

Buried Soil Horizons, Mantles, and Buried Soils: A tutorial

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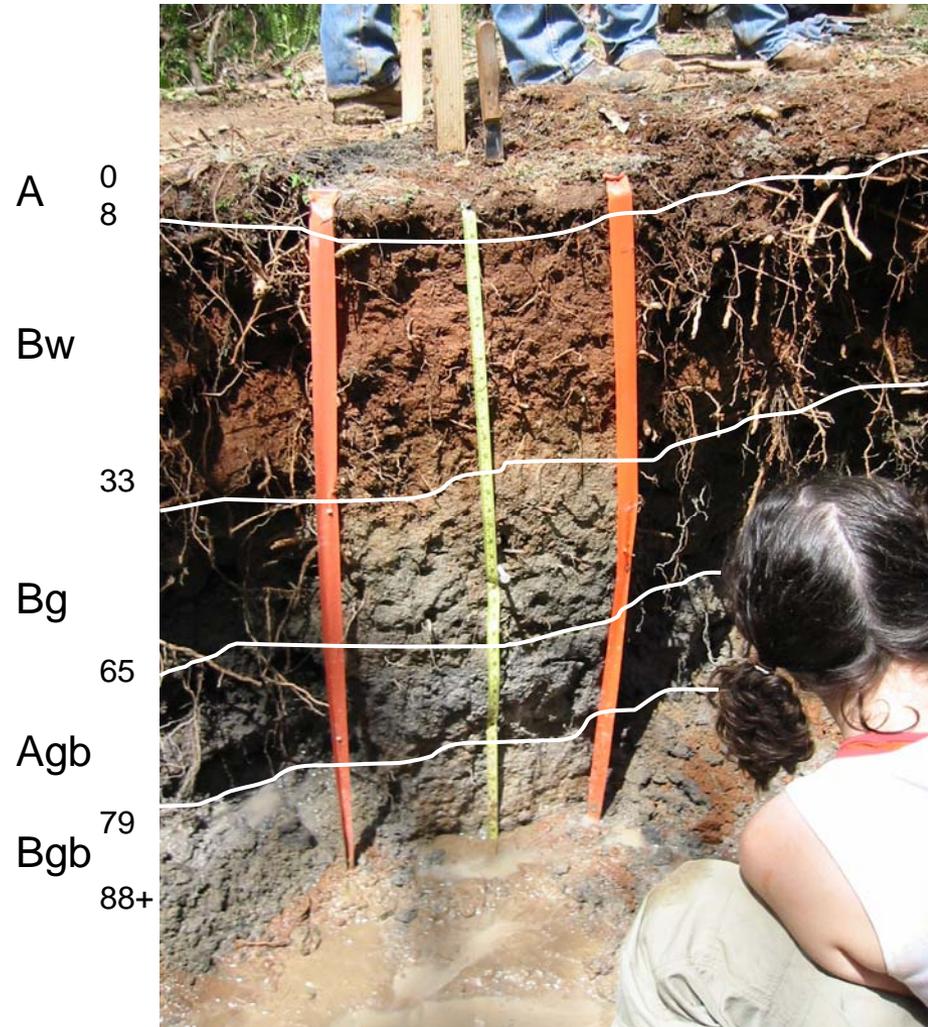
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What is a Buried Soil Horizon?

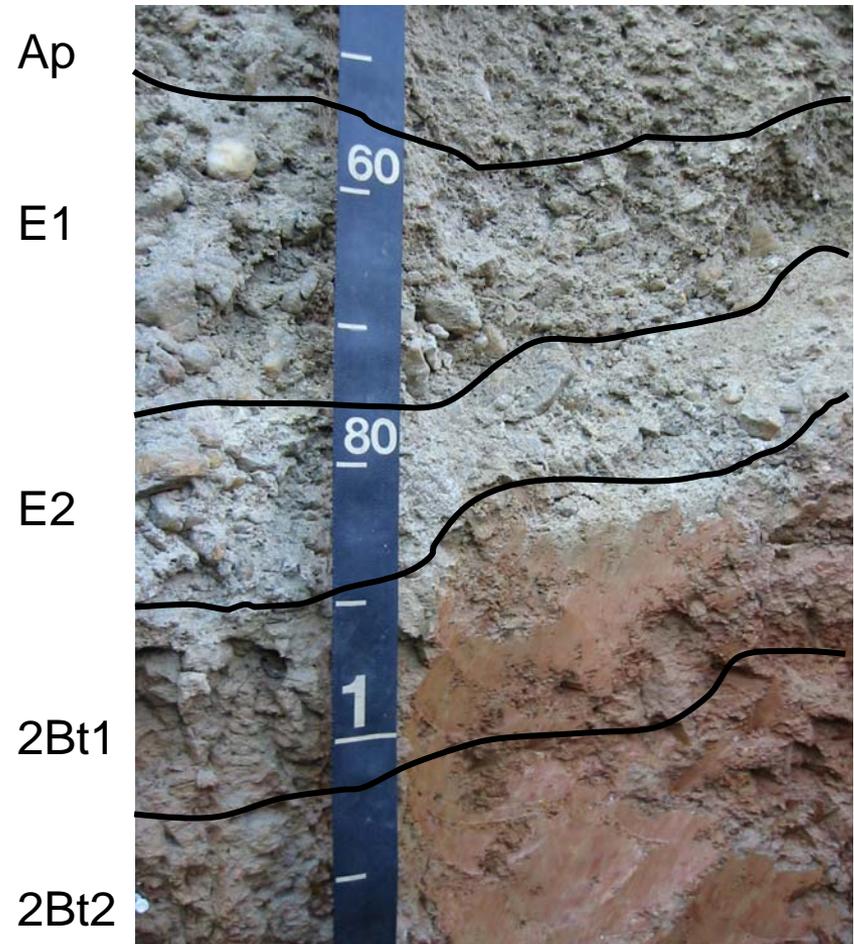
- A **buried soil horizon** is a soil horizon that formed in place and then was covered by recently transported material.
- Lowercase “b” is not added to the horizon every time you find two deposits, as in floodplains. There must be evidence of recent (Holocene-aged or younger) burial. Examples include a buried A horizon, or an irregular (higher-lower-higher) change in carbon with depth.
- C horizons are NOT eligible to have a “b” in the name, because they are parent materials.
- There is no minimum thickness of recently transported material before you use a “b”.
- The transportation source of the recently transported material might be animals (esp. humans), wind, water, ice, or gravity.

