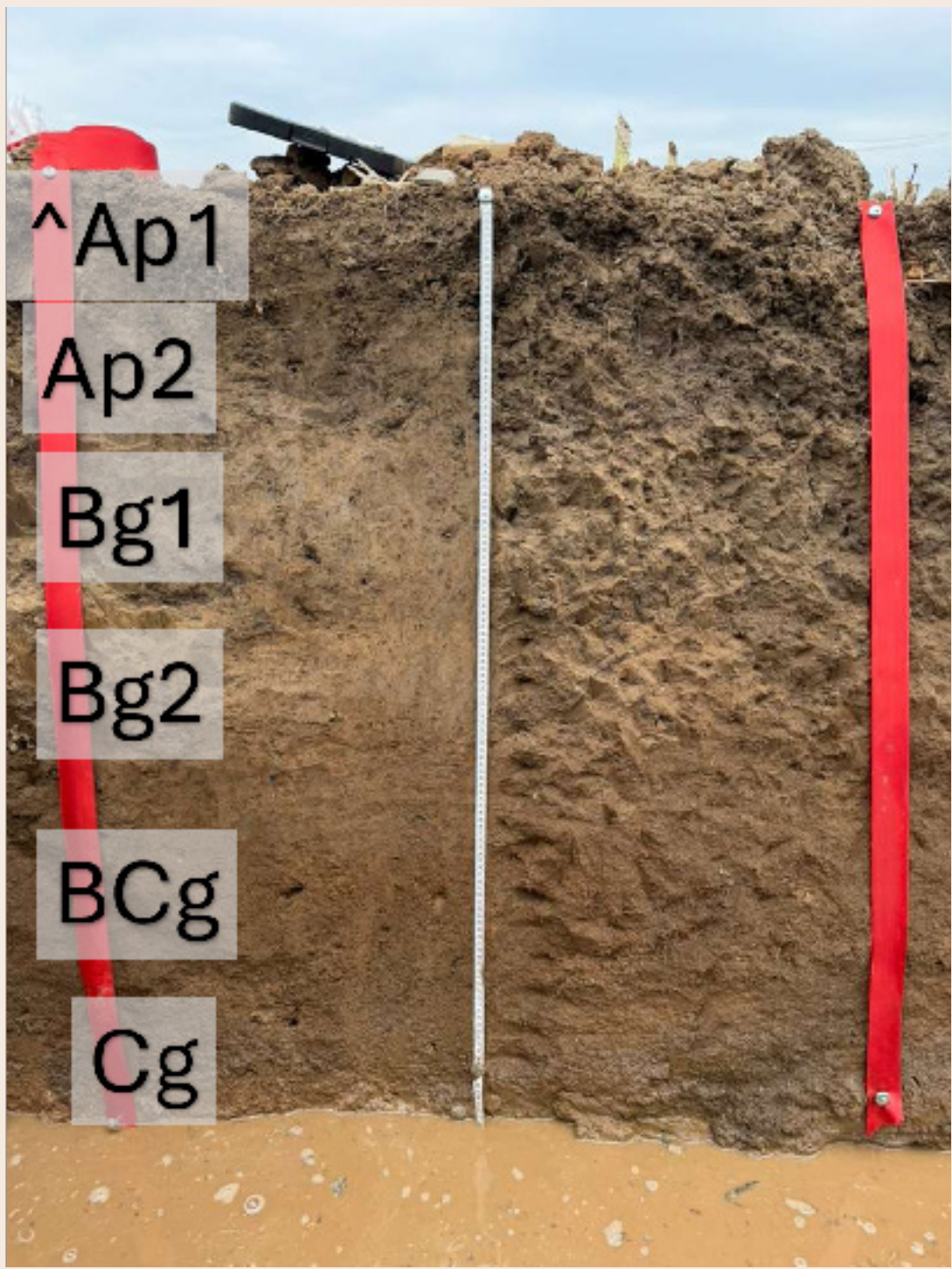


Answers for “Horizonate this soil profile!”

Soil profile 1:



Soil profile 2:



Soil profile 3:



Answers for “Horizonate this soil profile!”

Answers are based off of the World Reference Base (WRB) descriptions for soil horizons. In short:

- Capital letters are used to designate master horizons/ layers.
- Lower case letters indicate a specific characteristic about the master horizon/layer.
- Transitional layers where the characteristics of two or more master layers are superimposed on each other are indicated by a combination of master symbols, with the dominant layer listed first.
- Numbers indicate subdivisions between layers.
- Carets (^) indicate human-transported material.

