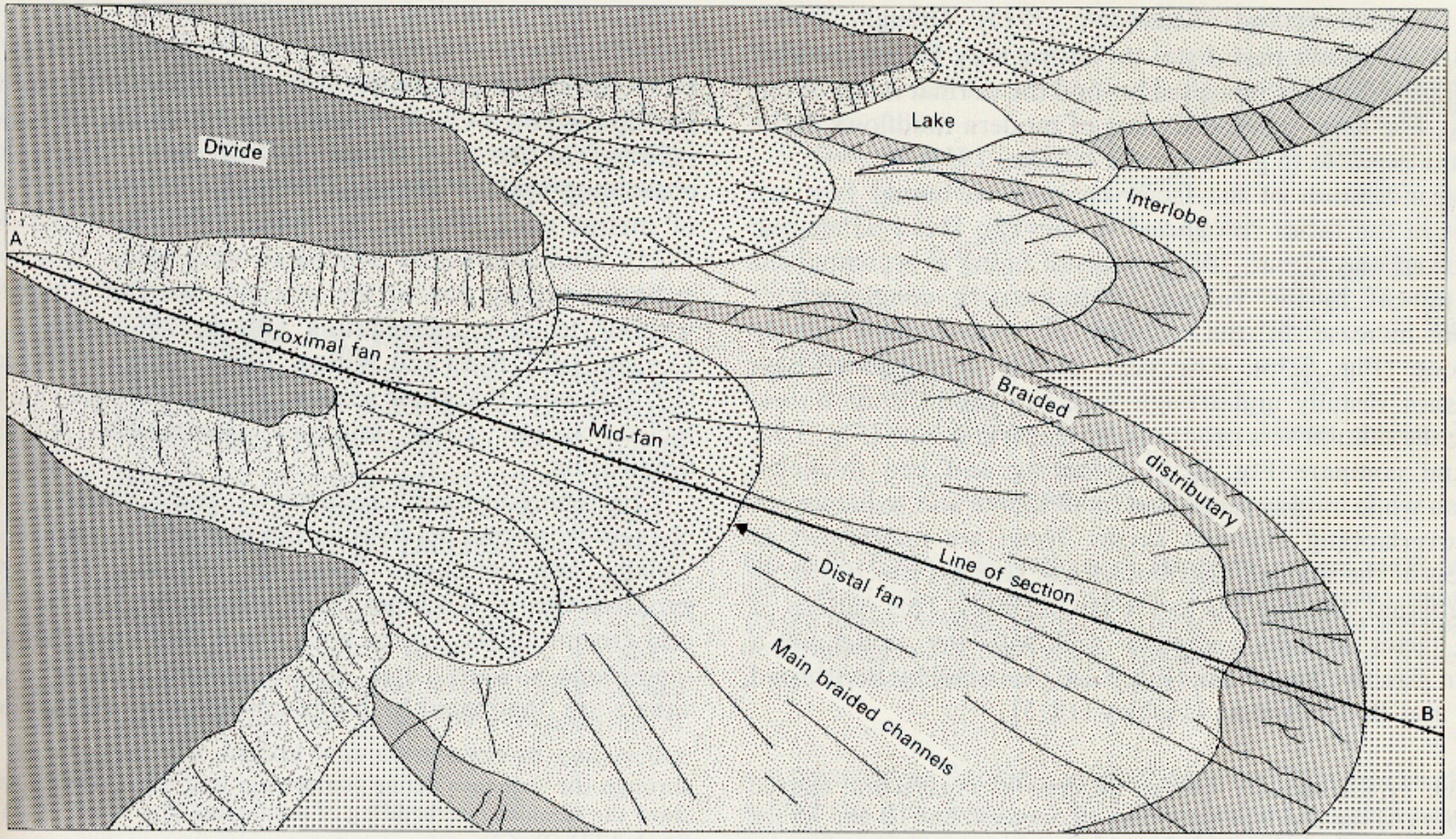
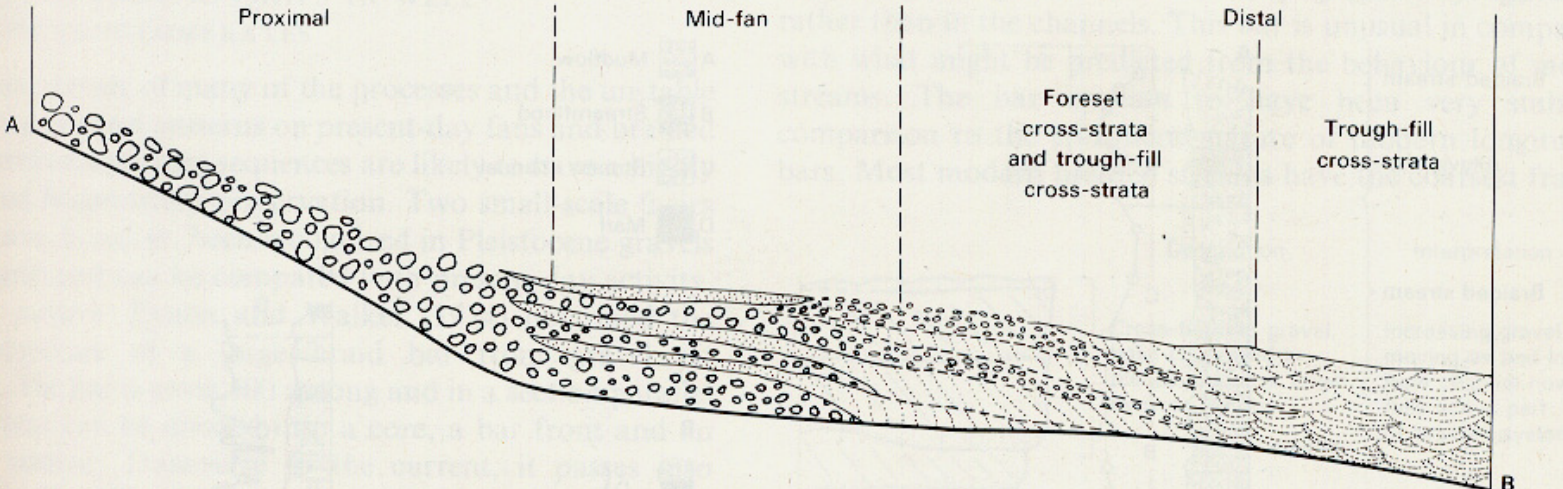

Soil horizons


Divide
Lake
Interlobe
A
Proximal fan
Mid-fan
Braided
distributary
Line of section
Distal fan
Main braided channels
B


Proximal
Mid-fan
Distal
A
Foreset
cross-strata
and trough-fill
cross-strata
Trough-fill
cross-strata
B

Communication and Application

Taxonomy

Chemical analyses

Horizon identification

Morphology Characterization

Review - Soils are products of…?