Recently Buried Soil



Ancient buried soil

- If the soil is on an upland and there is a change in parent materials or agent of transportation that caused a burial of former soils or parent materials, but there are no buried A horizons or irregular decrease in carbon or thin strata from flooding left, and we think that soil formation has taken place across both materials since the burial, we do not use “b” in the horizon names.
- For example: This soil has gravelly, sandy river alluvium over residuum. Most likely, the contact at 89 cm was at one time a gravel bar over metamorphic bedrock. The albic and the argillic horizons appear to have formed after the deposition of the alluvium, so post-deposition pedogenic processes have been superimposed across both parent materials and destroyed any organic carbon enriched horizons that may have been buried.
- Instead of using a “b” on these, we can use “2” or “3” instead. That means we observe ancient (pre-Holocene) burial from a distinctly different parent material at 89 cm but the morphology and chemistry of the original mantle has been completely altered over time.



What is a Mantle?

- Some materials recently-deposited on the surface qualify as a mantle, some do not. A Plaggen epipedon automatically qualifies as a mantle.
- A mantle is a deposit of recently transported material that meets the following requirements:
 - The bottom 7.5 cm or more of the mantle does not meet the requirements of any diagnostic horizon. Usually the bottom is a C horizon, but it may be an A or B horizon. For example, it could be a Bw horizon that is too sandy to be part of a Cambic horizon.
 - Mantles can have a cambic horizon but no other diagnostic subsurface horizons, but need not have any diagnostic subsurface horizons if too sandy or too recently deposited.

What is a Buried Soil?

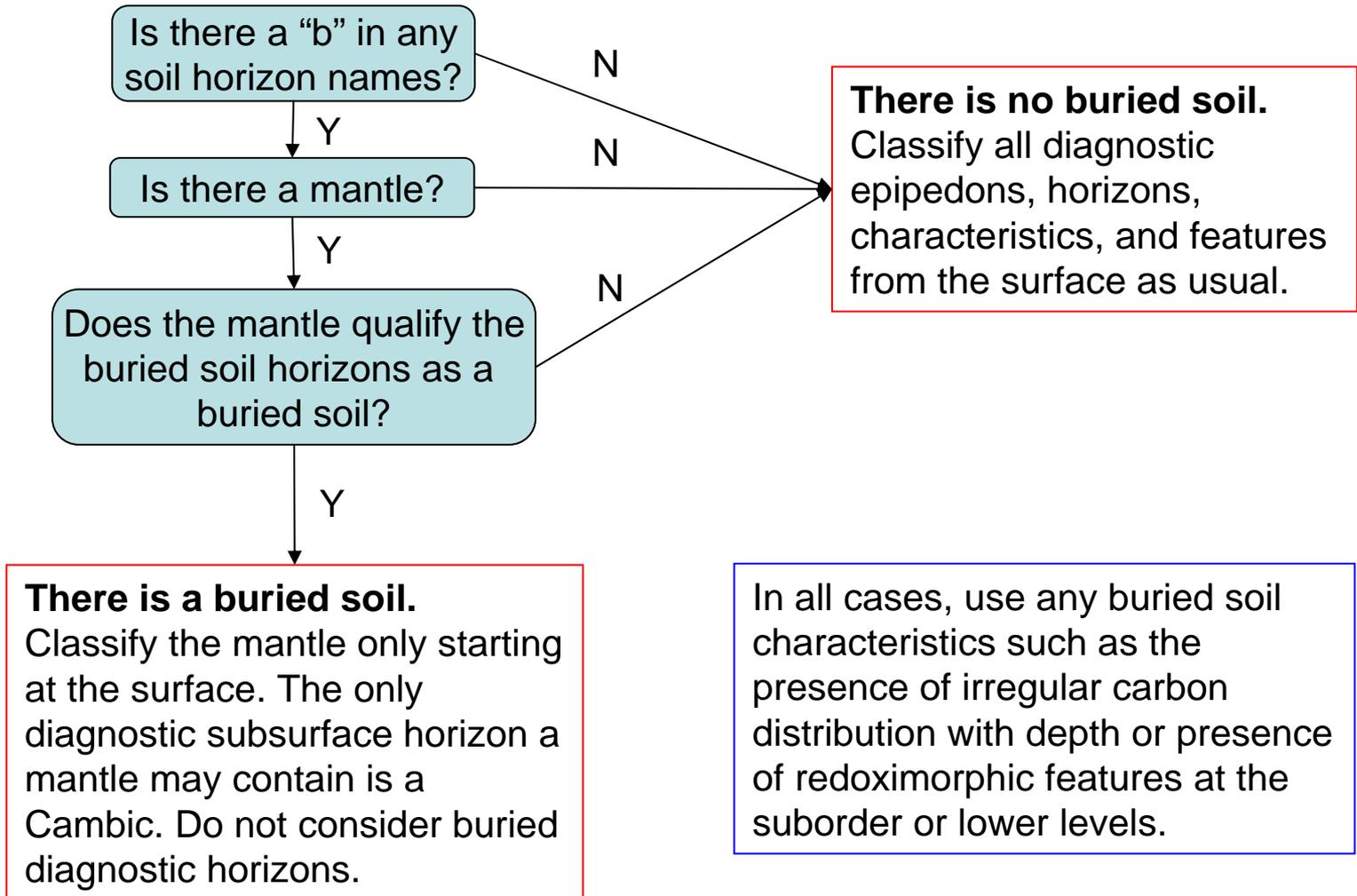
- Buried soils have a mantle and buried soil horizons other than C, M, W, or R horizons that formed before the mantle was deposited.
- Further, the mantle must meet the following criteria before the sequence of buried soil horizons are declared a buried soil:
 - a) the mantle is ≥ 50 cm thick*, or
 - b) the mantle is 30 to 50 cm thick, and the mantle thickness is $\geq 1/3$ the bottom depth of the deepest diagnostic horizon beneath the mantle, or
 - c) the mantle contains a Plaggen epipedon.