Master symbols (adapted from the World Reference Base for Soil Resources, 4th edition)

Symbol	Criteria
H	Organic or organotechnic layer, not forming part of a litter layer; water saturation > 30 consecutive days in most years or drained; generally regarded as peat layer or organic limnic layer. Nota bene: • Under water saturation, completely undecomposed organic layers, consisting of 100%(by volume, related to all dead plant residues) recognizable dead plant tissues, may exist. However, most H layers underwent at least some decomposition, show < 100%(by volume) recognizable dead plant tissues and are considered to be soil horizons. • If the H is used for organotechnic layers, the suffix u is mandatory.
O	Organic horizon or organotechnic layer, not forming part of a litter layer; water saturation ≤ 30 consecutive days in most years and not drained; generally regarded as non-peat and non-limnic horizon. Nota bene: If the O is used for organotechnic layers, the suffix u is mandatory.
A	Mineral horizon at the mineral soil surface or buried; contains organic matter that has at least partly been modified in-situ; soil structure and/or structural elements created by cultivation in ≥ 50% (by volume, related to the fine earth), i.e. rock structure, if present, in < 50% (by volume); cultivated mineral layers are designated A, even if they belonged to another layer before cultivation.
E	Mineral horizon; has lost by downward movement within the soil (vertically or laterally) one or more of the following: Fe, Al, and/or Mn species; clay minerals; organic matter.
B	Mineral horizon that has (at least originally) formed below an A or E horizon; rock structure, if present, in < 50% (by volume, related to the fine earth); one or more of the following processes of soil formation: • formation of soil aggregate structure • formation of clay minerals and/or oxides • accumulation by illuviation processes of one or more of the following: Fe, Al, and/or Mn species; clay minerals; organic matter; silica; carbonates; gypsum • removal of carbonates or gypsum. Nota bene: B horizons may show other accumulations as well.
C	Mineral layer; unconsolidated (can be cut with a spade when moist), or consolidated and more fractured than the R layer; no soil formation, or soil formation that does not meet the criteria of the A, E, and B horizon.

R	Consolidated rock; air-dry or drier specimens, when placed in water, will not slake within 24 hours; fractures, if present, occupy <10% (by volume, related to the whole soil); not resulting from the cementation of a soil horizon.
I	≥ 75% ice (by volume, related to the whole soil), permanent, below an H, O, A, E, B or C layer.
W	Permanent water above the soil surface or between layers, may be seasonally frozen.

Suffixes (adapted from the World Reference Base for Soil Resources, 4th edition)

Symbol	Criteria	Combination with
a	Organic material in an advanced state of decomposition; after gently rubbing, ≤ one sixth of the volume (related to the fine earth plus all dead plant residues	H, O
b	Buried horizon; first, the horizon has formed, and then, it was buried by mineral material [b like buried].	H, O, A, E, B
c	Concretions and/or nodules (only used if following another suf- fix (k, q, v, y) that indicates the accumulated substance) [c like concretion].	
d	Drained [d like drained]	H
e	Organic material in an intermediate state of decomposition; after gentle rubbing, ≤ two thirds and > one sixth of the volume (related to the fine earth plus all dead plant residues) consist of recognizable dead plant tissues [e like intermediate].	H, O
f	Permafrost [f like frost].	
g	Accumulation of Fe and/or Mn oxides (related to the fine earth plus accumulation of Fe and/or Mn oxides of any size and any cementation class} predominantly inside soil aggregates, if present, and loss of these oxides on aggregate surfaces (A, B, and C horizons), or loss of Fe and/or Mn by lateral subsurface flow (pale colours in ≥ 50% of the exposed area; E horizons); transport in reduced form [g like stagnic].	A, B, C E
h	Significant amount of organic matter; in A horizons at least partly modified in situ; in B horizons predominantly by illuvi- ation; in C horizons forming part of the parent material [h like humus].	A, B, C
i	Organic material in an initial state of decomposition; after gently rubbing, > two thirds of the volume (related to the fine earth plus all dead plant residues) consist of recognizable dead plant tissues [i like initial].	H, O
	Slickensides and/or wedge-shaped aggregates [i like slickside].	B
j	Accumulation of jarosite and/or schwertmannite (related to the fine earth plus accumulations of jaroste and/or schwertman- nite of any size and any cementation class) [j like jarosite]	H, O, A, E, B, C
k	Accumulation of secondary carbonates (related to the fine earth plus accumulations of secondary carbonates of any size and any cementation class), evident by one or both of the fol- lowing: • visible even in moist state • has a calcium carbonate equivalent of ≥ 5% higher (absolute, related to the fine earth plus accumulations of secondary car- bonates of any size and any cementation class) than that of an underlying layer and no lithic discontinuity between the two layers [k like German Karbonat].	H, O, A, E, B, C
l	Accumulation of Fe and/or Mn in reduced form by upward- moving capillary water with subsequent oxidation (related to the fine earth plus accumulations of Fe and/or Mn oxides of any size and any cementation class): accumulation predomi- nantly at soil aggregate surfaces, if present, and reduction of these oxides inside the aggregates [l like capillary]	H, A, B, C

