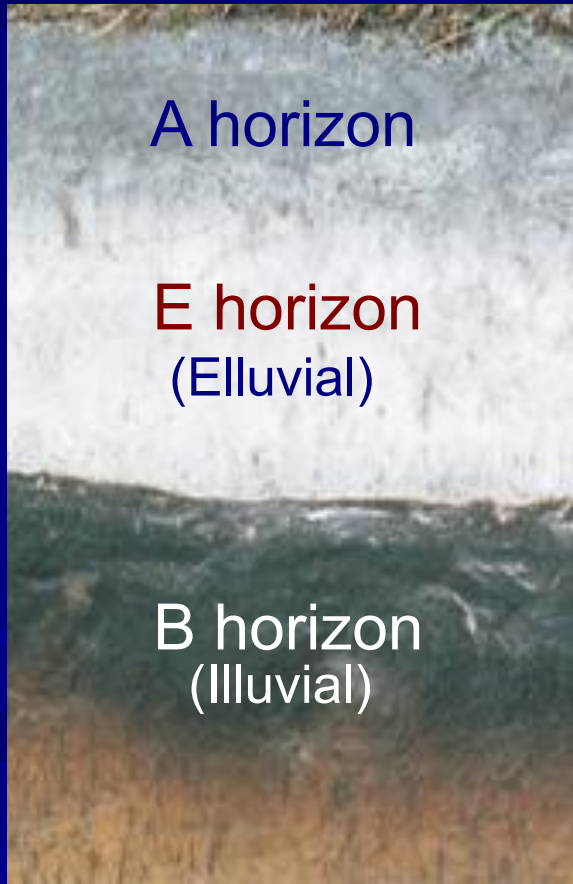


Soil Morphology and Classification

Master Horizons

Enough information?



← O horizon



Sub-horizon designations

Sub-horizon designations

Subordinate distinctions within master horizons

p – plowing/disturbance

t – clay accumulation

g – gleying

h – illuvial organic matter

w – development of color/structure

o – oxic

Subordinate distinction (p = plowed)

Disturbed surface horizon (cultivation, pasture, forestry)
Used with the A master horizon (e.g. Ap horizon)



← Ap horizon

Subordinate distinction (t = clay accumulation)

Translocation of clay **or** formed in place

Coatings or discrete

Used with the B master horizon (e.g. Bt)

If reduced, can be used with the g sub horizon (Btg)



Subordinate distinction (g = gleying)

- Oxygen de
- Reduction
- low chro
- Often use



ation.

E and C horizon.



oxid
mate

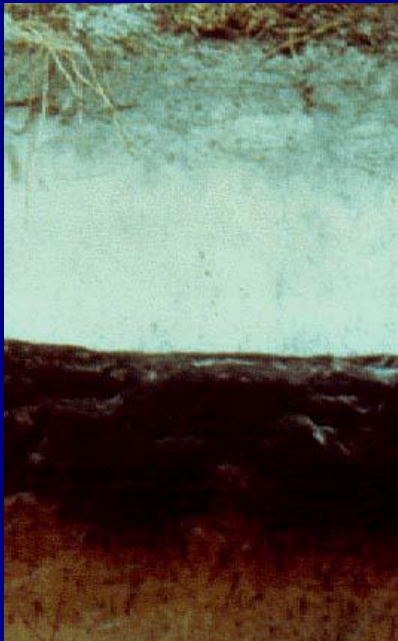


gley
ma

oxidized

Subordinate distinction (h = organic accumulation)

- Accumulation of illuvial organic matter-metal complexes
- Coatings on sand and discrete particles
- h = “humic”
- value and chroma approximately 3 or less
- Used with the B master horizon (e.g. Bh horizon)



← Bh horizon
“spodic horizon”



Subordinate distinction (w = color or structure)

Non-illuvial development
of color or structure

“w” can = “weak”

Commonly used with the
B master horizon (e.g. Bw)



Subordinate distinction (o = oxic horizon)

Low activity clays
Few weatherable materials
Little rock structure
Fe and Al oxides



Subordinate distinctions

g – gleying

h – illuvial organic matter

p – plowing/disturbance

t – clay accumulation

w – development of color/structure

o – oxic

Subordinate distinctions and Organic Matter

Subordinate distinction (a, e, i)

Denotes the degree of organic matter decomposition in the **O horizon**.

