

**SEASONAL HIGH WATER
TABLE INDICATORS
NON-HYDRIC**



**ACT PRESENTATION 2
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Seasonal High Water Tables



- **Seasonal High Water Table (Seasonal High Saturation in USDA NRCS terms) is the highest level to a zone of saturation in the soil in most years. Normally persists for several weeks and normally occurs during the time of the year when the most rain falls (June-September in FL)**
- **A water table that is seasonally high for LESS THAN 30 days is NOT indicated in the Soil and Water Features Table in Soil Surveys.**

Apparent/Perched Water Table



- **Apparent:** a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
- **Perched:** Water standing above an unsaturated zone. In some places, an upper, or perched, water table is separated from a lower one by a dry zone.

Redoximorphic (Redox) Features



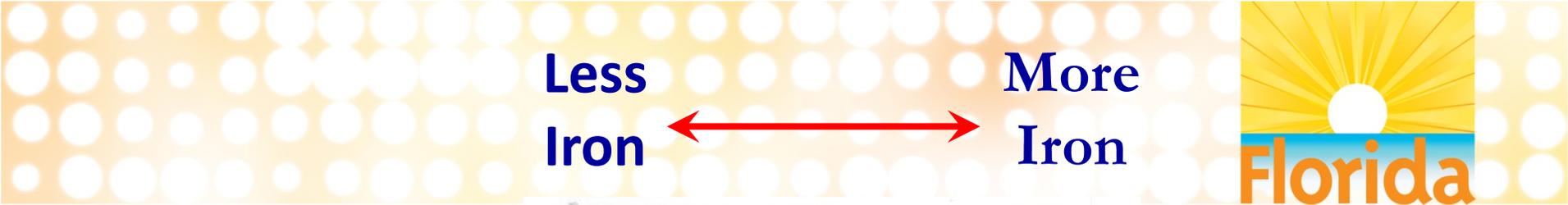
- **Redox Concentrations:** areas of apparent accumulation (*more color*) of Fe-Mn (Iron/Manganese) oxides. Results in the splotches of higher chroma.
- **Redox Depletions:** removal of Fe or Mn from the soil resulting in a removal of color and leaving grayer soils.