m	Pedogenic cementation in ≥ 50% of the volume (related to the whole soil); cementation class: at least moderately cemented (only used if following another suffix (k, l, q, s, v, y, z) that indicates the cementing agent) [m like cemented].	
n	Exchangeable sodium percentage ≥ 6% [n like natrium].	E, B, C
o	Residual accumulation of large amounts of pedogenic oxides in strongly weathered horizons [o like oxide].	B
p	Modification by cultivation (e.g. ploughing); mineral layers are designated A, even if they belonged to another layer before cultivation [p like plough].	H, O, A
q	Accumulation of secondary silica (related to the fine earth plus accumulations of secondary silica of any size and any cementation class) [q like quartz].	A, E, B, C
r	Strong reduction [r like reduction].	A, E, B, C
s	Accumulation of Fe oxides, Mn oxides and/or Al (related to the fine earth plus accumulations of Fe oxides, Mn oxides and/or Al of any size and any cementation class) by vertical illuviation processes from above [s like sesquioxide].	B, C
t	Accumulation of clay minerals by illuviation processes [t like German Ton, clay].	B, C
u	Containing artefacts or consisting of artefacts (related to the whole soil) [u like urban].	H, O, A, E, B, C, R
v	Plinthite (related to the fine earth plus accumulations of Fe and/or Mn oxides of any size and any cementation class) [the suffix v has no connotation].	B, C
w	Formation of soil aggregate structure and/or oxides and/or clay minerals (layer silicates, allophanes and/or imogolites) [w like weathered].	B
x	Fragic characteristics (soil aggregates with a rupture resistance of at least firm and a brittle manner of failure, not allowing roots to enter the aggregates) [the x refers to the impossibility to enter the aggregates].	E, B, C
y	Accumulation of secondary gypsum (related to the fine earth plus accumulations of secondary gypsum of any size and any cementation class) [y like gypsum or Spanish yeso].	A, E, B, C
z	Presence of readily soluble salts [z like Dutch zout].	H, O, A, E, B, C
@	Cryogenic alteration.	H, O, A, E, B, C
α	Presence of primary carbonates (in R layers related to the rock, in all other layers related to the fine earth) [α like carbonate].	H, A, E, B, C, R
β	Bulk density ≤ 0.9 kg dm-3 [like bulk density].	B
γ	Containing ≥ 5% (by grain count) volcanic glasses in the fraction between > 0.02 and ≤ 2 mm [α like glass].	H, O, A, E, B, C
δ	High bulk density (natural or anthropogenic - not due to cementation (symbol ..m), not in fragic horizons (symbol x), not in layers with retic properties (symbol Bt/E)), so that roots cannot enter, except along cracks [α like dense].	A, E, B, C
λ	Exchangeable sodium percentage ≥ 6% [n like natrium].	H, A, C
ρ	Relict features (only used if following another suffix (g, k, l, p, r, @) that indicates the relict feature) [α like relict].	
σ	Permanent water saturation and no redoximorphic features [α like saturation]	A, E, B, C
τ	Human-transported natural material (related to the whole soil) [α like transported].	H, O, A, B, C
φ	Accumulation of Fe and/or Mn in reduced form by lateral subsurface flow with subsequent oxidation (related to the fine earth plus accumulations of Fe and/or Mn oxides of any size and any cementation class) [α like flow].	A, B, C