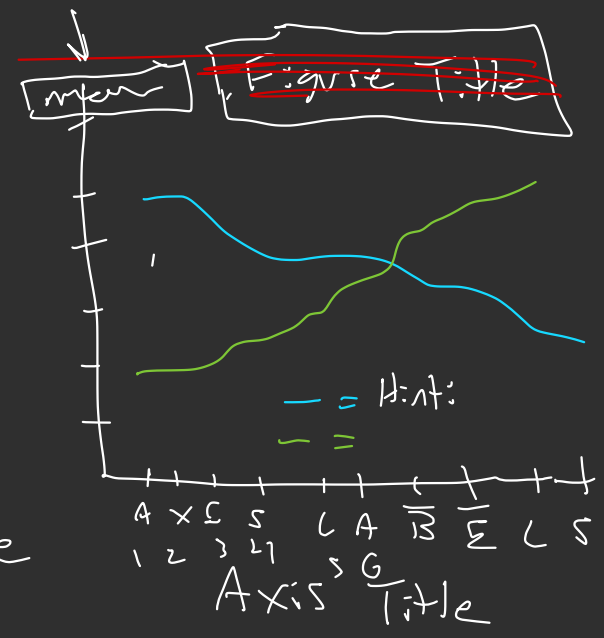
Science Graphs

Elements we need

1. Axis titles w/units
2. Axis Labels
4. Legend, if applicable



3. Caption → summary or description. Below graph

(Figure captions)

Table captions above

Figure XX: Graph showing infiltration rate. Infiltration rate (in/min) plotted by sampling location

- Counts (discrete)
- Binary

Data on the Graph

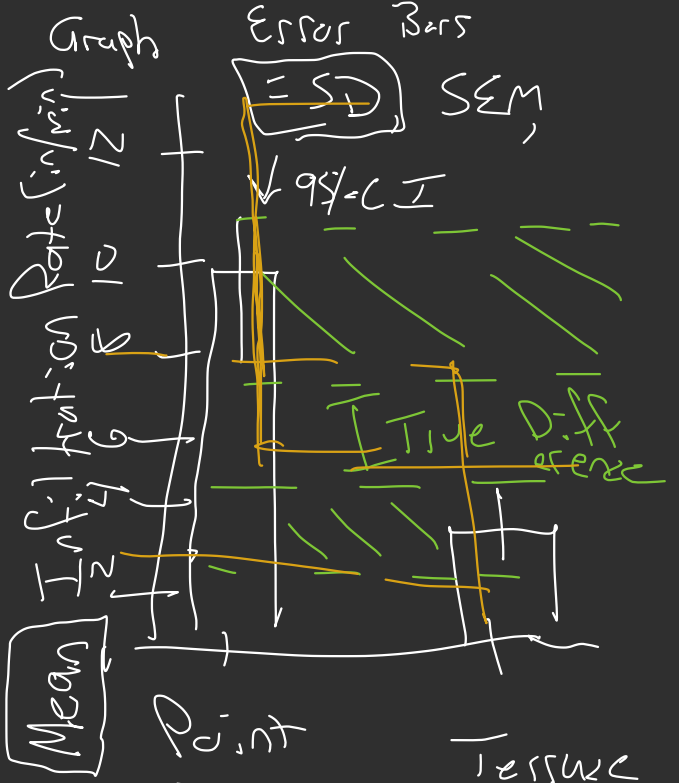
1. Which variable goes where? → Measurement (Continuous)