- 1 word =

- 5 words =

Horizons

- Distinctive zones weathering zones
- Roughly parallel to the land surface
- Chemically and physically different that the parent material

Soil Horizons

- A layer of soil material approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and/or biological properties or characteristics such as color, structure, texture.

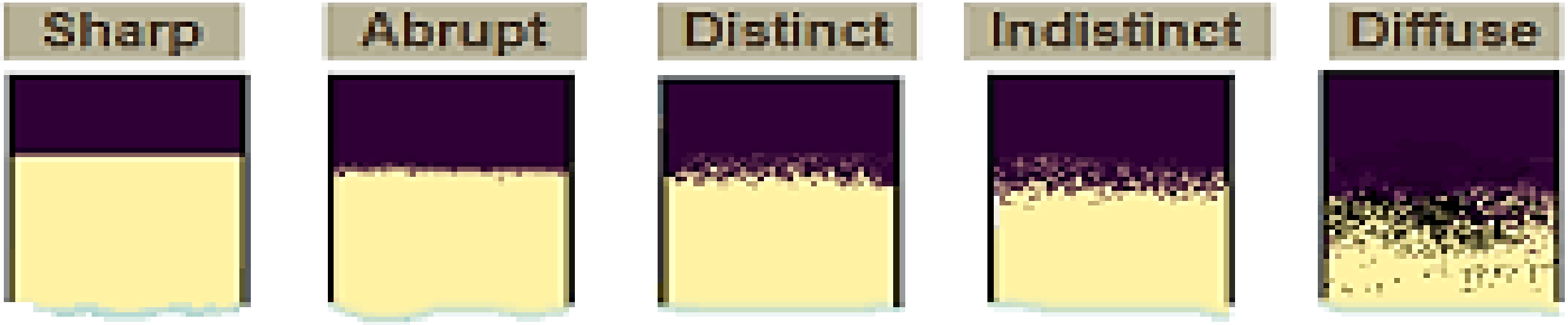
- The differentiation of material into soil horizons or ‘horizonation’ is a fundamental aspect of pedology.

Boundary distinctiveness

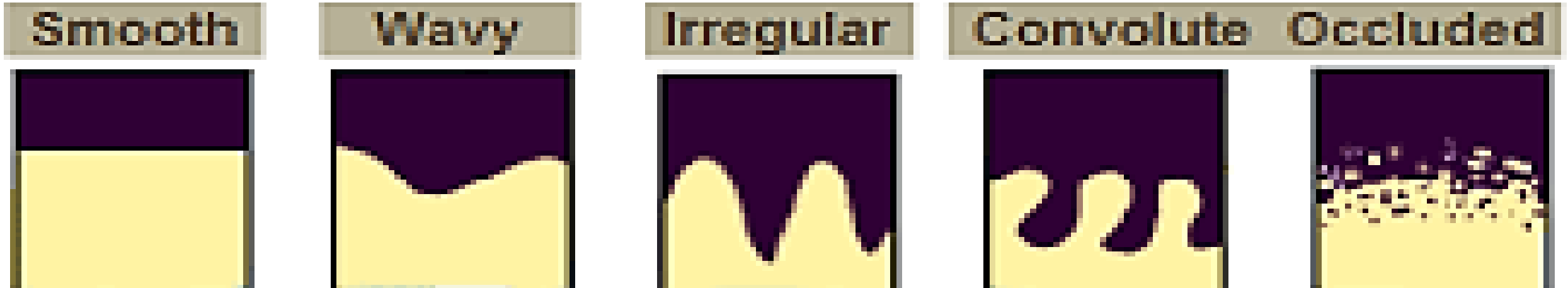
Transitional zone thickness

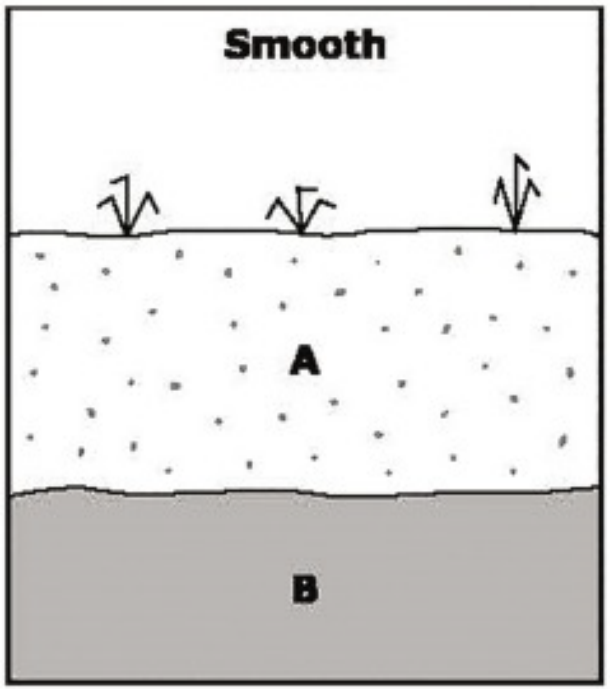
- Very abrupt/Sharp <0.5 cm
- Abrupt 0.5–2 cm
- Clear 2–5 cm
- Gradual 5–15 cm
- Diffuse 15 cm or more