**Well Drained
(OXIDIZED) Soil
(the red color is
oxidized, or
rusty, iron is in
abundance)**



**Poorly Drained
(REDUCED)
Soil. The gray is
reduced iron,
which is where
iron has been
removed)**



**Less
Iron**



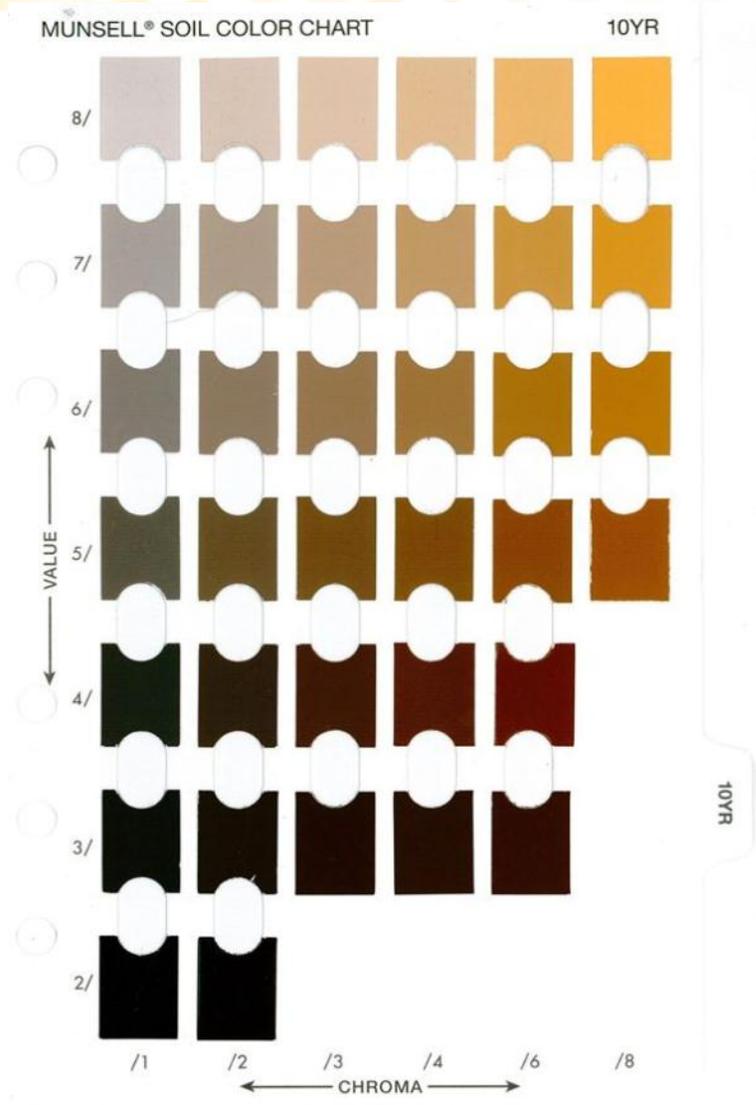
**More
Iron**



**Less
OM**



**More
OM**



SHWT (SHS) Indicators

Contemporary vs. Relict
What to look for



Contemporary vs. Relict



- **CONTEMPORARY FEATURES** - Soil morphological features that reflect current hydrologic conditions of saturation and anaerobiosis. These ARE used to determine SHWT.
- **RELICT FEATURES** - Soil morphological features that reflect past hydrologic conditions of saturation and anaerobiosis. These ARE NOT used to determine SHWT.