y-axis = Dependent (Response) variable

x-axis = Independent (Predictor) variable

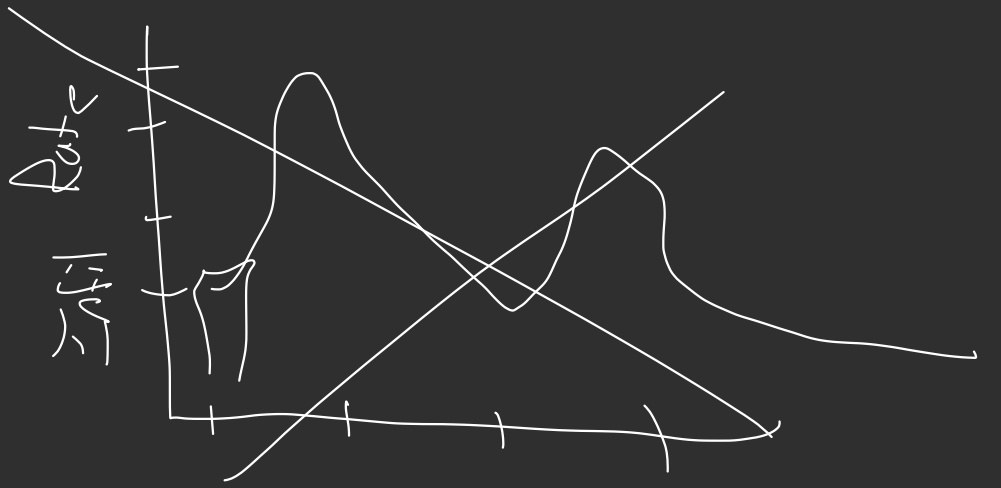
(Prediction → what we control.)

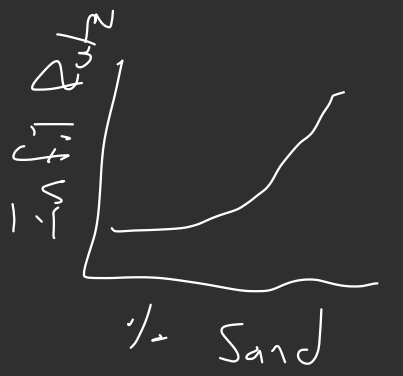
- Sampling location

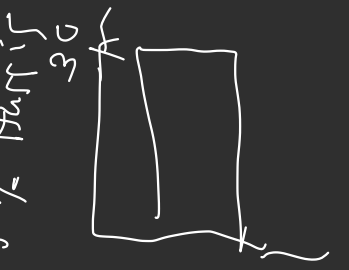


Sampling Location

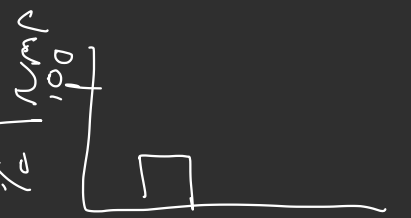
Categorical (discrete)