Oa – highly decomposed (sapric)

Oe – moderately decomposed (hemic)

Oi – slightly decomposed (fibric)

Sapric – most decomposed, low plant fiber, low water content

Hemic – intermediate decomposition

Fibric – least decomposed, recognizable fibers

Summary

Master: O, A, E, B, C, R

Sub horizon symbols: g, h, p, t, w and a,e,i

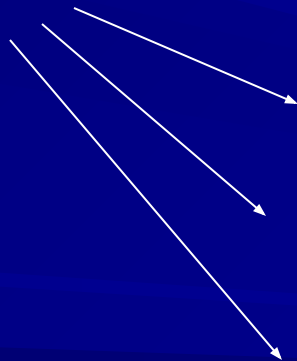
Examples: Oa, Oe, Oi
Bt
Bg
Btg
Bw
Ap

Other Designations

Vertical Subdivisions

Characterized by similar master and/or subordinate properties separated by “degree”.

Bt horizons



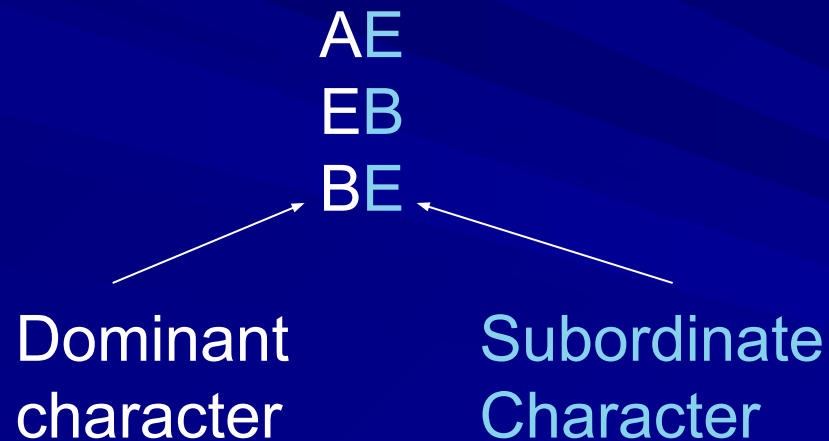
Bt1

Bt2

Bt3

Transitional Horizons

Transitional layers between master horizons.



Synthesis

Ap

AE

E

Bh

Btg1

Btg2

Soil Taxonomy

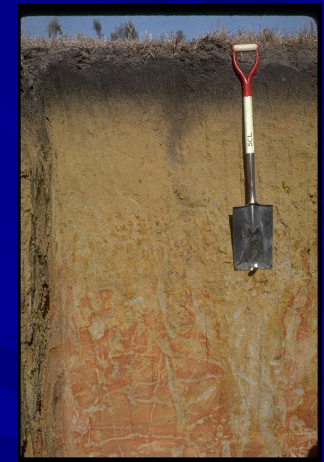
Soil Classification/Taxonomy

Hierarchical

Based on soil profile characteristics and the concept of soils as a natural body.

Observable properties: color, texture, structure, pH, O.M...