* If there is more than one mantle, consider the bottom of the deepest mantle in the thickness requirement above.

What Part of the Soil is Classified?

- The epipedon (if one occurs) is always at the current surface. The epipedon may extend through the recent deposit into the older deposit unless there is a mantle thick enough to identify a buried soil beneath.
- Some diagnostic horizons formed at the older surface and would qualify as epipedons but are now covered by recent deposits. They may be used in subgroup classifications, such as a Histic epipedon that qualifies for a “Thapto-Histic” subgroup. Use the presence of the buried organic carbon-rich horizons or an irregular decrease in OC with depth or $>0.2\%$ OC at the bottom of the profile for placement in taxa that utilize the “Fluv”, “Fluvaquentic”, “Fluventic” or other formative elements.
- If there is a mantle and it is thick enough to qualify the buried soil horizons underneath as a buried soil, classify the mantle only. Mantles that meet the thickness requirement can have any epipedon or none. There can only be a Cambic horizon or none in the subsoil of the mantle. Placement may occur in any soil order that does not require a more highly developed diagnostic subsoil horizon than a Cambic.
- If the mantle is too thin to qualify the buried soil horizons underneath as a buried soil, or there is a recent deposit that is not a mantle, classify the epipedon at the surface but then identify all diagnostic horizons and features as you would any other soil.

Classification Flowchart



Is there a "b" in any soil horizon names?

N

Y

Is there a mantle?

N

Y

Does the mantle qualify the buried soil horizons as a buried soil?

N

Y

There is no buried soil.
Classify all diagnostic epipedons, horizons, characteristics, and features from the surface as usual.

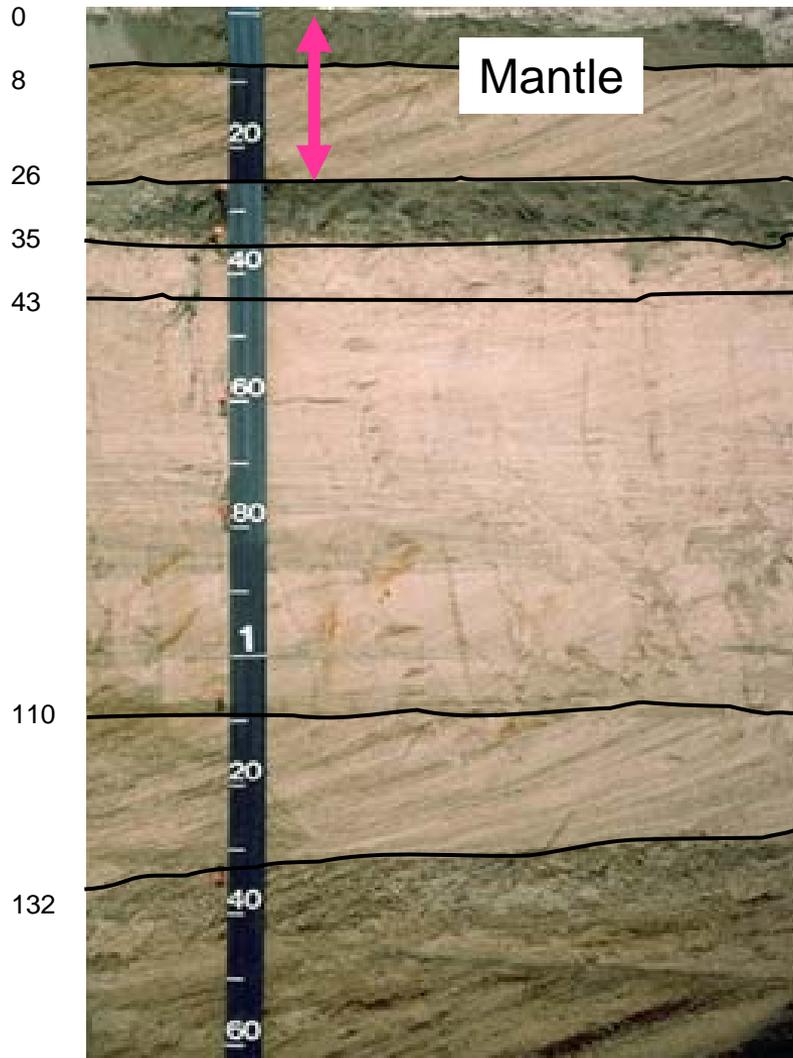
There is a buried soil.
Classify the mantle only starting at the surface. The only diagnostic subsurface horizon a mantle may contain is a Cambic. Do not consider buried diagnostic horizons.