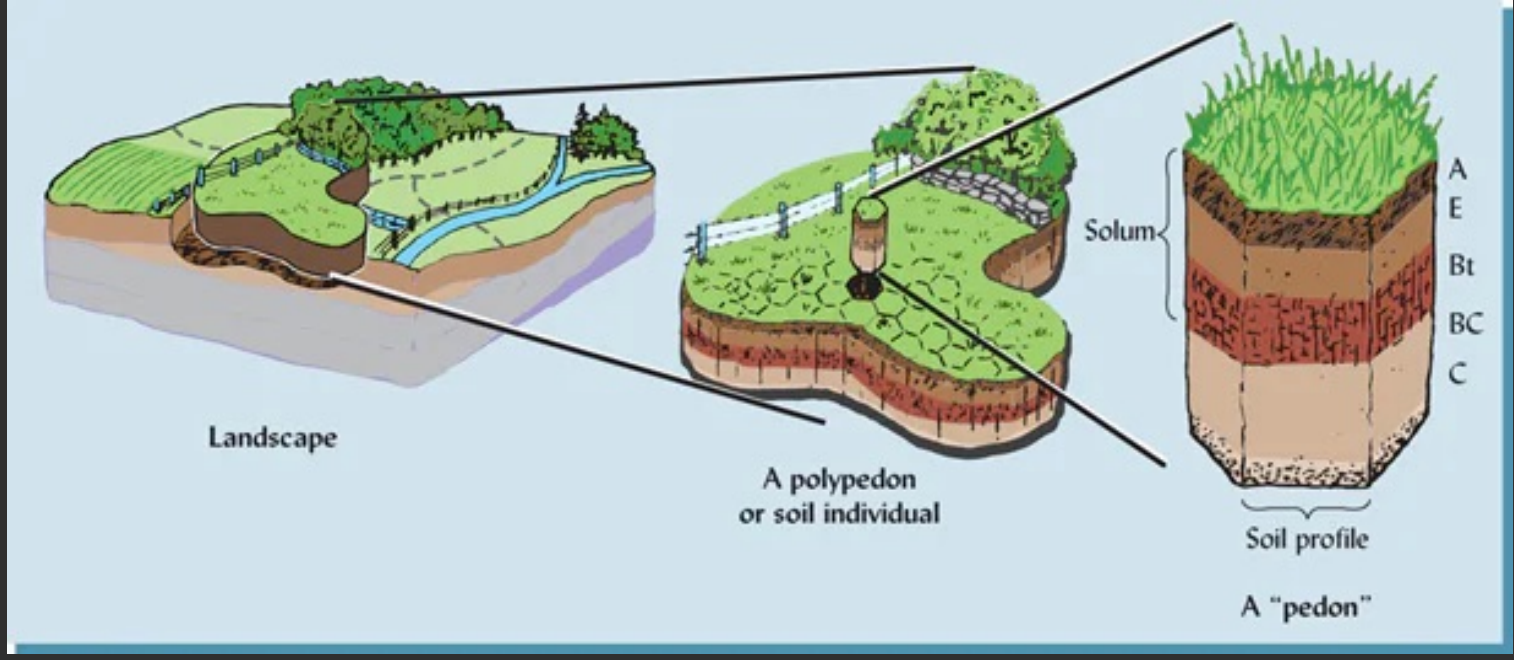
↳ Not a continuous predictor



Soil Taxonomy

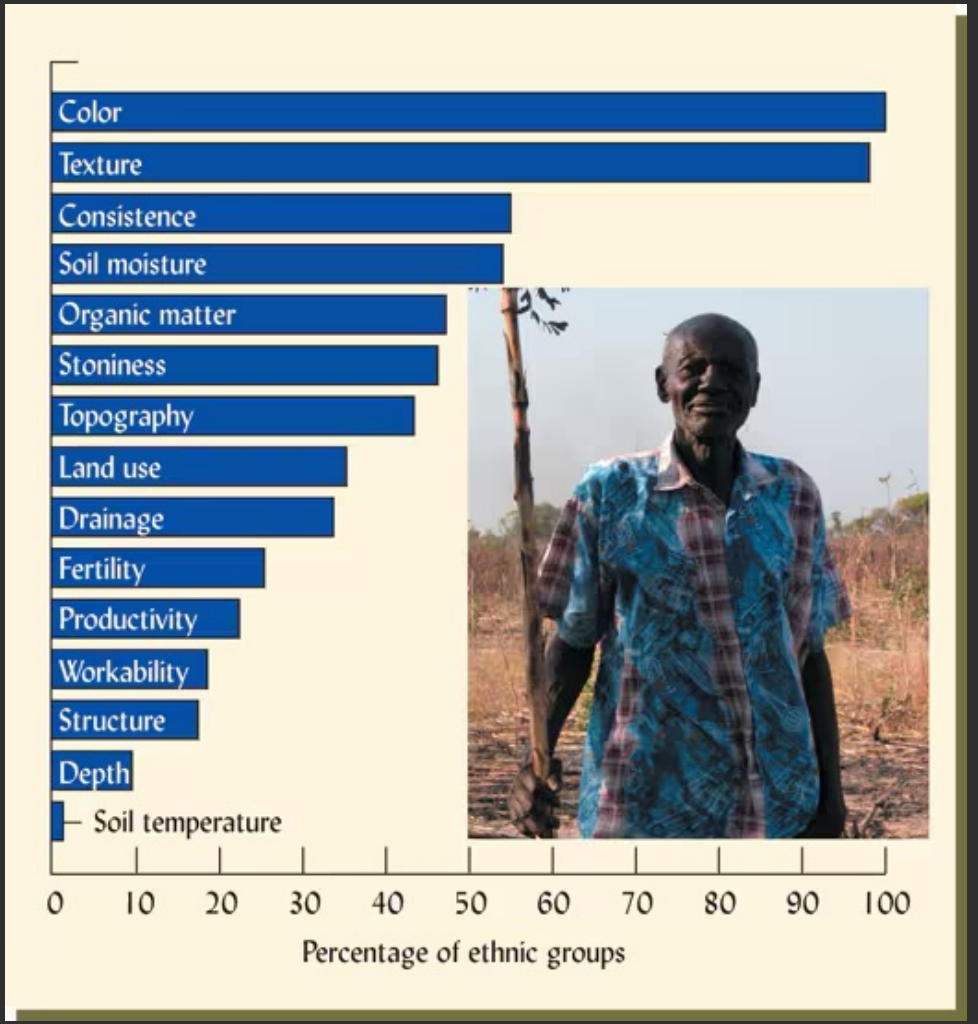
↳ order, classify

↳ A way to classify soils