Soil Profile



Genesis

1883 V.V. Dokuchaev: climate, vegetation, soil

1927 C.F. Marbut (USDA) applied to U.S. (1965)

Soil Classification/Taxonomy

USDA classification system

Soil Survey Staff 1965

Soil Taxonomy published 1975

- Adamsville: Hyperthermic, uncoated Aquic Quartzipsamment

Soil Taxonomy Hierarchy



Units for Soil Classification

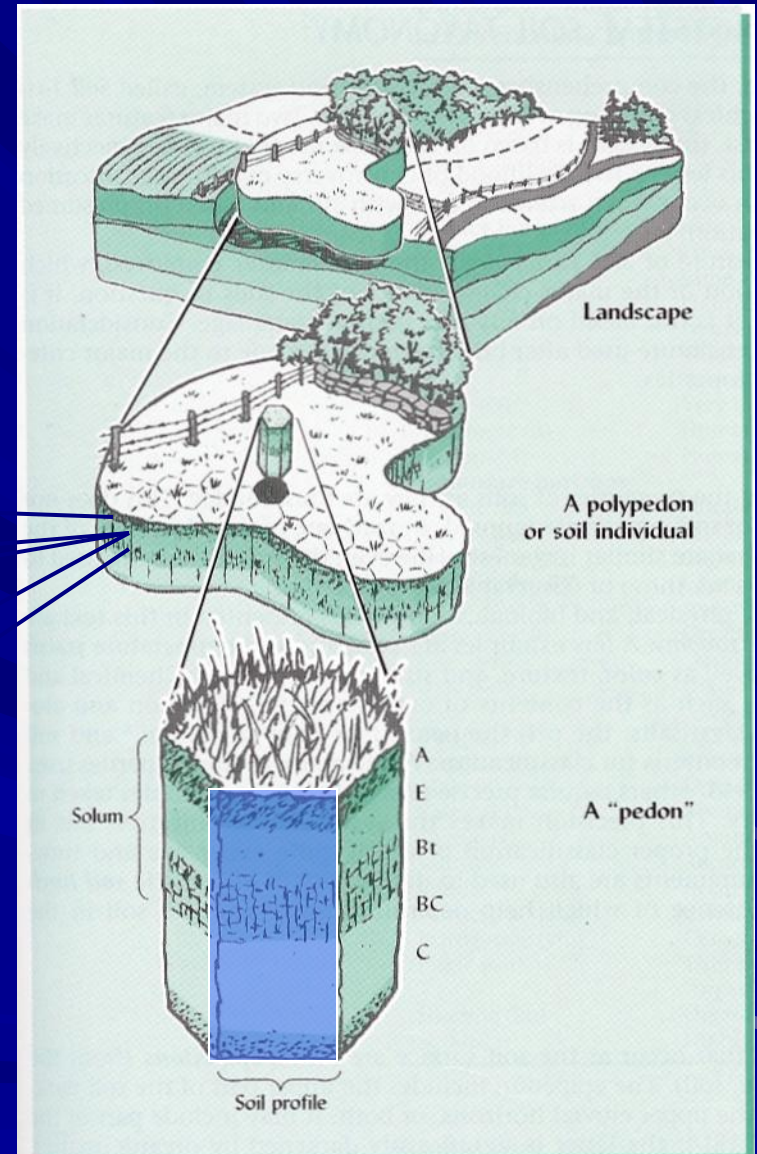
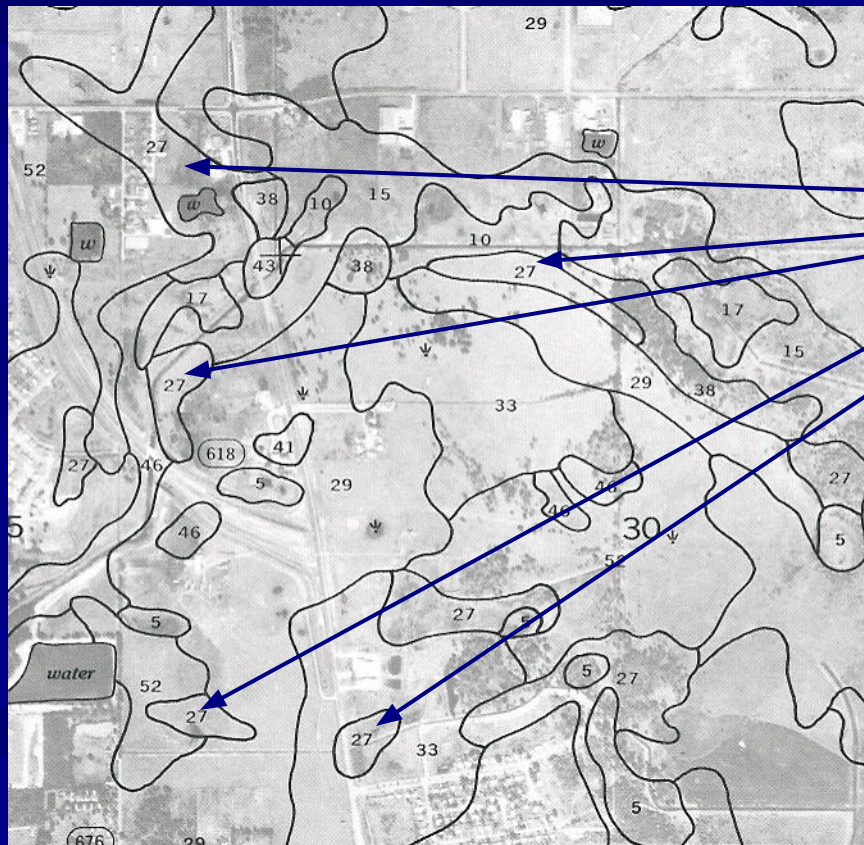
Pedon – smallest three-dimensional unit that displays the full range of properties characteristic of a given soil. (1-10 m² of area)