In all cases, use any buried soil characteristics such as the presence of irregular carbon distribution with depth or presence of redoximorphic features at the suborder or lower levels.

Examples

- The following examples are meant to show how the rules are applied.
 - Soils with a mantle but no buried soil
 - Soils with a mantle and a buried soil
 - Soils with no mantle and no buried soil
- Not all situations are covered.

A soil with a mantle but no buried soil (1)



A ← Epipedon – Ochric. Textures are sands throughout.

C ← There is a mantle because the lower 7.5 cm of the recent deposit is not part of a diagnostic horizon.

Ab

Bwb

C'1

There is an Ochric epipedon (Ab) under the recent deposit, but no diagnostic subsurface horizons.

The Bwb is too thin for a Cambic horizon. Even if it were thick enough, it would be too sandy for a Cambic horizon.

There is no buried soil because the mantle on top is too thin (< 30 cm thick).

2C'2

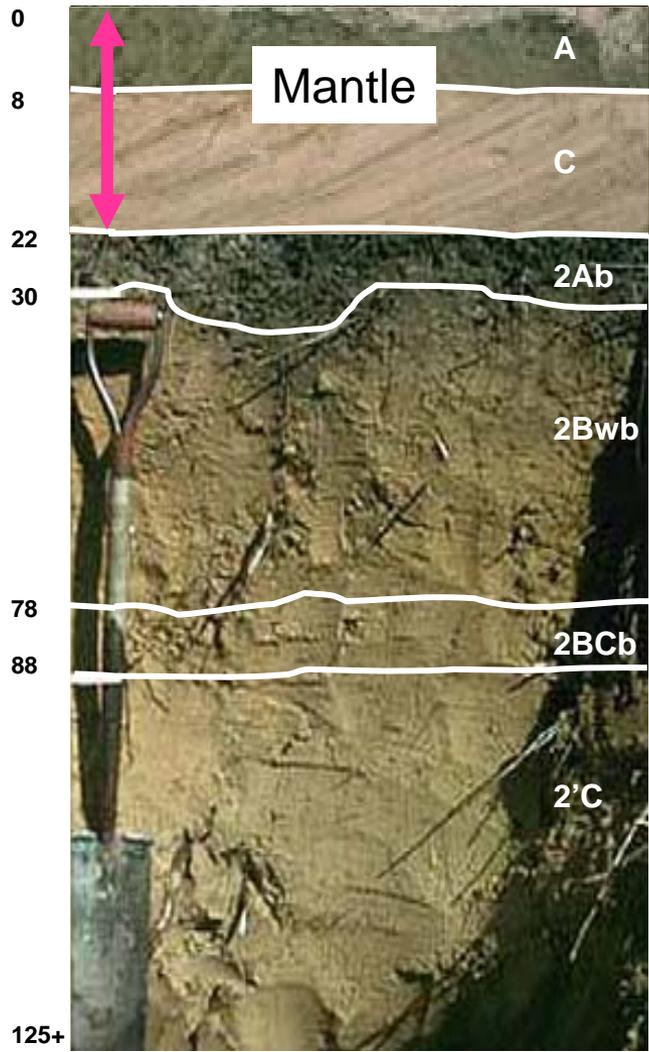
3C'3

↓

classify

This soil is an Entisol, a Fluventic Xero psamm ent.

A soil with a mantle but no buried soil (2)



← Epipedon – ochric. All textures above 22 cm are sands, but below 22 cm are loams and silt loams.

← There is a mantle because the lower 7.5 cm of the recent deposit is not part of a diagnostic horizon.

