Interpreting and Documenting Soil Horizons and Layers

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I think of a soil profile as a historic record of what has been happening beneath the ground surface: geologically, chemically, physically, and biologically.

For a soil evaluator, being able to interpret this is a very powerful tool.

Soil Forming Factors

- Time
- Parent Material
- Climate
- Living Organisms
- Position on the landscape

Describing a soil profile is not an exacting science and there may be several correct/reasonable interpretations.

Do your homework

Research available reference materials

- USDA, published Soil Survey Reports
- USGS Surficial Geology Maps
- DEP Wetland Maps
- USGS Topographic Maps
- FEMA Flood Insurance Maps
- Etc.

Soil Profile

A vertical cut in the soil extending down from the soil surface into the underlying unweathered geologic sediments

Soil Horizon

A layer of soil, approximately parallel to the ground surface, having distinct characteristics produced by soil-forming processes.

Soil Surface, starting point for depth measurements (zero point).

- Soils lacking a surface organic layer, depth measurements start at the soil surface (cultivated fields, pastures, lawns, etc.).
- If there is a surface layer of organic matter, depth measurements start below the organic material that can be easily brushed aside and at the top of the first layer that is held inplace by roots. Common in woodland areas.

Master Horizon Designations

The capital letters O, A, E, B, C, R, and M represent the master horizons that are common to the New England Region.

Subordinate Distinctions

Lowercase letters are used as suffixes to designate specific kinds of master horizons and layers

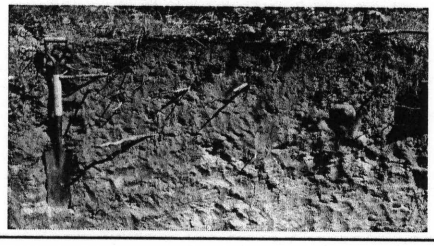
Organic Soil Material

- Partially decomposed leaves, pine needles, and twigs.
- Typically found within woodland areas

Live roots do not count as soil organic material

A Horizon (main concept)

"A dark surface mineral soil horizon resulting from the mixing of well decomposed organic matter and mineral material."



Characteristics of an A horizon

- Commonly referred to as the topsoil
- Typically the upper most mineral soil horizon
- Most often a darker color than the underlying soil layers

"p" Suffix

"Tillage or other disturbance"

- "p" for plowed
- Indicates disturbance of the surface layer by mechanical means, pasturing, or similar uses.

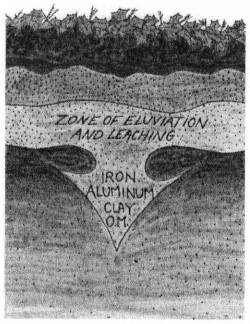
"b" Suffix

"Buried horizon"

- The "b" is used in combination with the O, A, E, and B horizon designations to identify a buried horizon.
- Not used with the C or R layers

E Horizon

Zone of eluviation and/or leaching



O Horizons

A Horizon

E Horizon

B Horizons

C Layer

Characteristics of an E horizon

- Typically underlies an O horizon and/or an A horizon
- Most often a light gray color
- Lighter in color than the overlying and underlying horizons (Oreo cookie appearance)
- Common in areas of sandy evergreen forests
- Absent in many areas of the State

B Horizons (main concept)

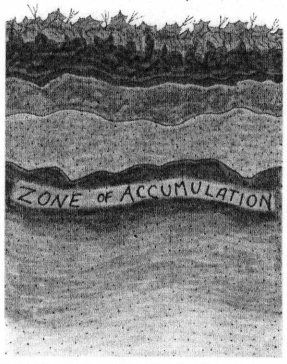
- **Zone of accumulation:** illuvial concentration of silicate clay, iron, aluminum, humus, or silica, alone or in combination.
- **Development of soil color:** coatings of iron oxides on silt and sand particles
- **Formation of soil structure**
- **Evidence of removal of carbonates**
- **Loss or transformation of iron** (i.e., ferric to ferrous) resulting from saturation and reduction (gleying)

Characteristics of B Horizons

- Commonly referred to as the subsoil
- Evidence of effects of soil formation
- Often referred to as a zone of accumulation
- Formed below an O, A, and/or E horizon
- Most varied expression
- In upland areas, typically a yellowish brown color

B Horizon

Zone of accumulation (iron, aluminum, clay, and/or organic)



O Horizons

A Horizon

E Horizon

B1 Horizon

B2 Horizon

C Layer

Bw Horizon

"Development of soil color and/or structure"

- Very common in upland areas
- Typically have colors with hues of 10YR or more yellow
- If a B horizon does not meet the criteria for any of the other subordinate distinctions for B horizons, it is most likely a Bw horizon.

"g" Suffix

" Strong gleying"

- Process - prolonged periods of soil saturation and reduction
- Soils with Bg horizons are most often wetland soils.

C Layer

"Layers that are little affected by pedogenic processes and lack the properties of O, A, E, or B horizons."