- the fundamental unit of soil classification

Polypedon – group of closely associated pedons in the field

Soil Series – class of soils world-wide which share a common suite of soil profile properties

Soil Sampling Units



Malabar Series

Diagnostic Horizons

Surface

Subsurface



Diagnostic Surface Horizons

Epipedons

Mollic

Umbric

Ochric

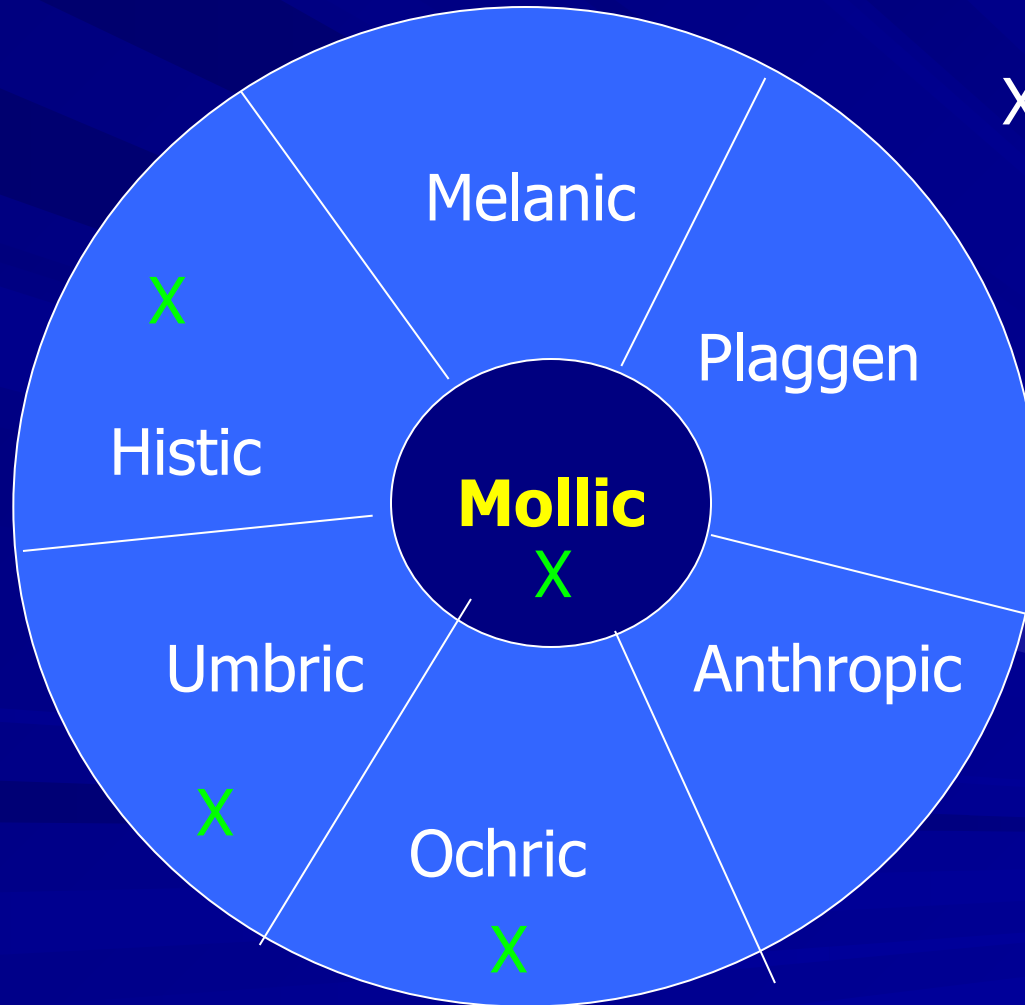
Histic

Melanic

Plaggen

Anthropic

Diagnostic Surface Horizons



X = Florida

Mollic Epipedon

Thickness > 18-25 cm

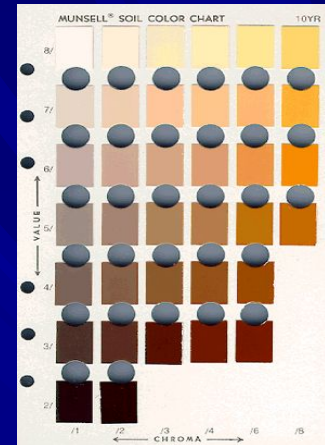
Color value < 3.5 moist
chroma < 3.5 moist

Organic Carbon > 0.6 %

Base Saturation > 50 %

Structure strongly developed

Organic carbon = organic matter x 0.5





v:u



Umbric Epipedon

Scale is in feet.