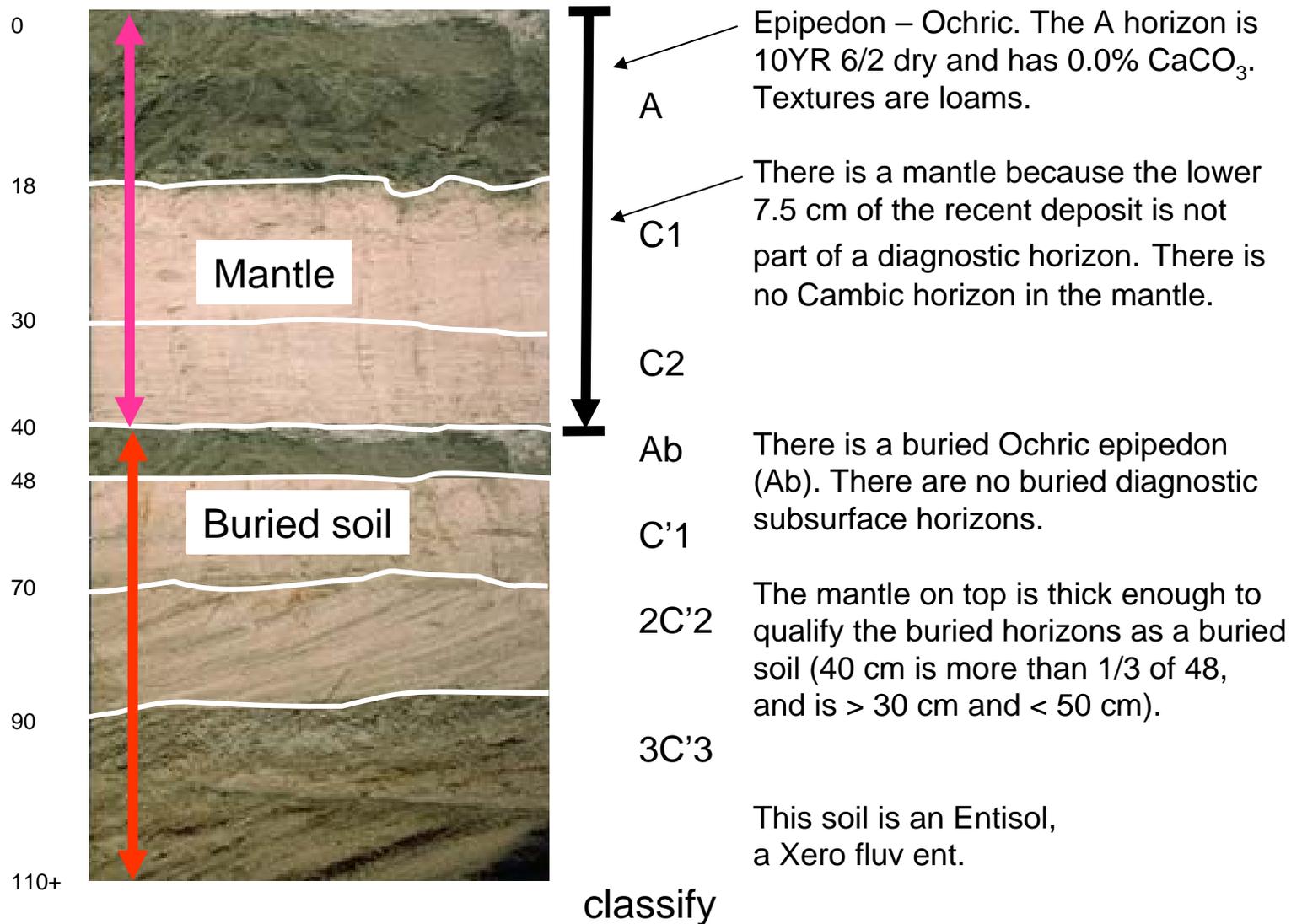
There is an Ochric epipedon (2Ab) and a Cambic subsurface horizon (2Bwb and 2BCb) under the recent deposit.

There is no buried soil because the mantle is too thin (22 cm thick). It would have needed to be 1/3 of 88 (~29 cm) thick, and also would have needed to be the minimum 30 cm thick.

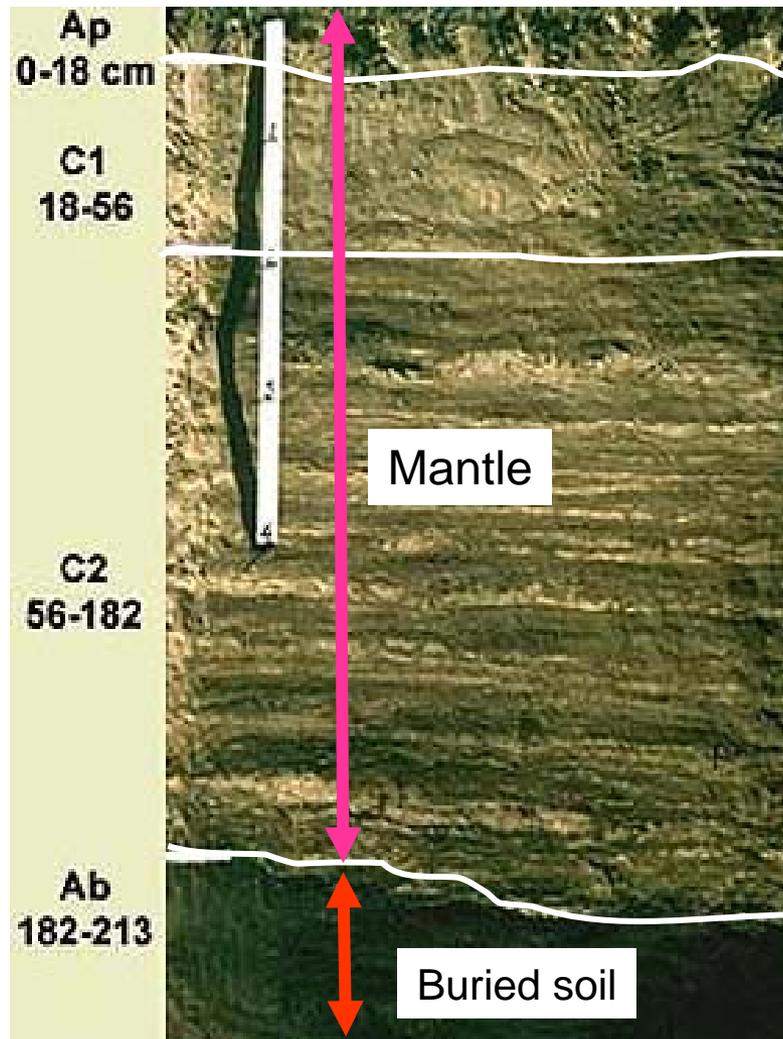
The buried cambic horizon would be used to classify this soil as an Inceptisol, a Fluventic Haplo xer ept.