- **Contemporary redox concentrations have diffuse boundaries.**



- **Relict redox concentrations may have sharp boundaries.**

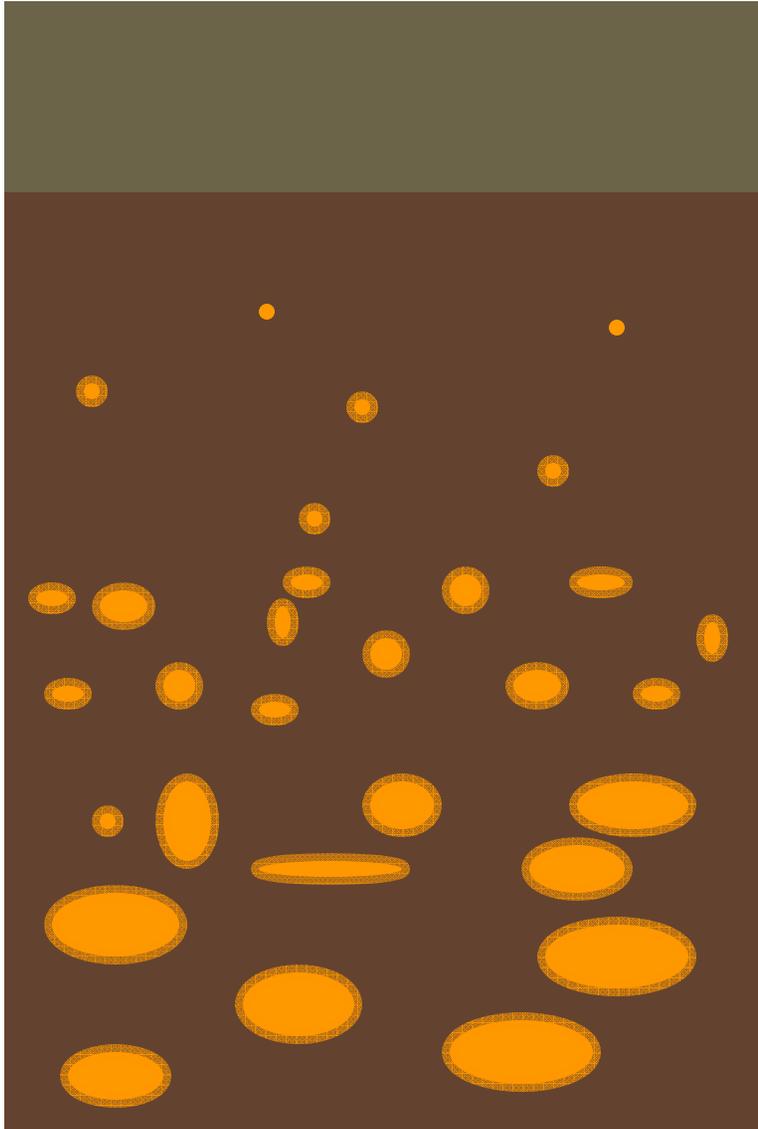


**Relict (not
useable)
Feature –
Note
sharper
boundaries**



- **Redox concentrations with diffuse boundaries**

Typical of High Chroma Redox



**NOTE DIFFUSE
BOUNDARIES OF
REDOX
CONCENTRATIONS**

Where To Begin Looking For
Redox Features

**Proper Measurement to Redox
Features**



- **WHERE THE NATURAL SOIL SURFACE HAS BEEN ALTERED BY THE ACTION OF MAN VIA SOIL ADDITION OR REMOVAL, ALL SWHT INDICATORS MUST BE JUDGED USING NATURAL SOIL SURFACE CRITERIA, ACCOUNTING FOR WHAT WAS ADDED OR REMOVED**

FILL



- **REDOX FEATURES MAY FORM IN FILL MATERIAL AND EXTRA CARE MUST BE TAKEN DURING THEIR EVALUATION.**

What is texture of fill and how long has it been on site?



- Try and determine the amount of time that the fill material has been on site.
- May be able to use Google Earth's historic imagery feature to look back to about 1994.
- Could also use other aerial photography sites like Florida Aerial Photography at <http://ufdc.ufl.edu/aerials>.

continued



- Some filled areas are much more recent.
- Filled areas present additional problems.
- It is often advisable to conduct many more soil profiles in the area of the drainfield to properly view the possibly very different soil properties.

Anthropogenic Soils



- Many areas in Florida have been filled for decades.
- This occurred in the 1960's and 1970's for a very large part of SW Florida.

RF in Fill Materials



- Use the information found in Hydric Soils Technical Note #5
- Sandy Soils: 3-5 years for contemporary features to form, if all “ingredients” are present for feature formation.
- Loamy/Clayey soils: 8-10 years for contemporary features to form, if all “ingredients” are present for feature formation.

NOTE



- *A USDA NRCS soil scientist may be hesitant or possibly unwilling to make a determination regarding the estimated seasonal high water table based on the soil morphology in anthropogenic soils. This does not mean that the CHD personnel do not have to determine the SHWT. The CHD must always have a SHWT determination to use for OSTDS permitting.*

SEASONAL HIGH WATER TABLE INDICATORS (REDOX FEATURES)

FROM SOIL SURFACE
DOWN TO 12"

- *MUST USE HYDRIC SOIL INDICATORS (HSI).*
These will be discussed in the next presentation.
- *USDA TEXTURES*
 - *LFS AND COARSER USE SANDY INDICATORS*
 - *LVFS AND FINER USE THE LOAMY/CLAYEY INDICATORS.*
- *Additional discussion in Hydric Soils Presentation.*

LFS AND COARSER TEXTURES



- Most to least coarse
- Very Coarse Sand (VCOS), Coarse Sand (COS), Sand (S), Fine Sand (FS), Very Fine Sand (VFS), Loamy Coarse Sand (LCOS), Loamy Sand (LS), Loamy Fine Sand (LFS)

LVFS and finer textures



- Most to least coarse (finest texture)
- Loamy very fine sand (LVFS),
Coarse Sandy Loam (COSL), Sandy Loam (SL),
Fine Sandy Loam (FSL), Very Fine Sandy Loam
(VFSL), Loam (L), Silt Loam (SiL), Silt (Si),
Sandy Clay Loam (SCL), Clay Loam (CL),
Silty Clay Loam (SiCL), Sandy Clay (SC); Silty Clay
(SiC), Clay (C)

- *Redoximorphic features must have distinct or prominent contrast with the matrix (or be the matrix color in the case of the loamy/clayey soils) and have diffuse boundaries (except where a specific indicator dictates otherwise.)*
- *Redoximorphic features include redox concentrations and depletions.*

NODULES AND CONCRETIONS:



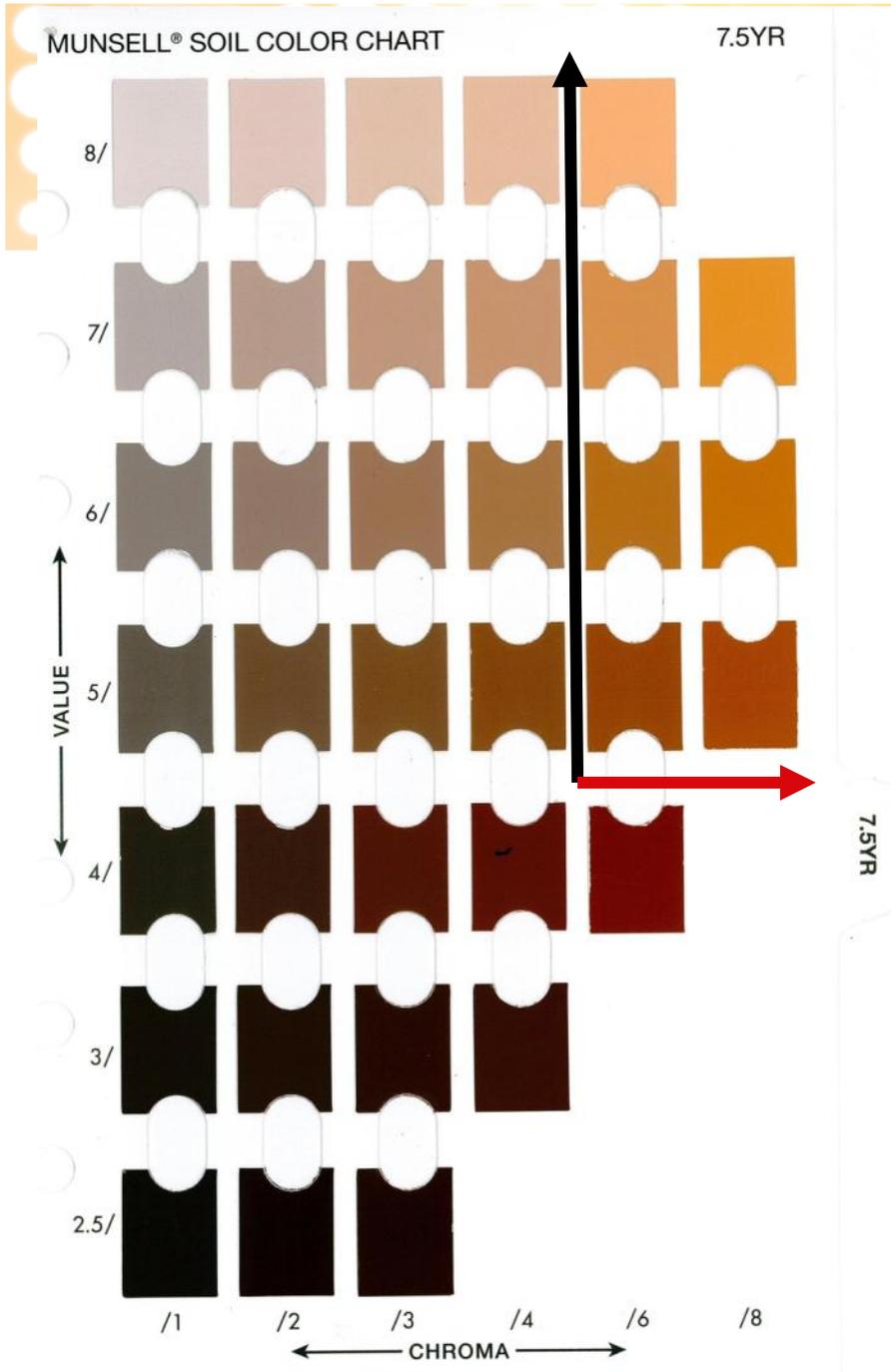
- Nodules are cemented or hardened plinthite. Concretions are similar except for the presence of visible, concentric layers around a point or line. Both have sharp boundaries and except as specifically noted for specific HSI, do not count as a redoximorphic feature.