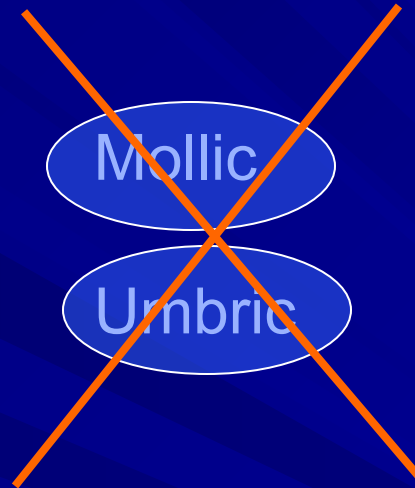
There are 4 horizons.

Meets all criteria of the Mollic epipedon,
except base saturation $< 50\%$

Chemically different than Mollic

Ochric Epipedon

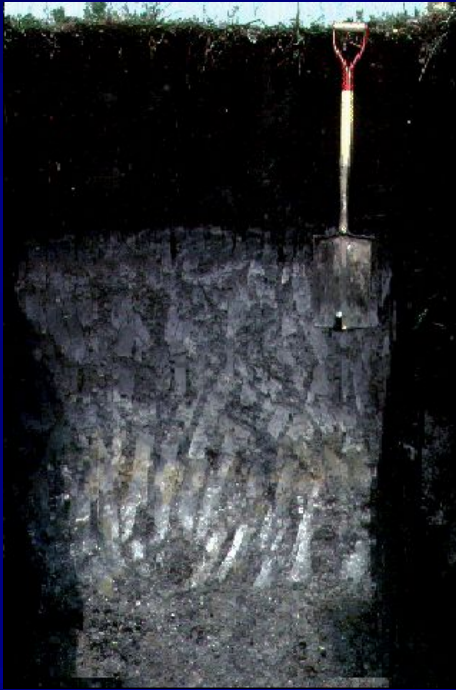
Too: thin
light
low in O.M



Ochric = pale

Extremely common

Histic Epipedon



Organic horizon
Formed in wet areas
Black to dark brown
Low bulk density
20-30 cm thick



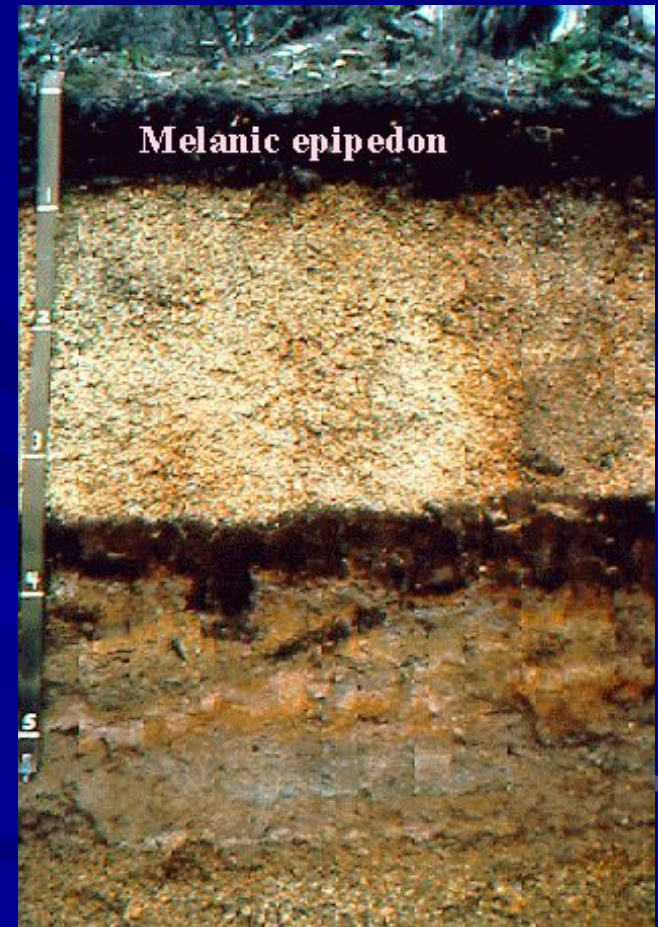
Organic = > 20% - 35% O.M.
(water saturation, clay content)