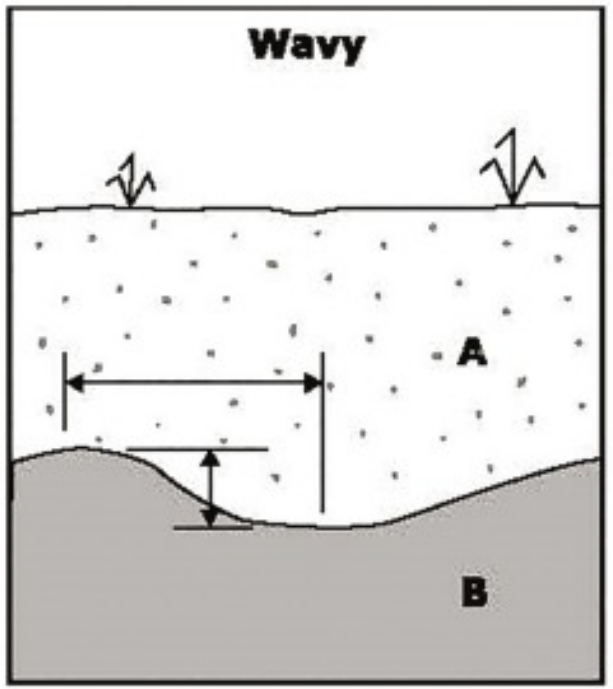
Distinctness

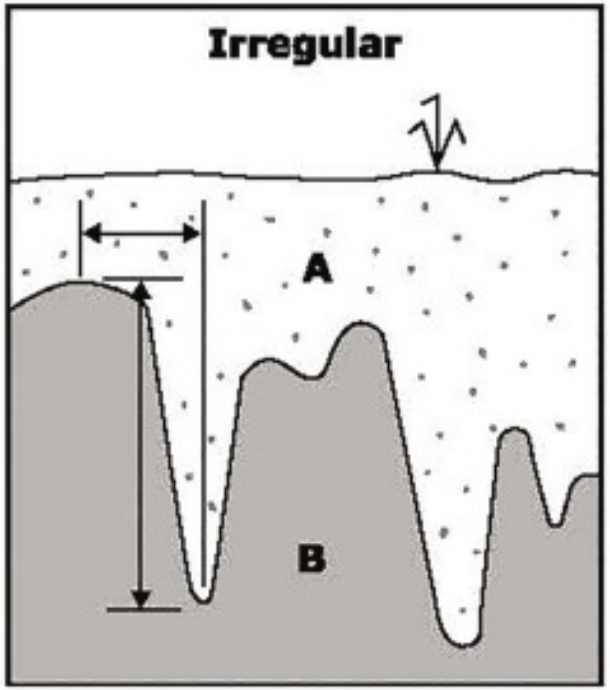


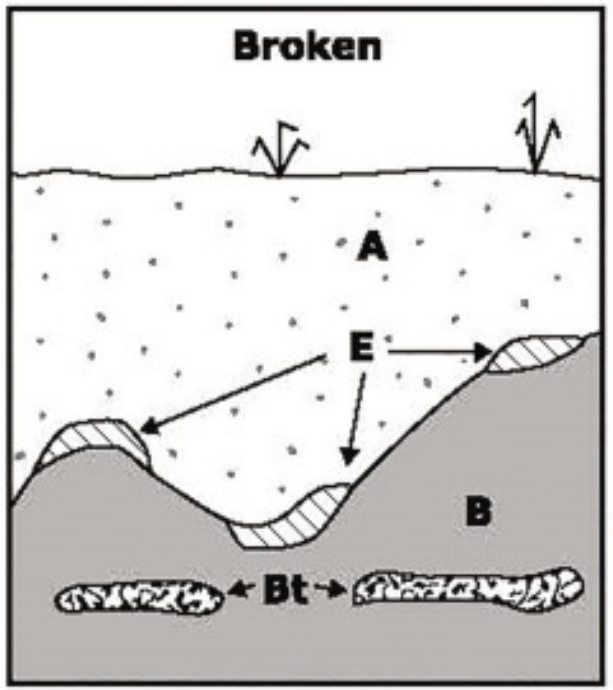
Shape/topography

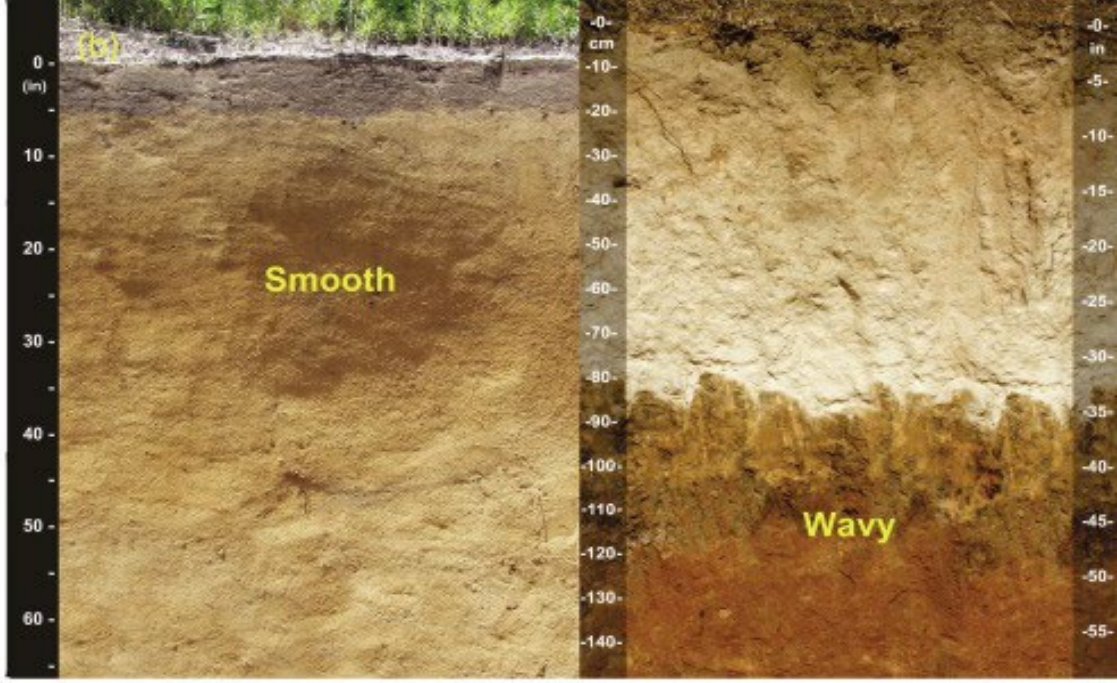


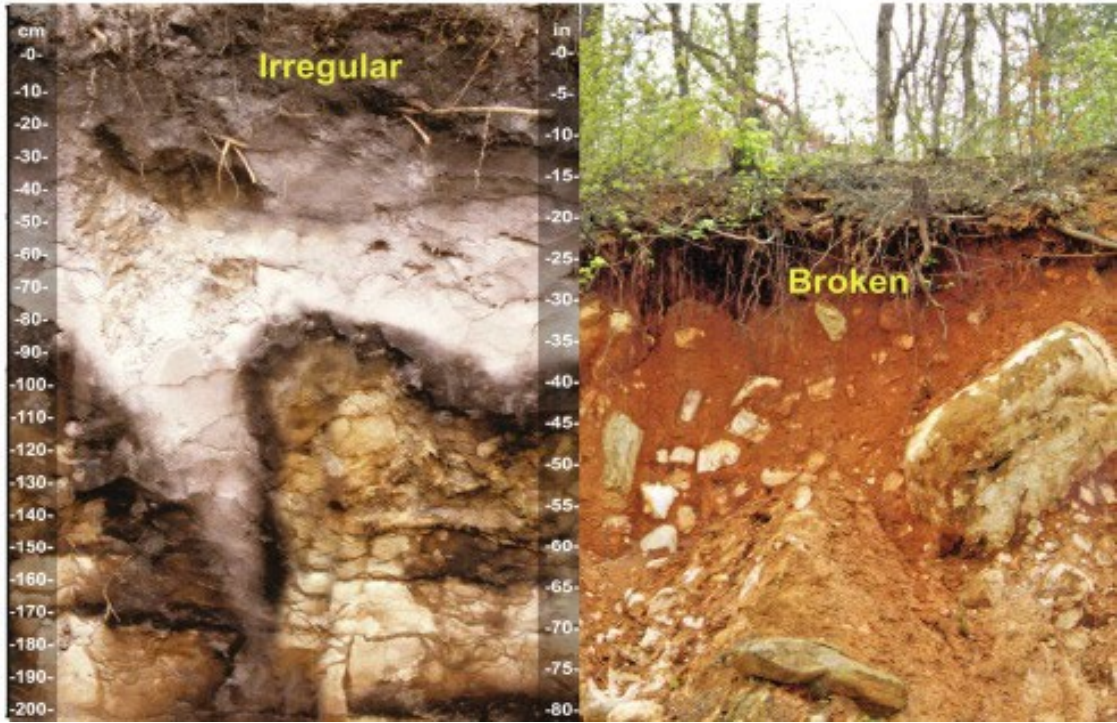

Smooth
A
B

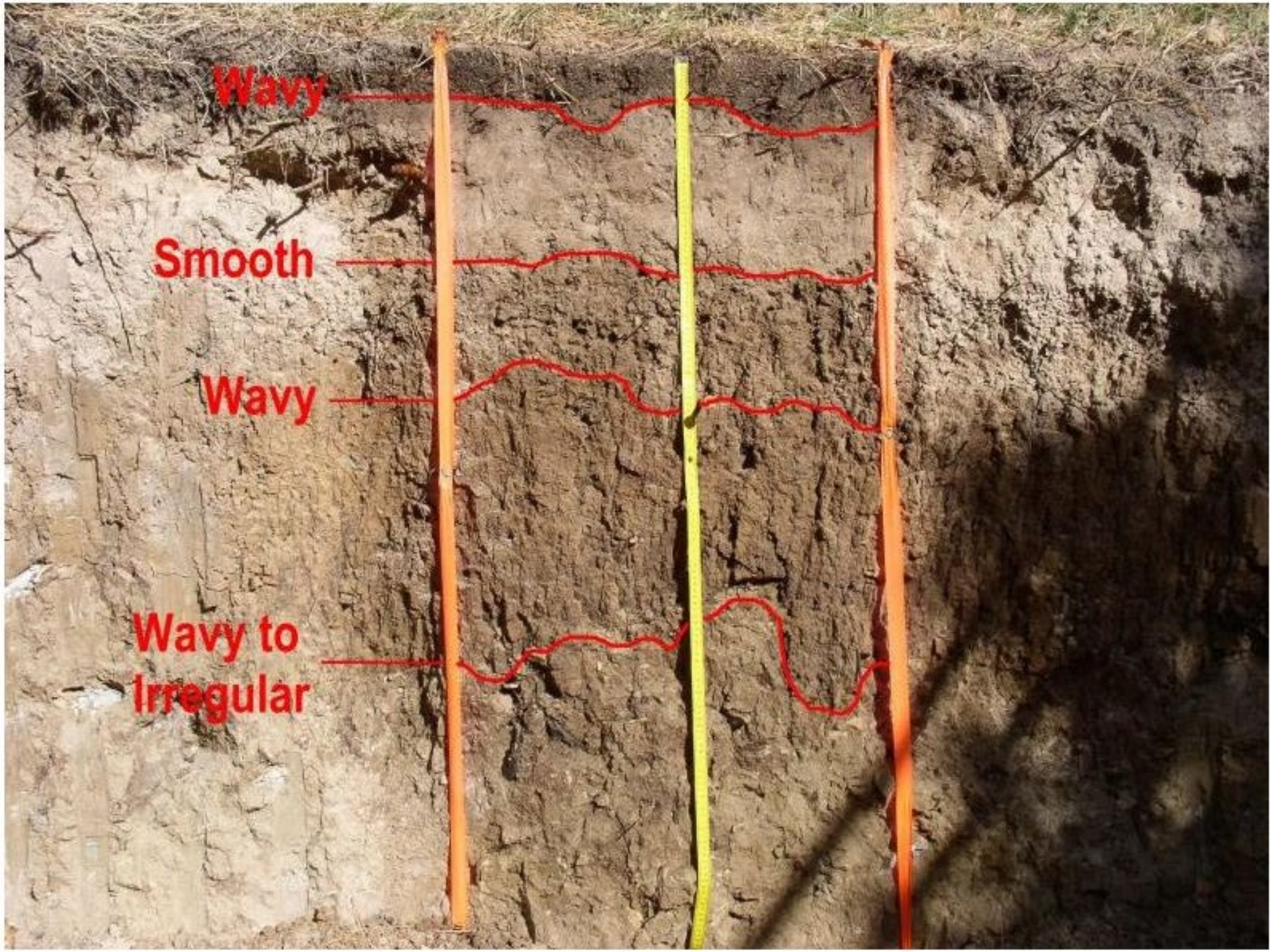

Wavy
A
B


Irregular
A
B


Broken
A
E
B
Bt


(b)
Smooth
Wavy


Irregular
Broken


Wavy
Smooth
Wavy
Wavy to
Irregular

Additional horizon features

- Ped coatings, concretions, pH, salinity, the presence of carbonates, and any observation the investigator deems of interest and potential value in characterizing the horizon should be noted.

Poor field work leads to worthless lab work & Interp.

- Horizon descriptions in the field are a vital link between real soil conditions and any data quantified from laboratory analysis.