classify

A soil with a mantle and a buried soil (1)



A soil with a mantle and a buried soil (2)



Epipedon – none. What would have been an Ochric is an (Ap) that directly overlies freshly stratified sediments with an irregular decrease in carbon.

Textures are loams and silt loams.

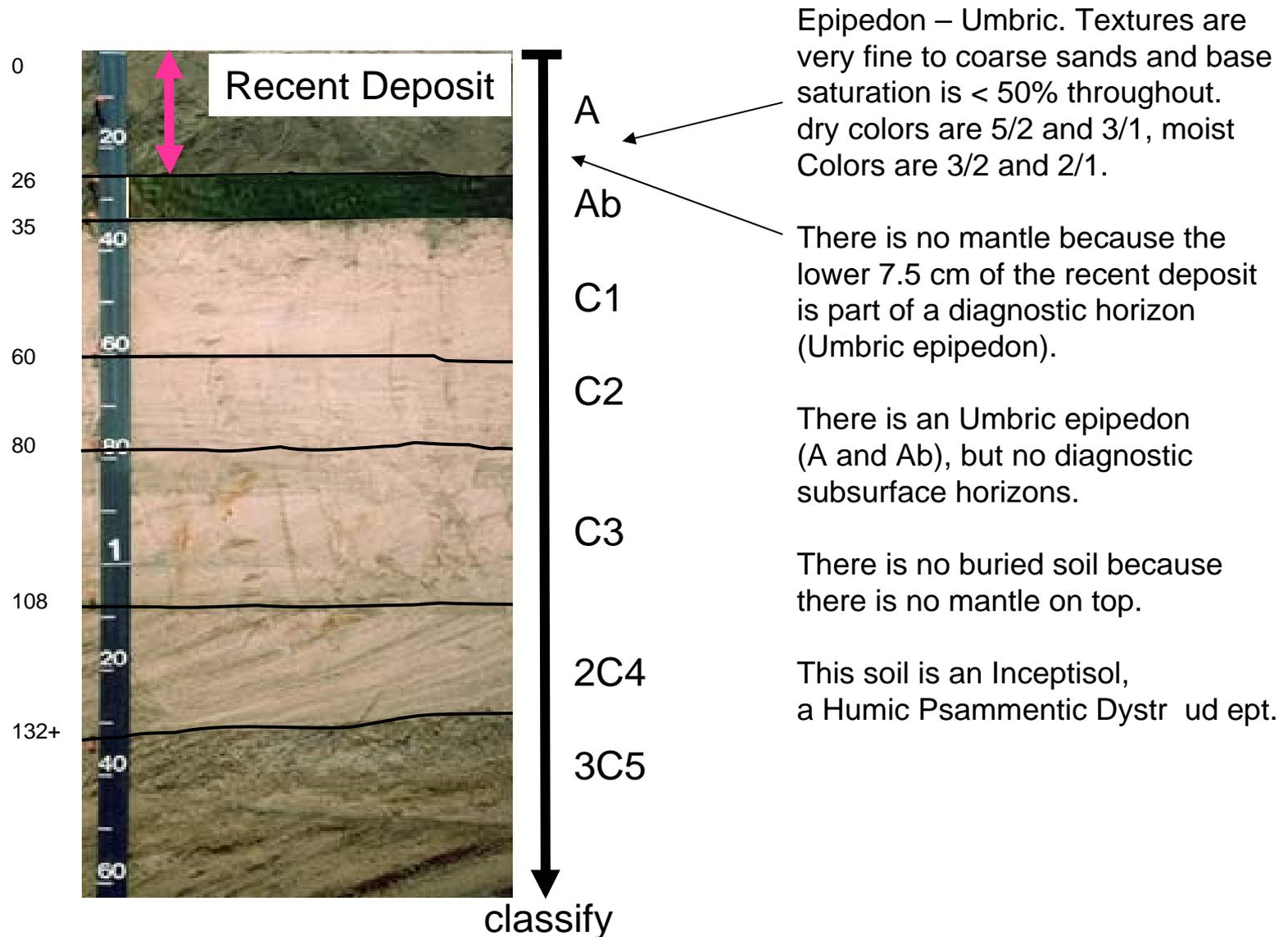
There is a mantle because the lower 7.5 cm of the recent deposit is not part of a diagnostic horizon.

There is no Cambic horizon in the mantle.