- Commonly referred to as the substratum
- Unweathered or slightly weathered geologic sediments

"d" Suffix

"Physical root restriction"

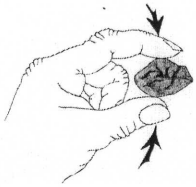
- Compact or dense material that is not cemented
- Firm, very firm, or extremely firm consistency
- Most often used to designate lodgment till (compact, dense)

Hardpan

- Any naturally occurring layer of hard, densely, compacted soil
- Generally formed in glacial till soils
- Little void space
- Low permeability and slow perc rate

Kinds of Hardpans

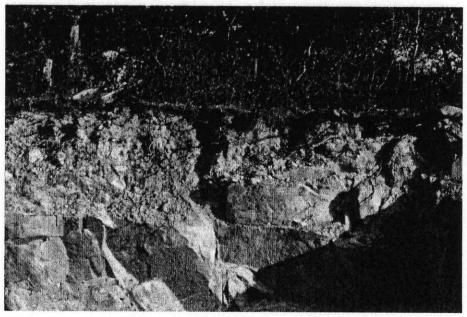
- Moderately restrictive, 20 to 30 min./inch
- Severely restrictive, 30 to 60 min./inch
- Impervious, greater than 60 min./inch



Soil Consistence:
Firm,
Very Firm, and
Extremely Firm

R Layer

"Solid bedrock or ledge"



Ledge Rock

- Continuous bedrock underlying the soil layers
- Variable in elevation and slope
- Often need for additional site testing
- 4 foot separation below leaching system

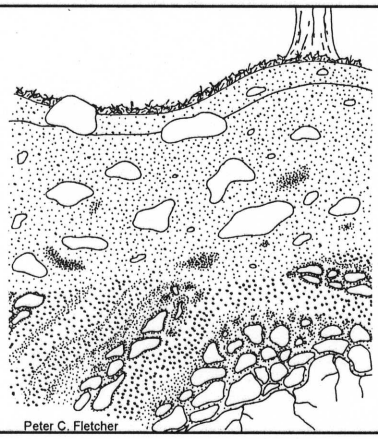
Cr Layer

"Weathered or soft bedrock"

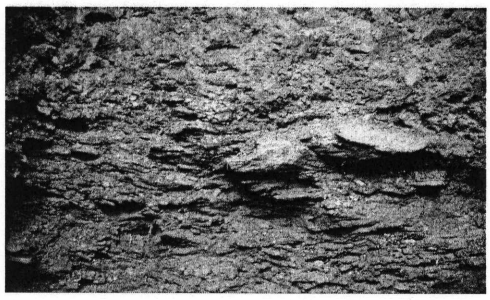
- Moderately cemented or less
- Excavation difficulty is low to high
- High excavation difficulty: excavation with a spade can be accomplished, but with difficulty. Easily possible with a full length pick using an over-the-head swing.

Non-Typical Ledge Rock

- Soft, partly decomposed rock layer that is easily excavated by a backhoe
- Becomes ledge rock with depth
- Does not present a barrier to water movement
- 2 foot separation below leaching system
- Always dig deeper to confirm solid rock below

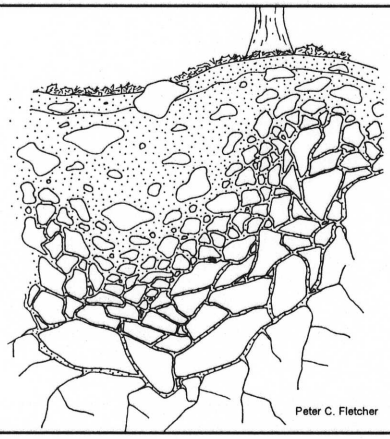


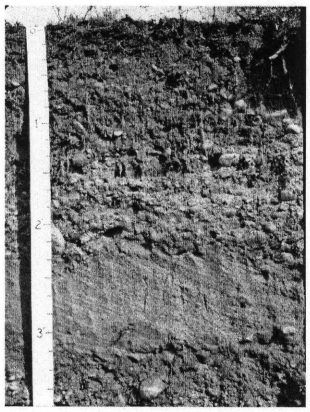
Rotten Rock (saprolite)



Fractured Ledge Rock

- Loose fractured rock overlying ledge rock
- Large fissures do not provide filtration of sewage effluent
- 4 foot separation below leaching system
- Always dig deeper to confirm solid rock below





Vertical Subdivisions

C1

C2

C3

Transitional Horizons and Layers

"Horizons dominated by properties of one master horizon but having subordinate properties of another."

- Two capital letter symbols are used in combination (e.g., BC) when a horizon has properties of two master horizons.
- The master horizon symbol that is given first designates the kind of horizon whose properties dominate the transitional horizon.

Fill Material

Debris, organic materials, soil, rock, and/or geologic sediments placed by human activities on top of natural, inplace soil material.

New Term for Fill Material
Human-transported material (HTM)

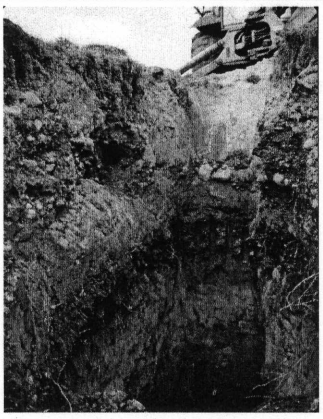
"Any material moved and placed onto another from a different source directed (intentional) human activity, usually with the aid of heavy equipment."

- Formerly referred to as fill material or anthropogenic soil

Prefix "^" caret symbol

"Mineral or organic layers of human-transported material (HTM)"

- Used to designate fill material
- Recent HTM is most often designated as a ^C layer.
- In very old fill with evidence of pedogenesis, can be used with other master horizon designations (e.g., ^A, ^E, and ^BC horizons)



^C Layer (Fill Material

Ab Horizon

Bb Horizon

C Layer