Scale of taxonomy

Ethnopedology

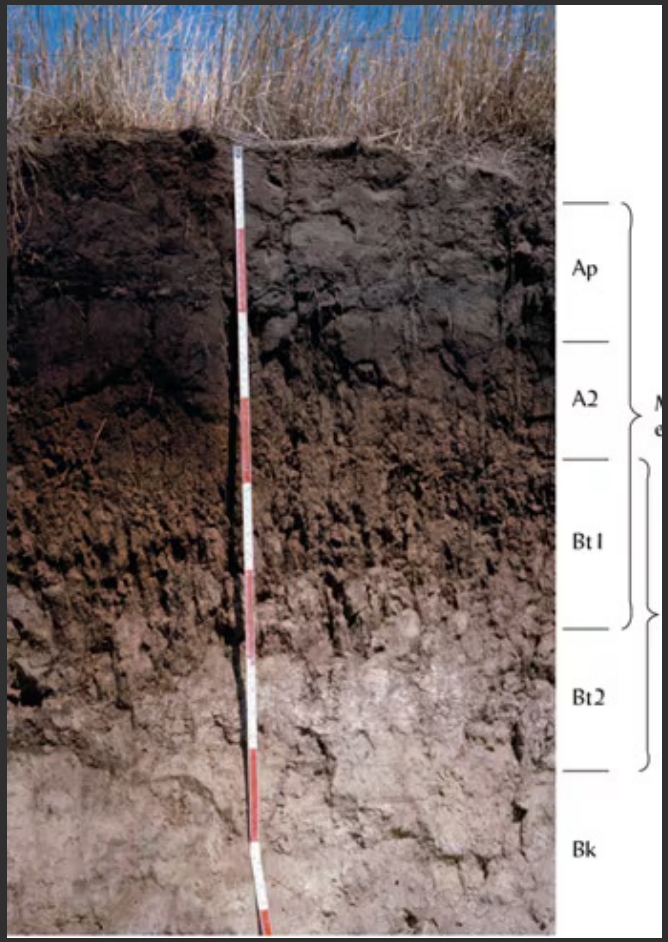


Epipedons: A characteristic or diagnostic soil horizon, often surface or near surface.