BELOW 12" FROM
NATURAL SOIL SURFACE

SANDY SOILS (*USDA textures of loamy fine sand and coarser*) use the following Redoximorphic Concentrations:



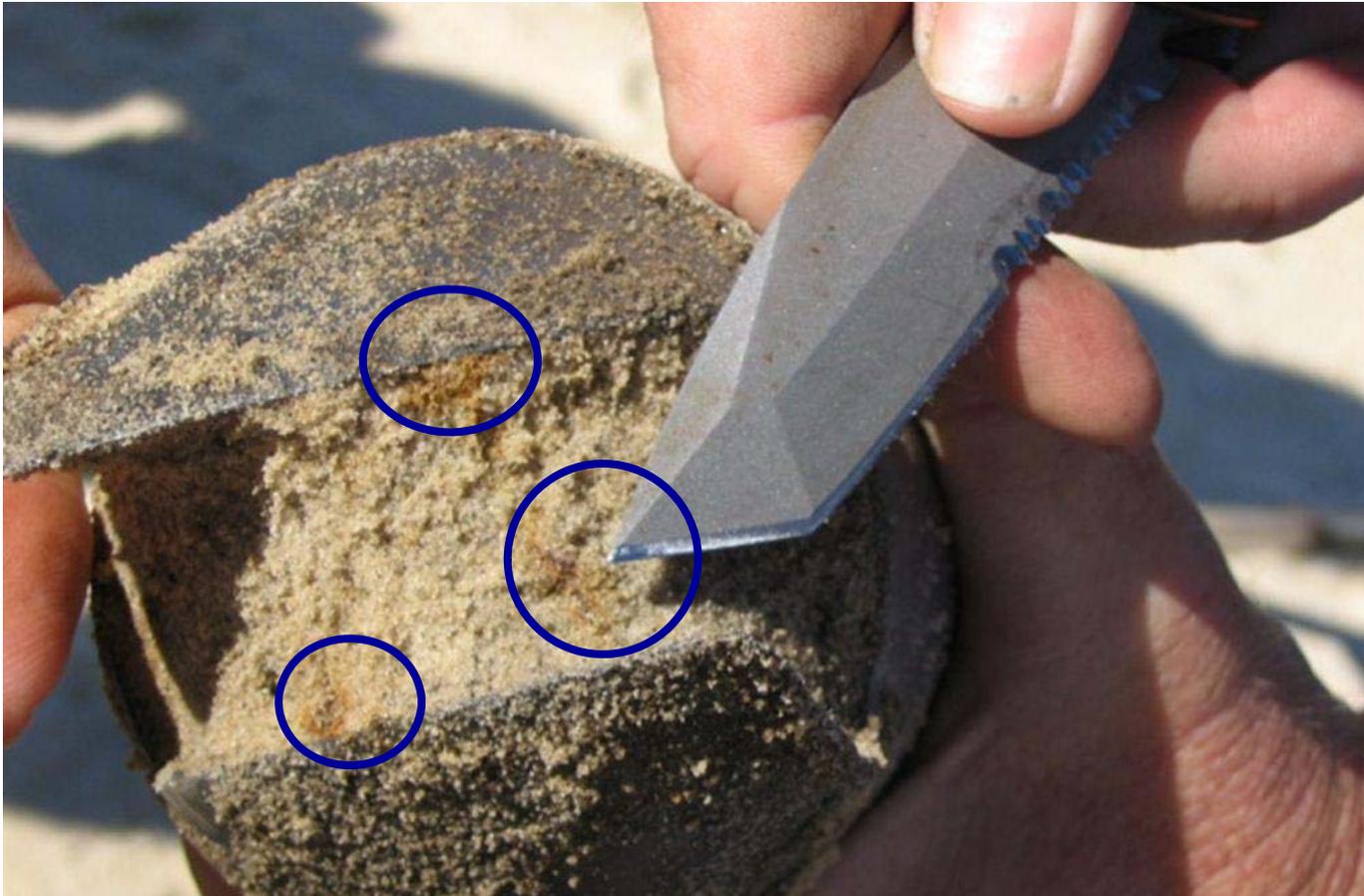
- Matrix color must have Chroma ≥ 3 and may have any value.
- Redoximorphic concentrations (contemporary) have a Hue of 2.5YR to 10YR, Value ≥ 5 , Chroma ≥ 6 , and must have distinct or prominent color contrast with matrix and must be at least 2% (common) in volume.
- OR: Depth to one of the sandy hydric soil indicators (will not meet the HSI depth requirement)