Melanic Epipedon

Similar in properties to Mollic

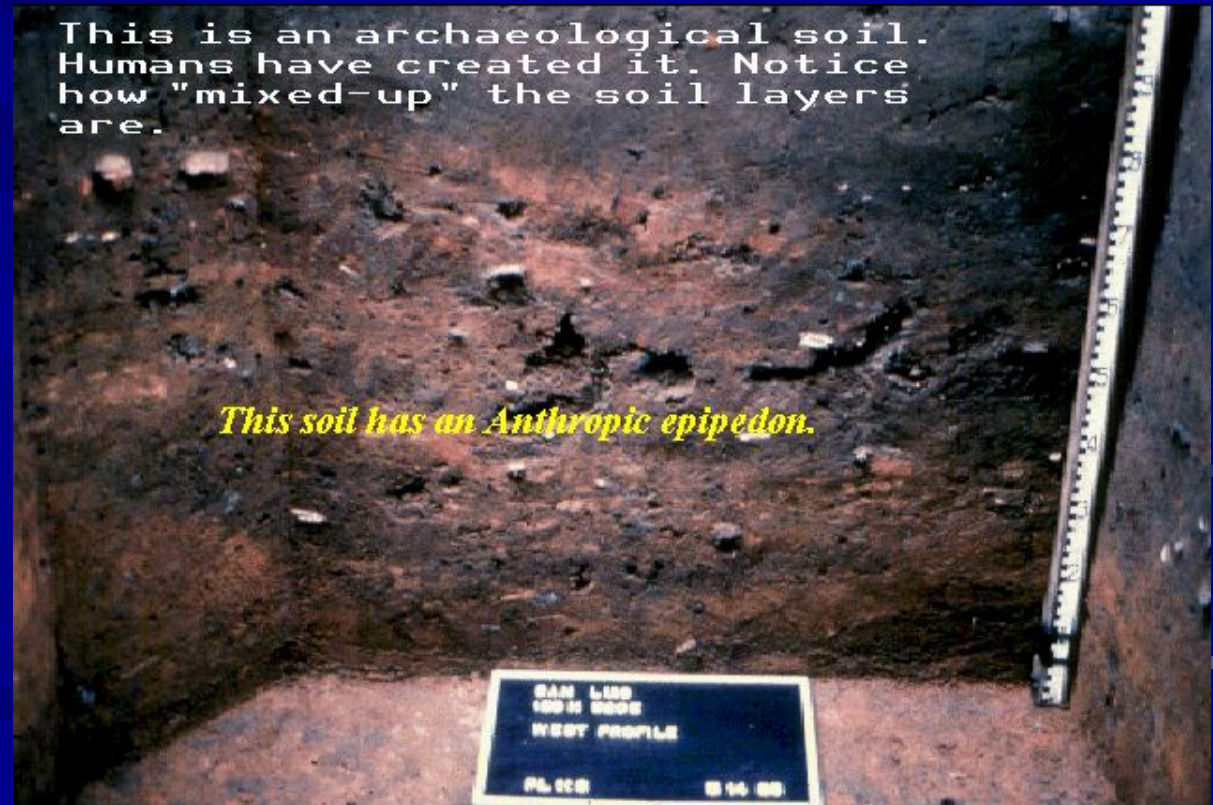
Formed in volcanic ash

Lightweight, Fluffy



Anthropic Horizon

- Resembles mollic (color, o.m.)
- Use by humans
- Shells and bones
- Water from humans



Plaggen Epipedon

Produced by long-term (100s yrs.) manuring

Old, human-made surface horizon

Absent in U.S.

> 50 cm thick



Diagnostic Surface Horizons

Epipedons

Mollic

Umbric

Very common

Ochric

Histic

“specialized”