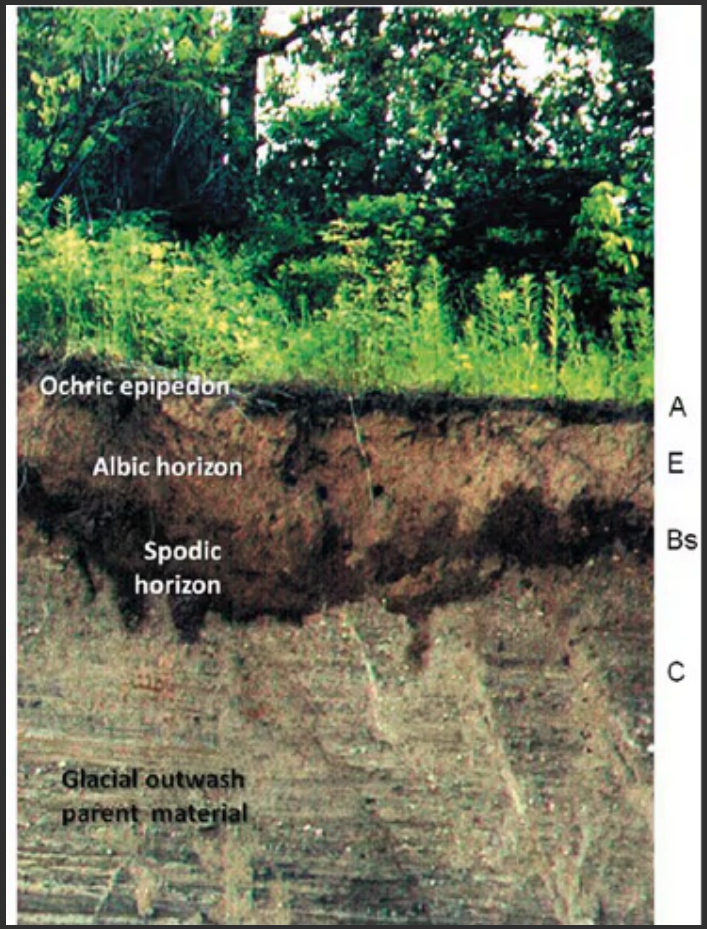
- Anthropic (A) human influenced soils, accumulation of P, K, rice paddic
- Folistic (O)
- Histic (O) → "tissue" accumulation of organic matter
- Melanic (A)*
- Mollic (A)*
- Ochric (A)
- Plaggen (A)
- Umbric (A)

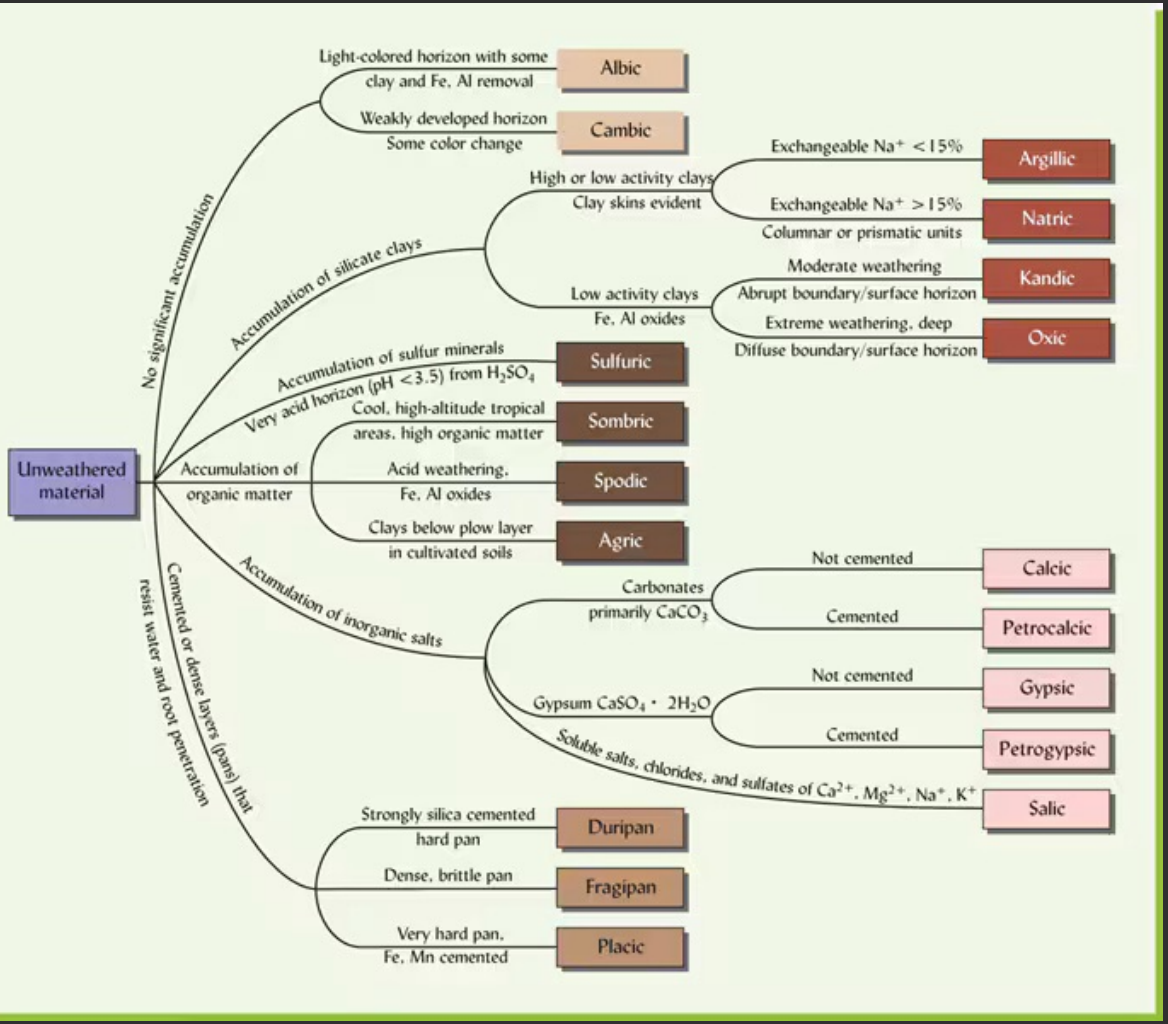
The asterisks (*) indicate the five epipedons that are naturally occurring over wide areas.