- Value ≥ 5 ,
chroma ≥ 6
(Hue 7.5YR)



High Chroma Redox in Sand



High Chroma Redox in Sand

LOAMY AND CLAYEY SOILS (LVFS AND FINER)

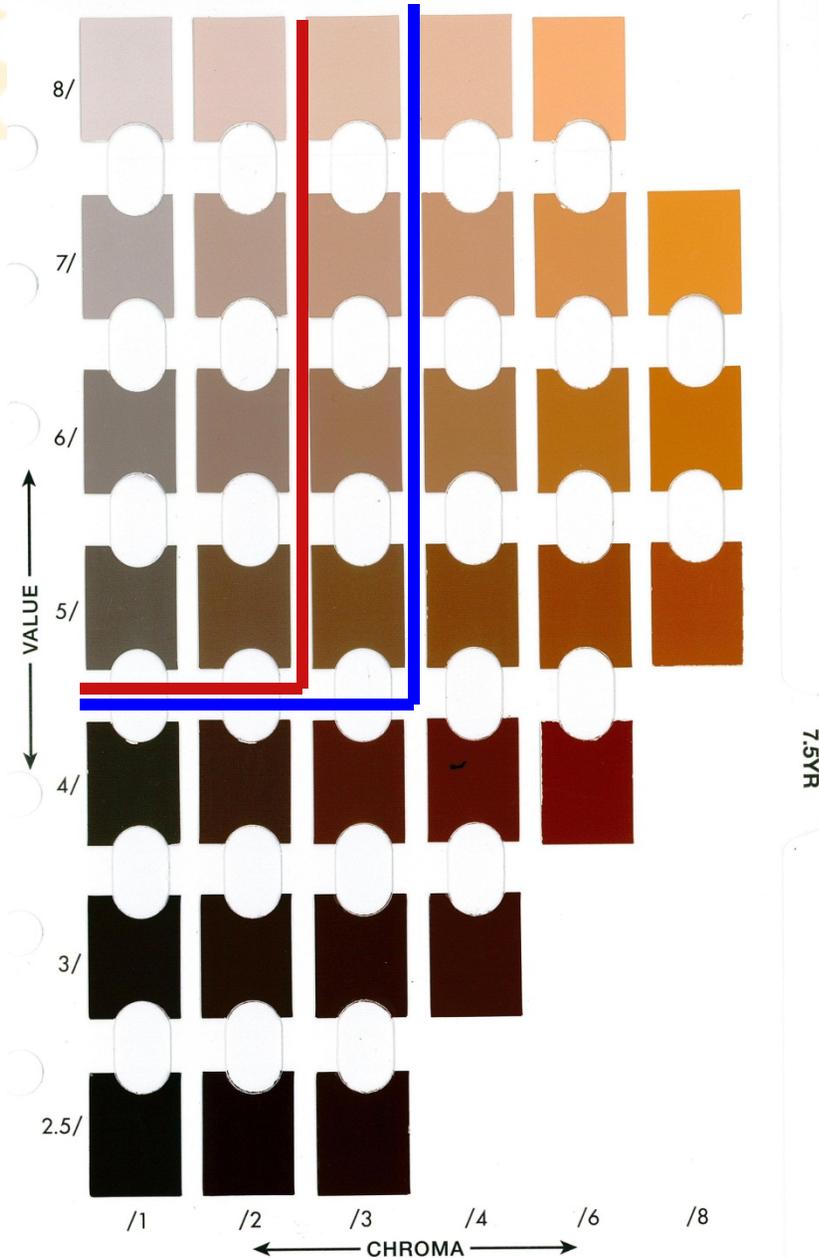


LOAMY AND CLAYEY SOILS (USDA textures of LVFS and finer) use the following Redoximorphic Depletions (grayed out areas):

- From 12" (30 cm) down to one meter (39.37"):
Any Hue, Value ≥ 5 , Chroma ≤ 2 .
- Deeper than one meter:
Any Hue, Value ≥ 5 , Chroma ≤ 3 .
- OR: Depth to one of the loamy/clayey hydric soil indicators
(Note: will not meet HSI depth requirement)