Communication and Application

Taxonomy

Chemical analyses

Horizon identification

Morphology Characterization

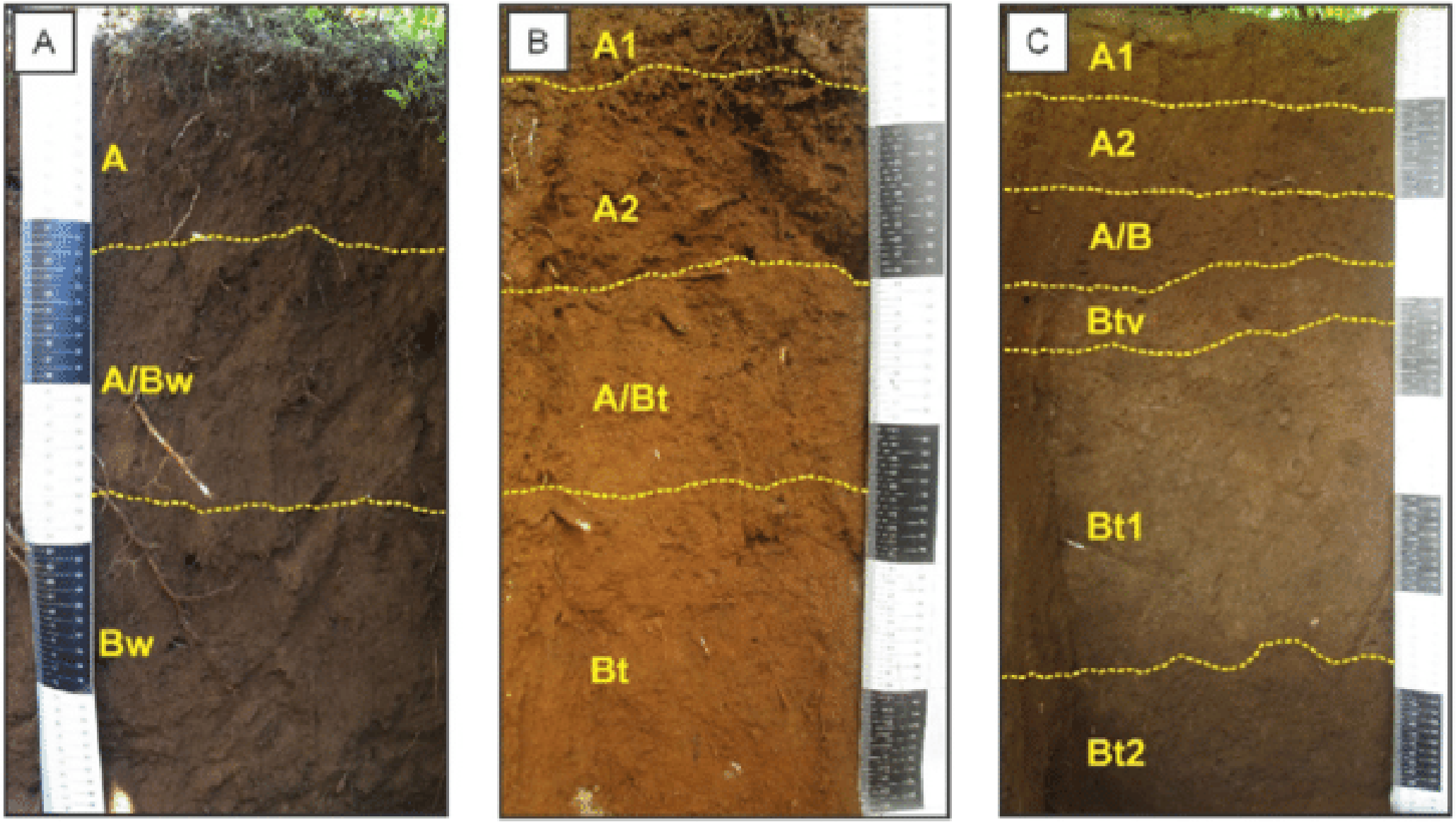
Master horizons – Board work

- Capital letters
- O, L, A, E, B, C, R, M, W

Transitional horizons

E.g.

- AE
- AB
- BC
- CB



Subordinate horizons

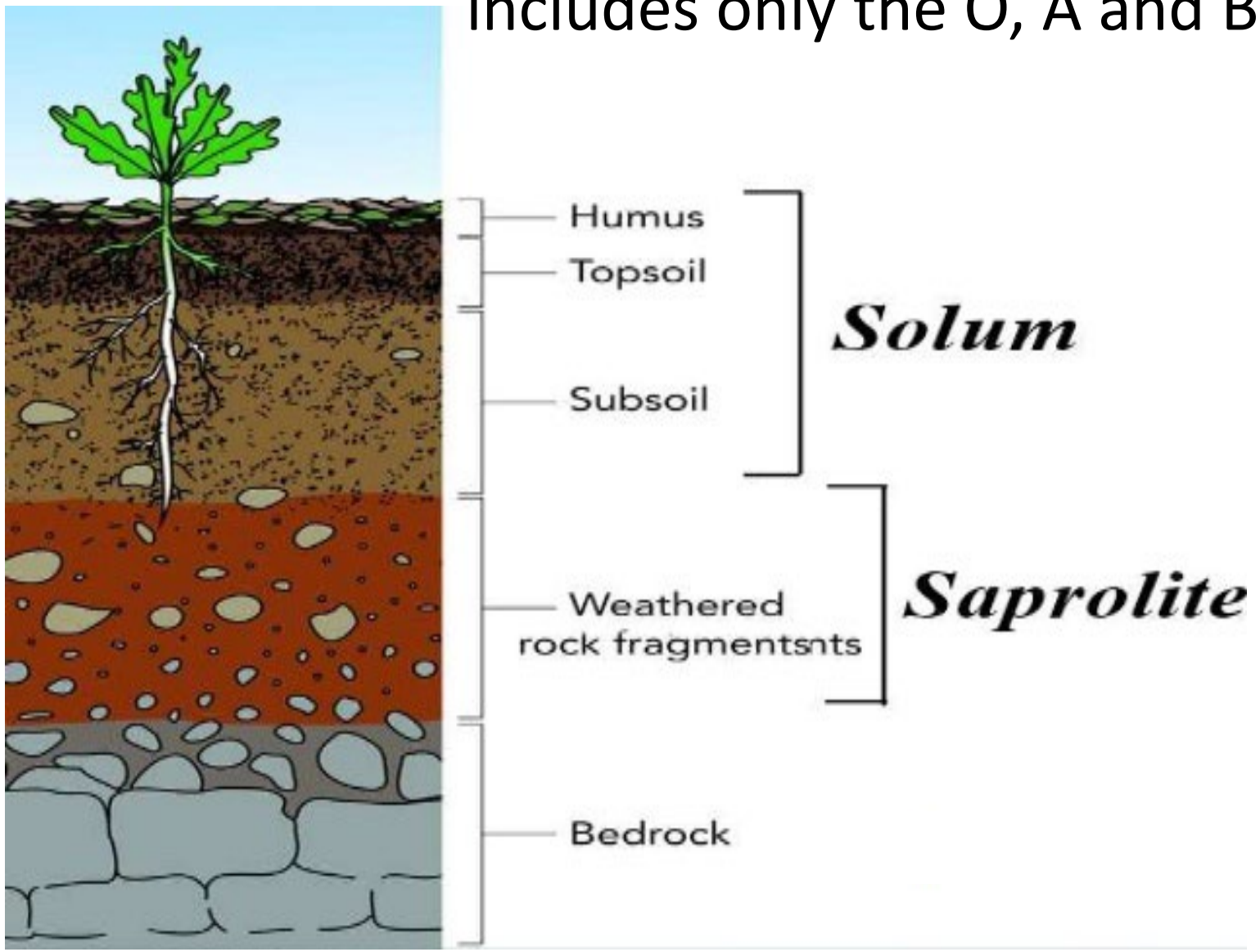
- Lowercase letters
  - O, L, and B horizons must have at least one subordinate distinction.
  - Many of the designations include the term “accumulation,” which means that the horizon contains more of the material in question than is presumed to have been present in the parent material.