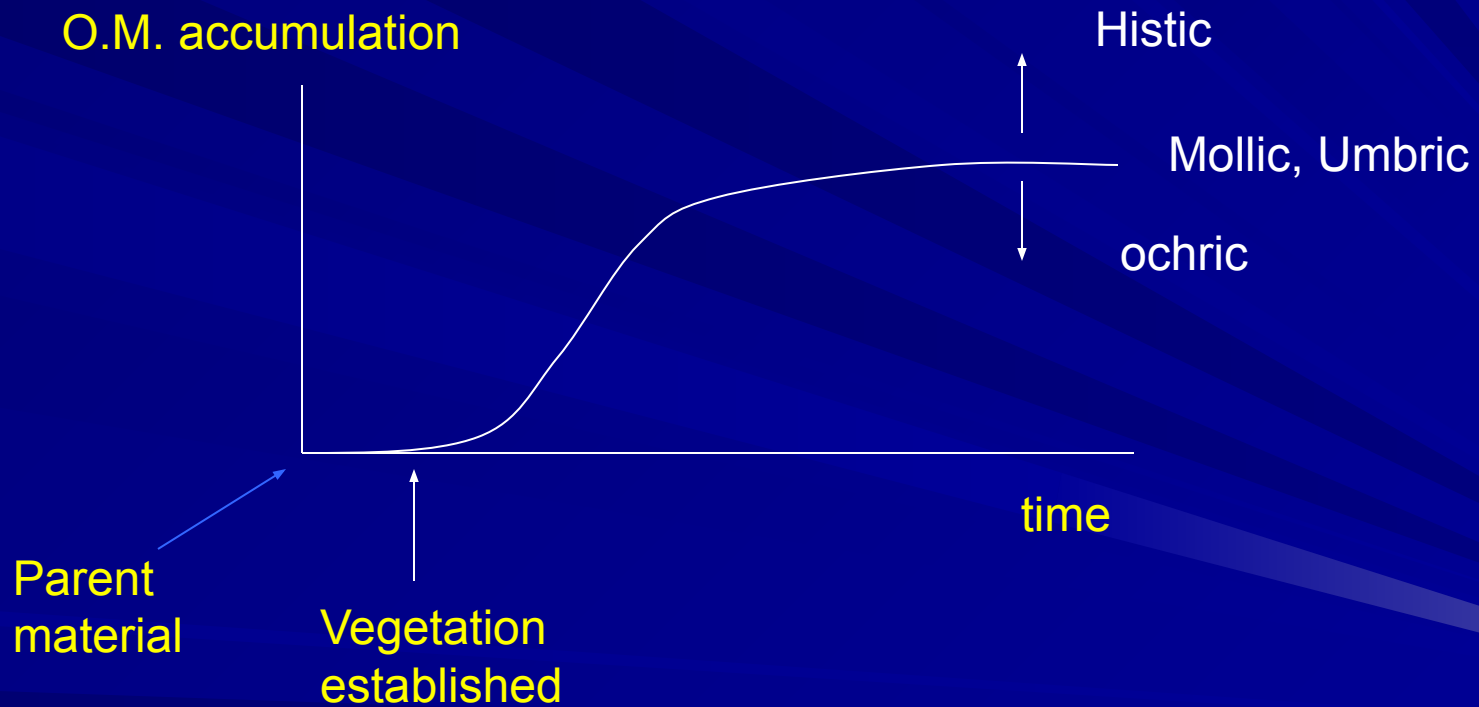
Melanic

Plaggen

Anthropic

Human-derived

Organic Matter Accumulation



$t_{\max} = 3000 \text{ yrs}$

Diagnostic Sub-surface Horizons

Diagnostic Subsurface Horizons

Formation
Translocation
Transformation



Subsurface Horizons

Formation
Translocation
Transformation

Organic Matter

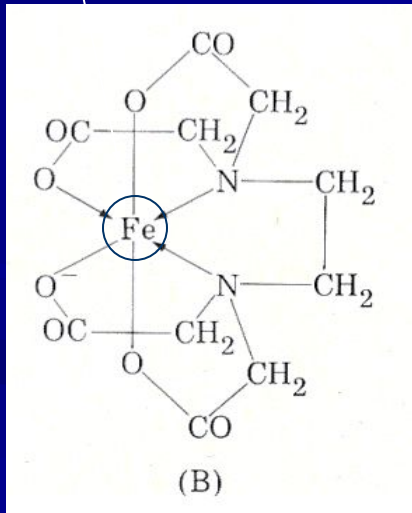
Dark colors
Metals (Fe, Al)

Clays

smectites
Kaolinite

Oxides

Iron
Aluminum



Also: salts, carbonates, sulfides

Diagnostic Subsurface Horizons

Albic

Argillic

Spodic

Oxic

Cambic

Kandic

Sombric

sulfuric

Natric

Agric

Calcic

Gypsic

Salic

Duripan

Fragipan

Placic

Sub-Horizon Designations

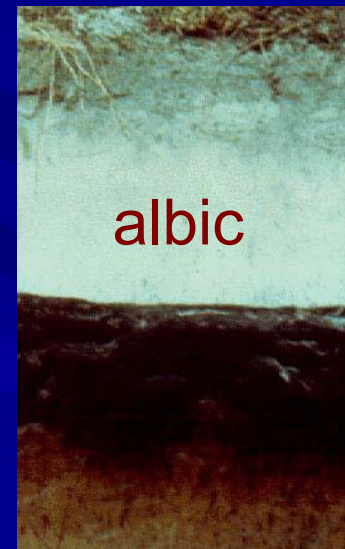


Diagnostic Subsurface Horizons

Albic (white) Horizon

- Light-colored (Value > 6 moist)
- Elluvial (E master horizon*)
- Low in clay, Fe and Al oxides
- Generally sandy textured
- Low chemical reactivity (low CEC)
- Typically overlies Bh or Bt horizons