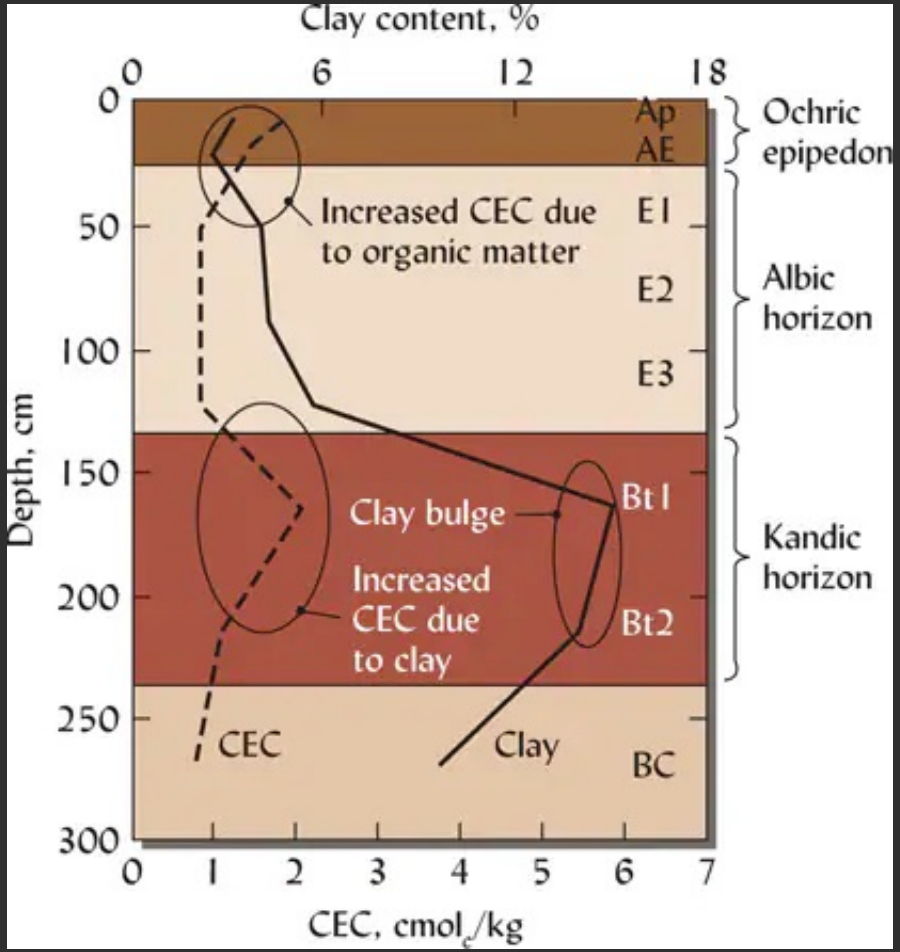
Diagnostic Horizon (and Typical Genetic Horizon Designation)	Major Features
Surface horizons = epipedons	
Anthropic (A)	Human-transported or modified materials, with artifacts, or high phosphorus or puddled condition (rice paddies)
Folistic (O)	Organic horizon saturated for less than 30 days per normal year
Histic (O)*	Very high in organic content, wet during some part of year
Melanic (A)*	Thick, black, high in organic matter (>6% organic carbon), common in volcanic ash soils
Mollic (A)*	Thick, dark-colored, high base saturation, well-developed structure
Ochric (A)*	Too light-colored, low organic content or thin to be mollic; may be hard and massive when dry
Plaggen (A)	Human-made sod-like horizon created by years of manuring, often with artifacts and spade marks
Umbric (A)*	Similar to mollic except low base saturation
Subsurface horizons	
Agric (A or B)	Organic and clay accumulation just below plow layer resulting from cultivation
Albic (E)	Light-colored, clay and iron and aluminum oxides mostly removed
Anhydritic (By)	Accumulation of anhydrite ($CaSO_4$)
Argillic (Bt)	Silicate clay accumulation
Calcic (Bk)	Accumulation of carbonates of calcium and/or magnesium
Cambic (Bw, Bg)	Altered by physical movement, structure development, or by chemical reactions, generally nonilluvial
Duripan (Bqm)	Hard pan, strongly cemented by silica
Fragipan (Bx)	Brittle pan, usually loamy textured, dense, coarse prisms
Glossic (E)	Whitish eluvial horizon that tongues into a Bt horizon
Gypsic (By)	Accumulation of gypsum ($CaSO_4 \cdot 2H_2O$)
Kandic (Bt)	Accumulation of low-activity clays
Natric (Btn)	Argillic, high in sodium, columnar or prismatic structure
Oxic (Bo)	Highly weathered, primarily mixture of Fe, Al oxides and nonsticky-type silicate clays
Petrocalcic (Ckm)	Cemented calcic horizon
Petrogypsic (Cym)	Cemented gypsic horizon
Placic (Csm)	Thin pan cemented with iron alone or with manganese and organic matter
Salic (Bz)	Accumulation of salts
Sombric (Bh)	Organic matter accumulation
Spodic (Bh, Bs)	Organic matter, Fe and Al oxide accumulation
Sulfuric (Cj)	Highly acid with Jarosite mottles