Common Midwest Examples

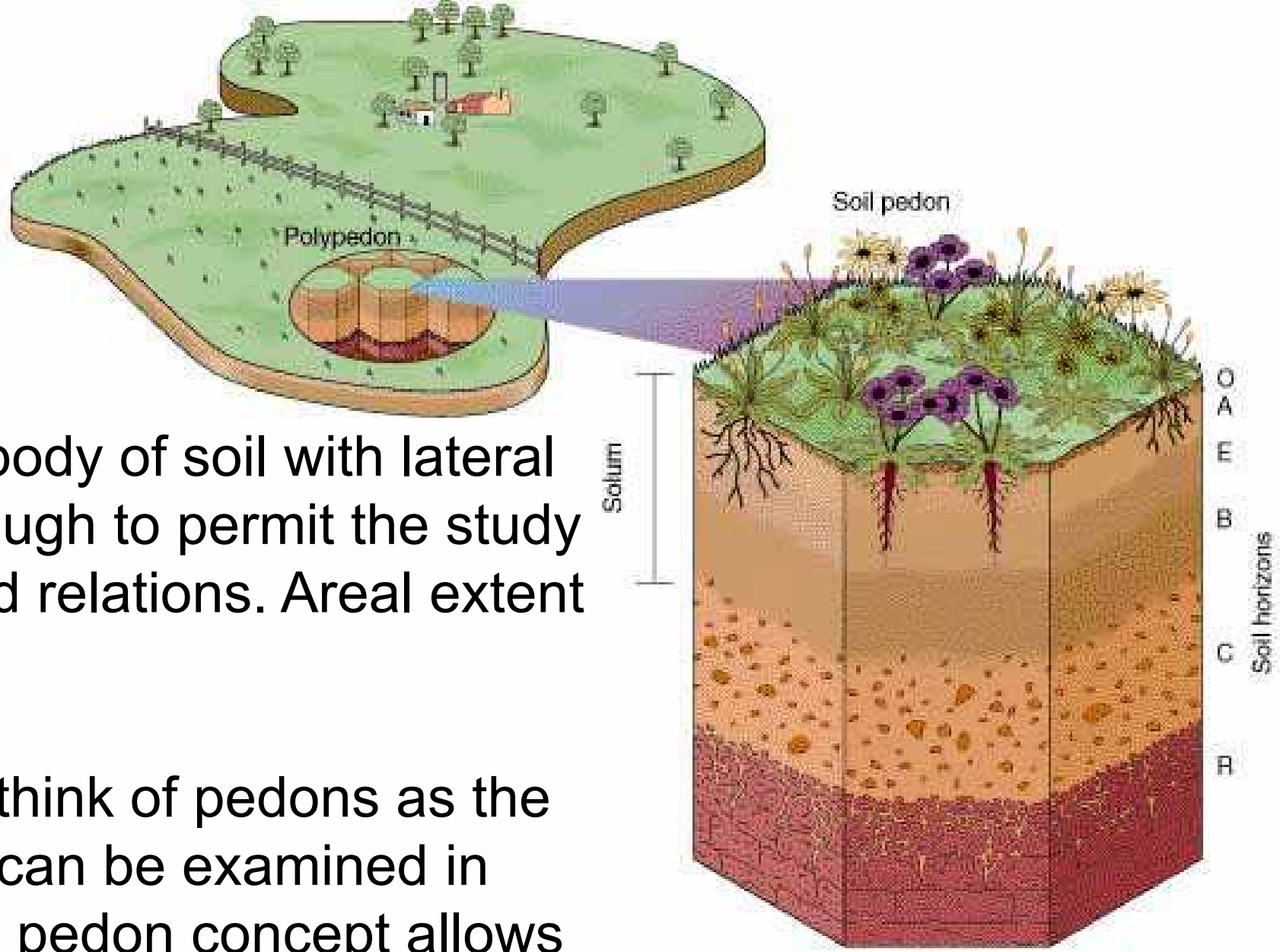
- p – plowing or other disturbance (used only with A-horizons)
- c – concretions or nodules
- d – dense layer
- k –pedogenic accumulation of carbonate (not equivalent to calcareous geologic material)
- ss - slickensides
- t – illuvial accumulation of silicate clay
- w –structural or color development within the B-horizon

Solum

An incomplete soil profile consisting of only pedogenic material. *The geologic material is not included*, so solum includes only the O, A and B horizons.



Pedon



A three-dimensional body of soil with lateral dimensions large enough to permit the study of horizon shapes and relations. Areal extent is typically 1 to 10m^2.

Alternatively, we can think of pedons as the smallest volume that can be examined in detail in the field. The pedon concept allows pedologists to more fully understand operative processes.

Epipedon

Diagnostic **surface horizon** that includes the upper part of the soil that is **darkened by organic matter**, Or the upper eluvial horizons

May include B-horizon if **darkened by organic matter**

Epipedon Types

Mollic (A) – Thick, dark colored, strong structure, HIGH base saturation: High in K^+, Ca^{2+} and Mg^{2+} , elevated pH/basic

Umbric (A) – Same as Mollic, but LOW base saturation: Low in Ca^{2+} and Mg^{2+}, acidic