MUNSELL® SOIL COLOR CHART

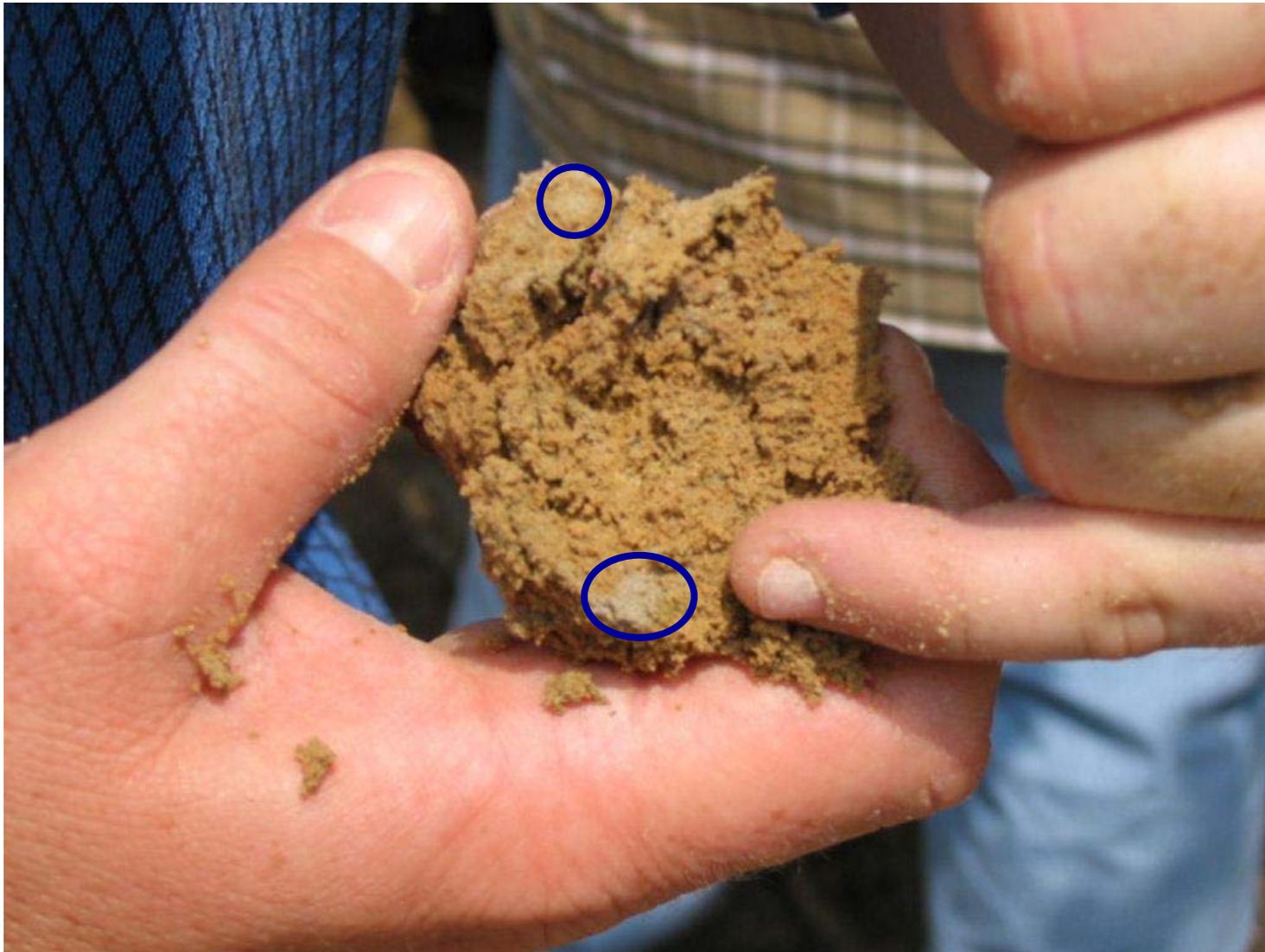
7.5YR



- Value 5 or more, chroma 2 or less to left and above red line, chroma 3 or less to left and above blue line.