There is a buried Mollic (Ab) epipedon and buried soil beginning at 182 cm. The Mollic epipedon is not considered except to confirm an irregular decrease in carbon.

classify This soil is an Entisol, a Xero fluv ent.

A soil with no mantle and no buried soil (1)



Epipedon – Umbric. Textures are very fine to coarse sands and base saturation is < 50% throughout. dry colors are 5/2 and 3/1, moist Colors are 3/2 and 2/1.

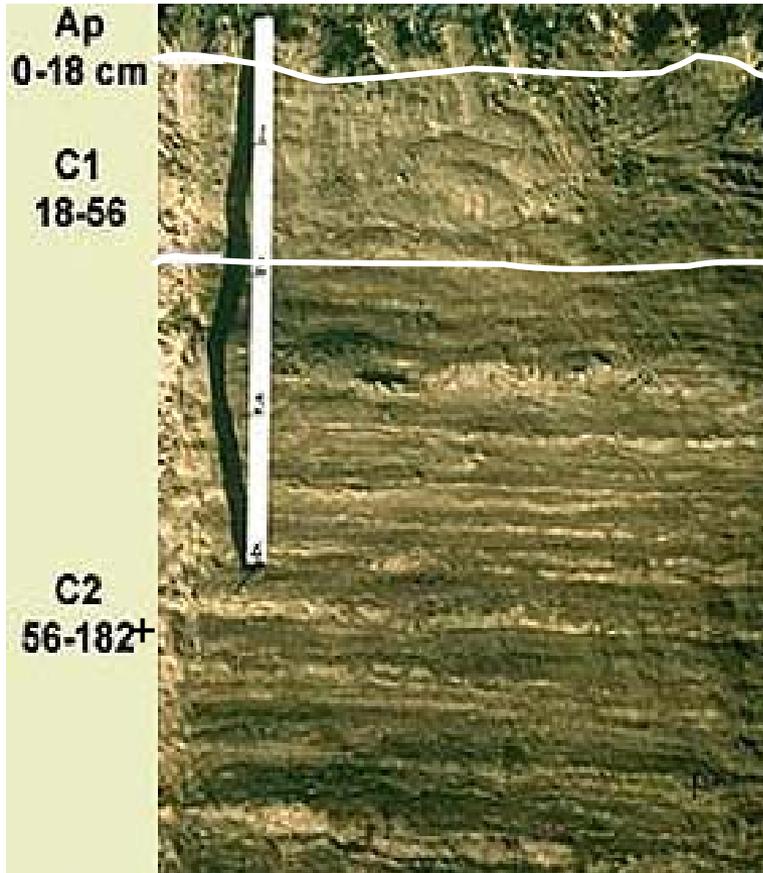
There is no mantle because the lower 7.5 cm of the recent deposit is part of a diagnostic horizon (Umbric epipedon).

There is an Umbric epipedon (A and Ab), but no diagnostic subsurface horizons.

There is no buried soil because there is no mantle on top.

This soil is an Inceptisol, a Humic Psammentic Dystr ud ept.

A soil with no mantle and no buried soil (2)



Epipedon – none. What would have been an Ochric is an (Ap) that directly overlies freshly stratified sediments and an irregular decrease in carbon. Texture is loam.

Textures are sandy loams stratified with loams below 18 cm.

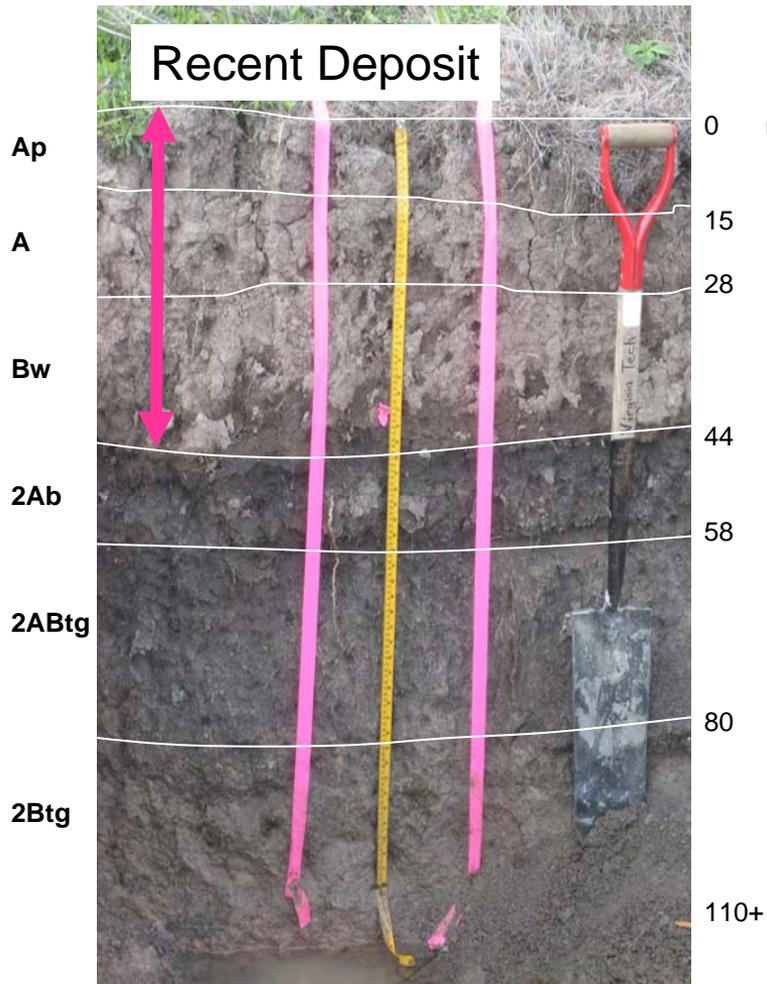
There is no mantle since the whole soil is a recent deposit.