*not all E horizons are albic horizons



Diagnostic Subsurface Horizons

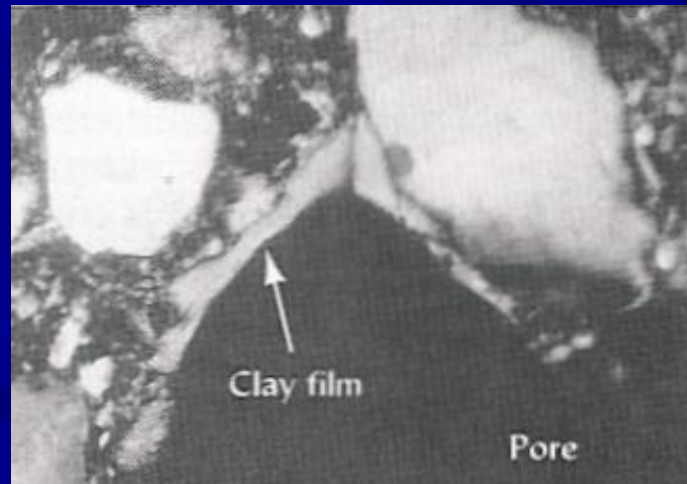
Argillic Horizon

Illuvial accumulation of silicate clays

Illuvial based on overlying horizon

Clay bridges

Clay coatings



Diagnostic Subsurface Horizons

Argillic Horizon

Kandic Horizon

High

Activity of Clays

Low

Necessary

Illuviation of clay

Not Necessary

Diagnostic Subsurface Horizons

Spodic Horizon

- Illuvial accumulation of organic matter and aluminum (+/- iron)
- Dark colored (value, chroma < 3)
- Low base saturation (acidic)
- Formed under humid acid conditions



Eluviation and Illuviation

Eluviation (E horizon)

Organic matter

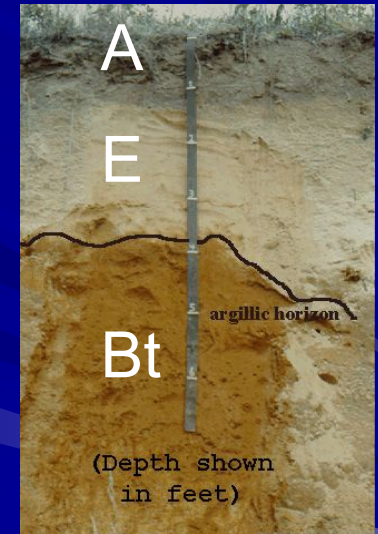
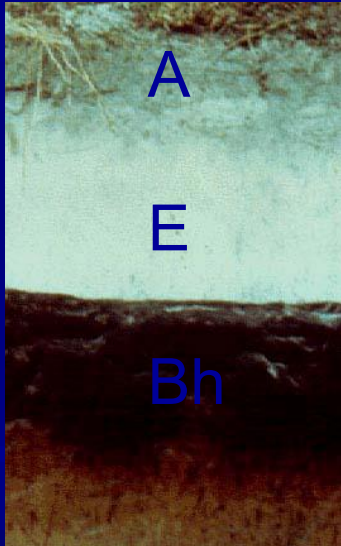
Clays

Bh horizon

Bt horizon

Spodic horizon

Argillic horizon



Diagnostic Subsurface Horizons

Oxic horizon

- Highly weathered (high temperatures, high rainfall)
 - High in Fe, Al oxides
 - High in low-activity clays (kaolinite < smectite < vermiculite)

activity



Diagnostic Horizons

Epipedons

Mollic
Umbric
Ochric
Histic
Melanic
Plaggen
Anthropic

Subsurface

Albic
Kandic
Argillic
Spodic
Oxic

Soil Taxonomy

Diagnostic Epipedons

Diagnostic Subsurface horizons

Moisture Regimes

Temperature Regimes