Mollic


Ochric epipedon
Albic horizon
Spodic horizon
Glacial outwash parent material
A
E
Bs
C


Unweathered material
No significant accumulation
Light-colored horizon with some clay and Fe, Al removal
Albic
Weakly developed horizon Some color change
Cambic
Accumulation of silicate clays
High or low activity clays Clay skins evident
Exchangeable Na+ <15%
Argillic
Exchangeable Na+ >15%
Columnar or prismatic units
Natric
Low activity clays Fe, Al oxides
Moderate weathering Abrupt boundary/surface horizon
Kandic
Extreme weathering, deep Diffuse boundary/surface horizon
Oxic
Accumulation of sulfur minerals
Very acid horizon (pH <3.5) from H2SO4
Sulfuric
Accumulation of organic matter
Cool, high-altitude tropical areas, high organic matter
Sombric
Acid weathering, Fe, Al oxides
Spodic
Clays below plow layer in cultivated soils
Agric
Accumulation of inorganic salts
Carbonates primarily CaCO3
Not cemented
Calcic
Cemented
Petrocalcic
Gypsum CaSO4 · 2H2O
Not cemented
Gypsic
Cemented
Petrogypsic
Soluble salts, chlorides, and sulfates of Ca2+, Mg2+, Na+, K+
Salic
Cemented or dense layers (pans) that resist water and root penetration
Strongly silica cemented hard pan
Duripan
Dense, brittle pan
Fragipan
Very hard pan, Fe, Mn cemented
Placic


Clay content, %
0
6
12
18
0
50
100
150
200
250
300
Depth, cm
Ap
AE
E1
E2
E3
Bt1
Bt2
BC
Ochric epipedon
Albic horizon
Kandic horizon
Increased CEC due to organic matter
Clay bulge
Increased CEC due to clay
CEC
Clay
0
1
2
3
4
5
6
7
CEC, cmol/kg

Argillic Horizons

- Accumulation of Si clays (concentrations), translocated from above horizons.