Ochric (A) – Low organics, Light colored, thin, may be hard when dry

Melanic (A) – Common in volcanic ash, Thick, black, X>6% organic C

Histic (O) – Very High organic content, wet during part of year

Anthorpic (A) – Human modified Mollic like, High in available Phosphorus

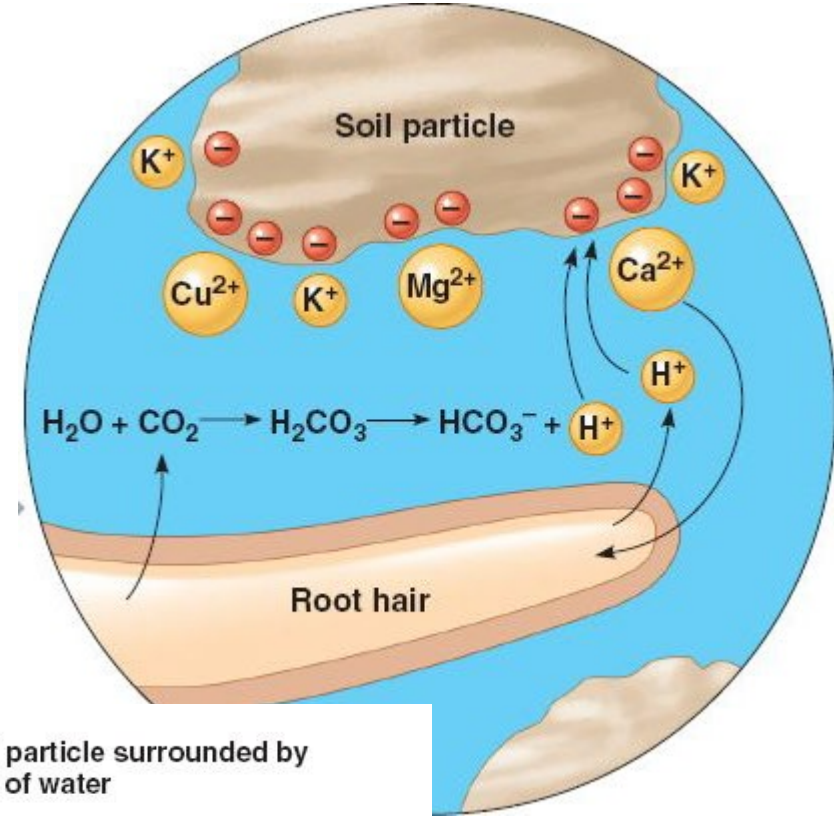
Plaggen (A) – Human made sod-like horizon from years of manure spreading

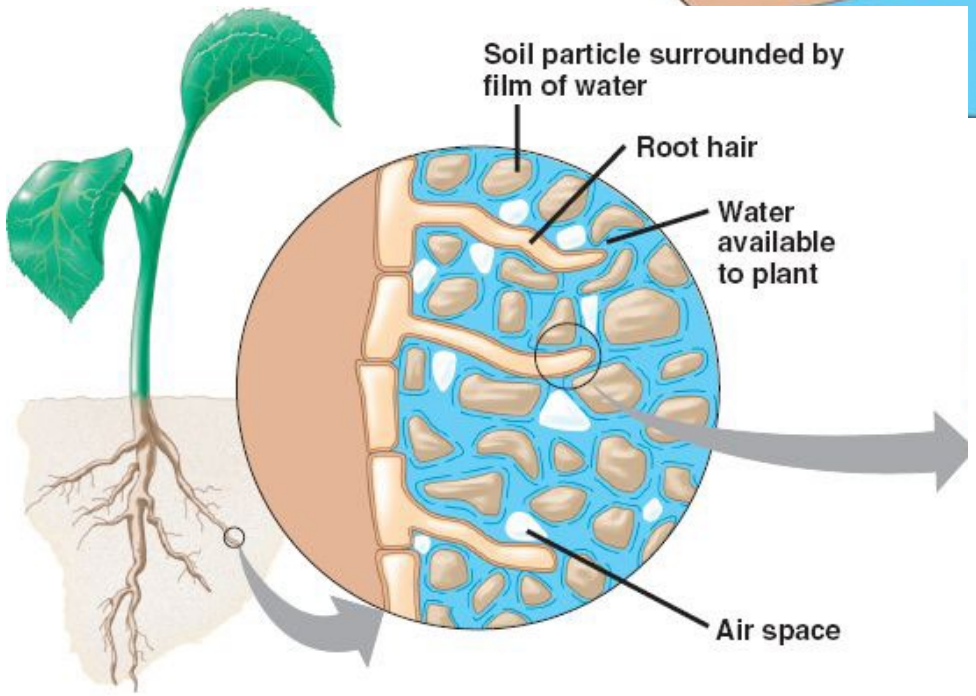
Chemistry sidebar

Cation Exchange Capacity (CEC)

Cation-exchange capacity is a measure of how many cations can be retained on soil particle surfaces.

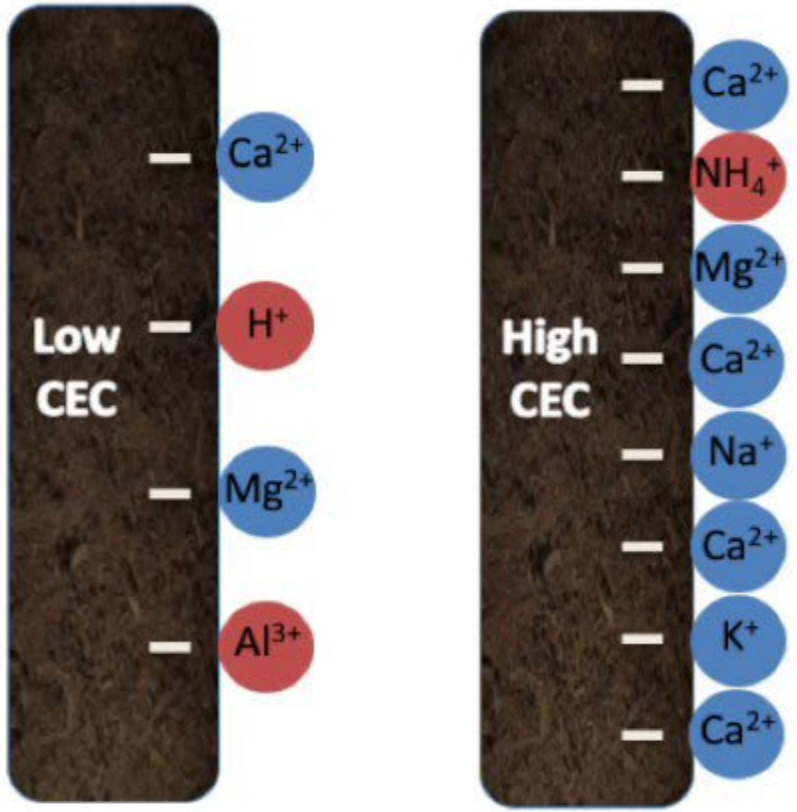
Negative charges on soil particle surfaces bind to positively-charged atoms or molecules in the surrounding water.