There is no buried horizons and no diagnostic subsurface horizons.

This soil is an Entisol, a Xero fluv ent.

classify

A soil with no mantle and no buried soil (3)



Epipedon – Mollic. Dry colors are 7.5YR 4 or 5/2, moist colors 3/2. All textures are loams or silt loams. Base sat. is > 50% throughout the soil.

The recent deposit is thick (44 cm), but there is no mantle because the lower 7.5 cm of the recent deposit above 44 cm is part of a diagnostic Cambic horizon (Bw). Moist color 3/4.

There is a second Mollic epipedon (2Ab and 2ABg) under the recent deposit.

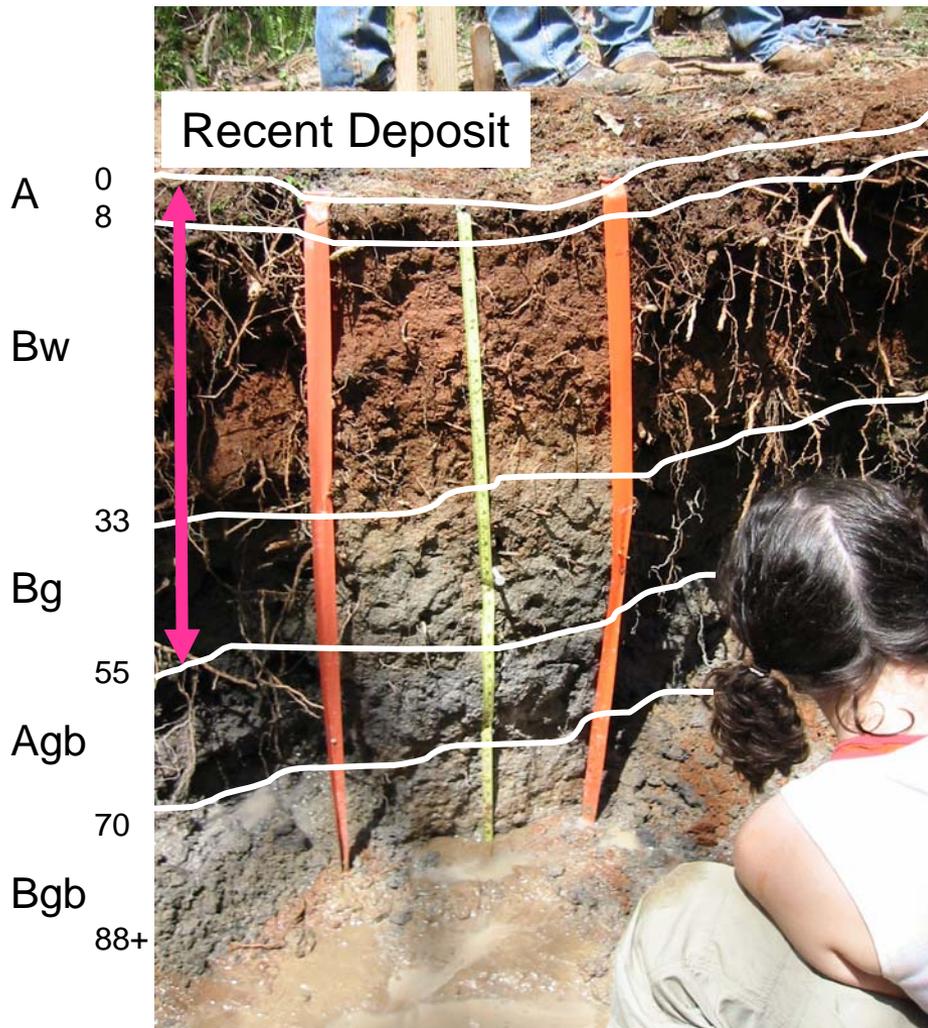
There is an argillic (2ABtg and 2Btg) horizon under the recent deposit.

We classify the soil from the surface. The second Mollic epipedon is not used except to confirm an irregular decrease in carbon. The argillic is used to place the soil at the great group level.

classify

This soil is a Mollisol, an Argi xer oll, almost an Endo aqu oll.

A soil with no mantle and no buried soil (4)



Epipedon – Ochric. All textures are loams or silt loams. Base sat. is < 50% throughout.

The recent deposit is thick, but there is no mantle because the lower 7.5 cm of the recent deposit above 55 cm is part of a diagnostic Cambic (Bw and Bg) horizon.

There is a second Ochric epipedon (Agb) and a second Cambic (Bgb) horizon under the recent deposit.

We classify the soil from the surface.

The buried Agb horizon is not used except to confirm an irregular decrease in carbon. The second cambic is not used because it duplicates the upper cambic as far as classification is concerned.

This soil is an Inceptisol, an Endo aqu ept.

classify