Natric Horizon → Accumulation of Si clays but with ≥15% exchangeable sodium. → Common in arid and semi-arid

Kandic horizons → Accumulation of Fe and Al oxides. Often with kaolinite

Oxic horizons → Highly weathered horizons, rich in Fe and Al oxides; subsurface

- Tropical rainforests, wet and humid.

High water content; but not saturation

$2s + O_2 =$ Oxidation Fe, Al

Spodic Horizon → illuvial horizon ← washed in

rich in organic matter, mer

Al oxides → Cool, moist forests.

Sombric → illuvial horizon rich in

o matter w/o Al oxides

Albic horizons → Light colored eluvial horizons, low in clay and Al, Fe oxides

Calcic horizons → Accumulation of carbonates in the soil horizon

Pans = Cemented or densely packed and relatively impermeable layers

Soil Moisture Regimes

Duration or seasonality and quantity of moisture in soil

Aquic

Saturated soil free of oxygen

Aquic

Soil "gleying" Turning gray or blue in color from reduction

Udic

Sufficently high moisture year-round to support leeching

Perudic → excess moisture and very high leeching

Ustic

Fairly common in places with dry winters and wet growing seasons.

"Between Udic and Aridic"

Aridic

Dry, for at least half of the growing season. Moist for < 90 consecutive days

Calcic horizons

Xeric → Mediterrien Climates

- cool, moist winter, dry summers

Soil Temperature Regimes

Hot

Hyperthermic

Thermic

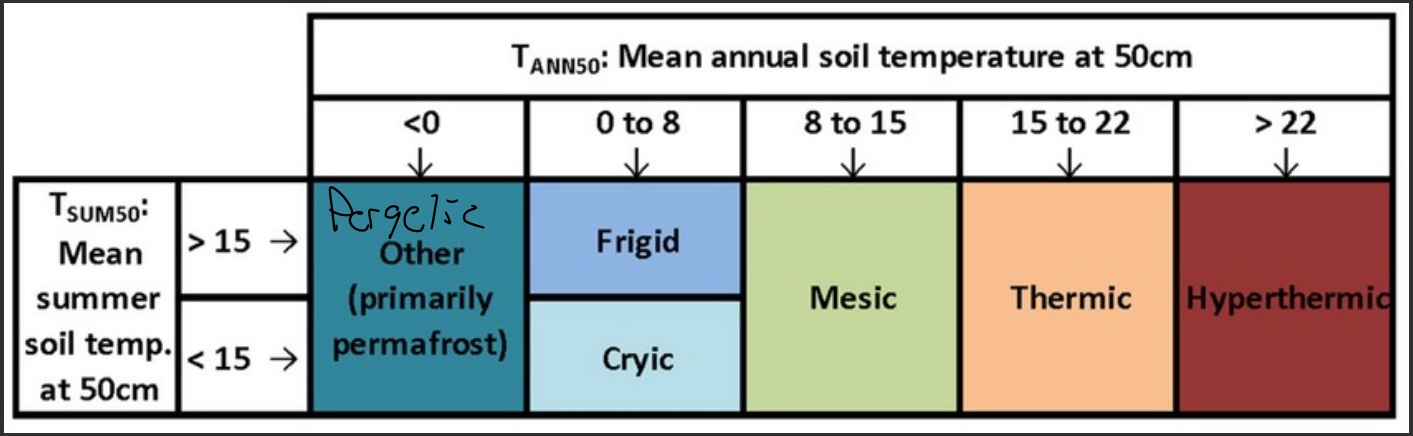
Mesic

Frigid

Cryic

Pergelic

Cold


T_{ANN50}: Mean annual soil temperature at 50cm
<0
0 to 8
8 to 15
15 to 22
> 22
T_{SUM50}: Mean summer soil temp. at 50cm
> 15 →
< 15 →
Argelic
Other (primarily permafrost)
Frigid
Cryic
Mesic
Thermic
Hyperthermic