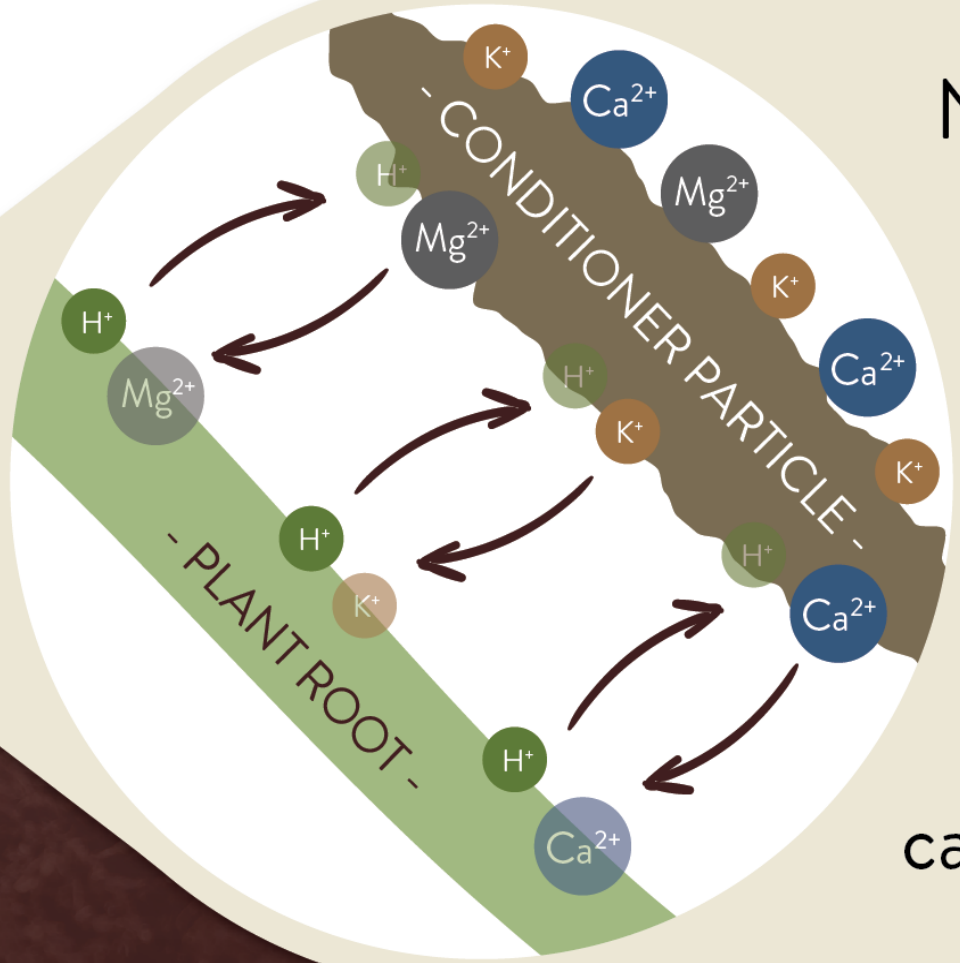
Cation Exchange Capacity (CEC)

- Fundamental soil property
  - Plant nutrient availability and retention
- Total quantity of ***negative*** surface charges
- Sum of cations:
  Base cations + acid cations
  (Ca + Mg + K + Na) + (H + Al)



CATION EXCHANGE CAPACITY (CEC)

CEC is a helpful gauge for determining soil fertility



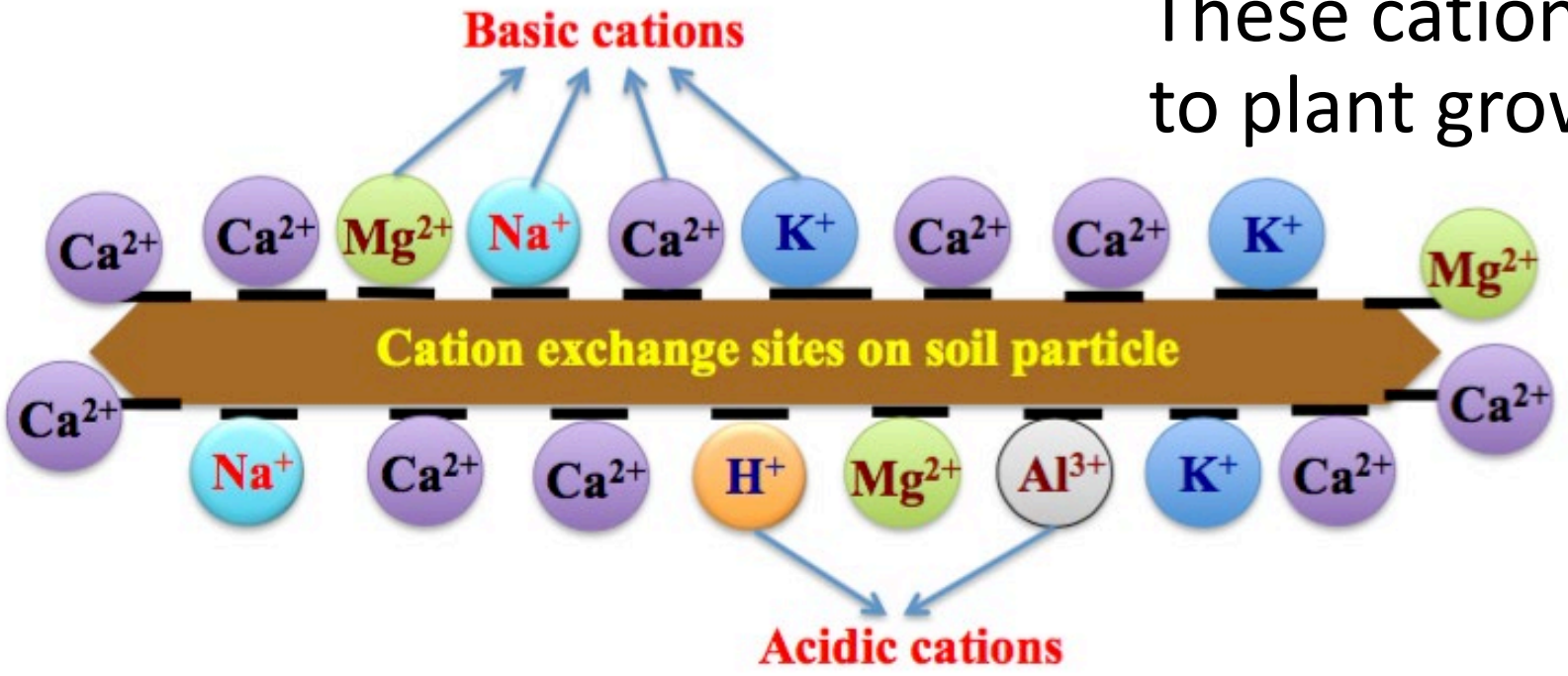
Negatively charged conditioner particles hold and store positively charged cations.

Plant roots exchange hydrogen cations for essential nutrients it cannot produce for itself.

REDMOND

Base saturation

Percent base saturation (BS) is the percentage of the Cation-Exchange Capacity occupied by the basic cations **Calcium (Ca), Magnesium (Mg) and Potassium (K)**



These cations are essential minerals to plant growth.

High Base Saturation $^{2+}$

Soils with high percent base saturation <u>have a higher pH</u>; they are buffered against acid cations from plant roots and soil processes that acidify the soil (nitrification, acid rain, etc.).

They contain **greater amounts** of essential plant nutrient cations **K^+, Ca and Mg^{2+}** for use by plants.

Low Base Saturation

Low Ca^{2+} and Mg^{2+}

Leads to nitrogen build up in soil.

Causes pH to be low/acidic.