- The depth at which these low chroma colors are encountered is the estimated depth of the SHWT. There is one important exception to use of this color pattern as an indicator. *If low chroma colors directly underlie a dark topsoil layer, the SHWT is at, near, or above the soil surface (THIS COULD BE A HYDRIC SOIL INDICATOR).*

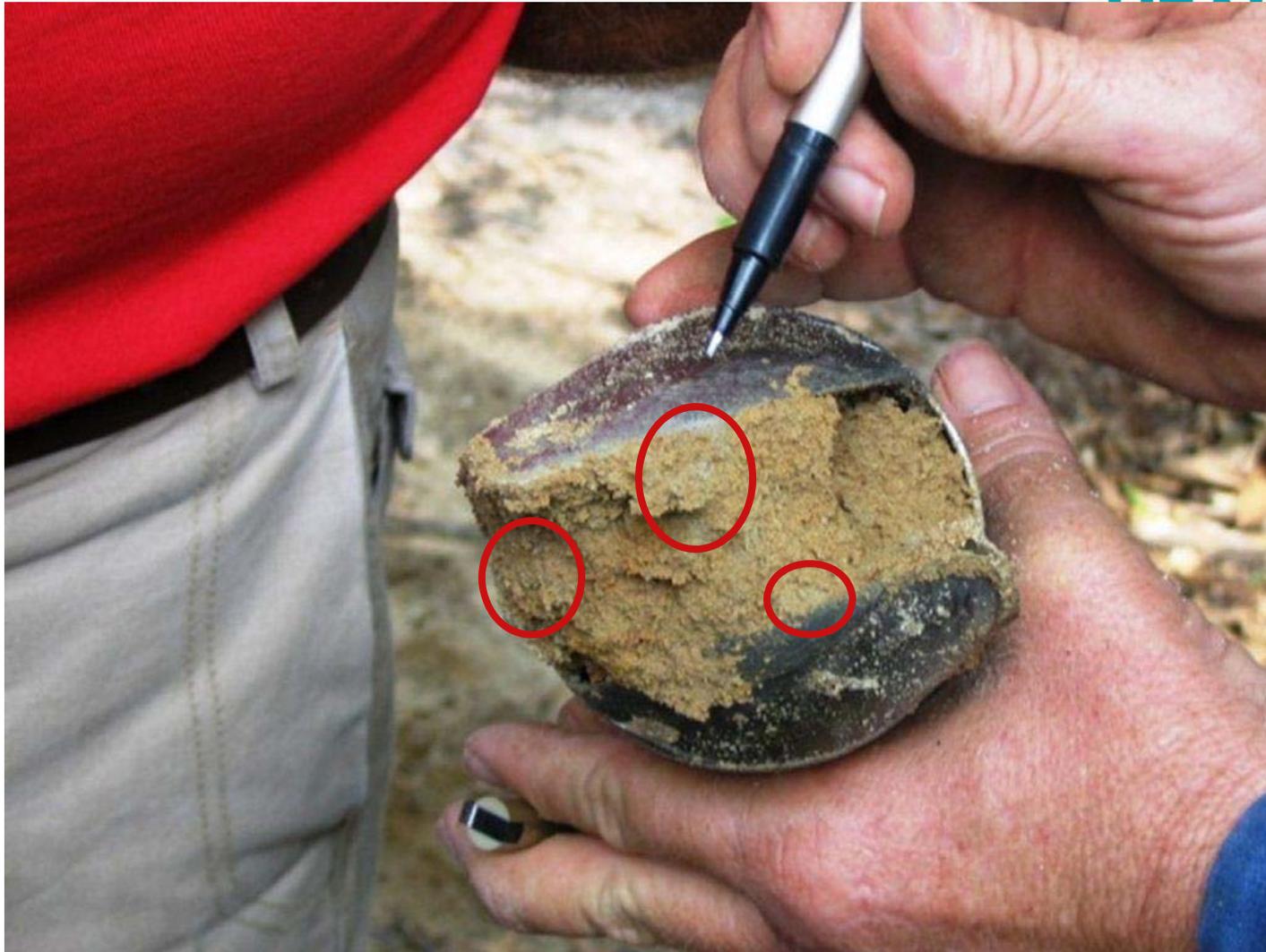
Low chroma in SCL



Low chroma in SCL



Low Chroma in SCL



Low Chroma MATRIX in SCL



Specific Gley Colors



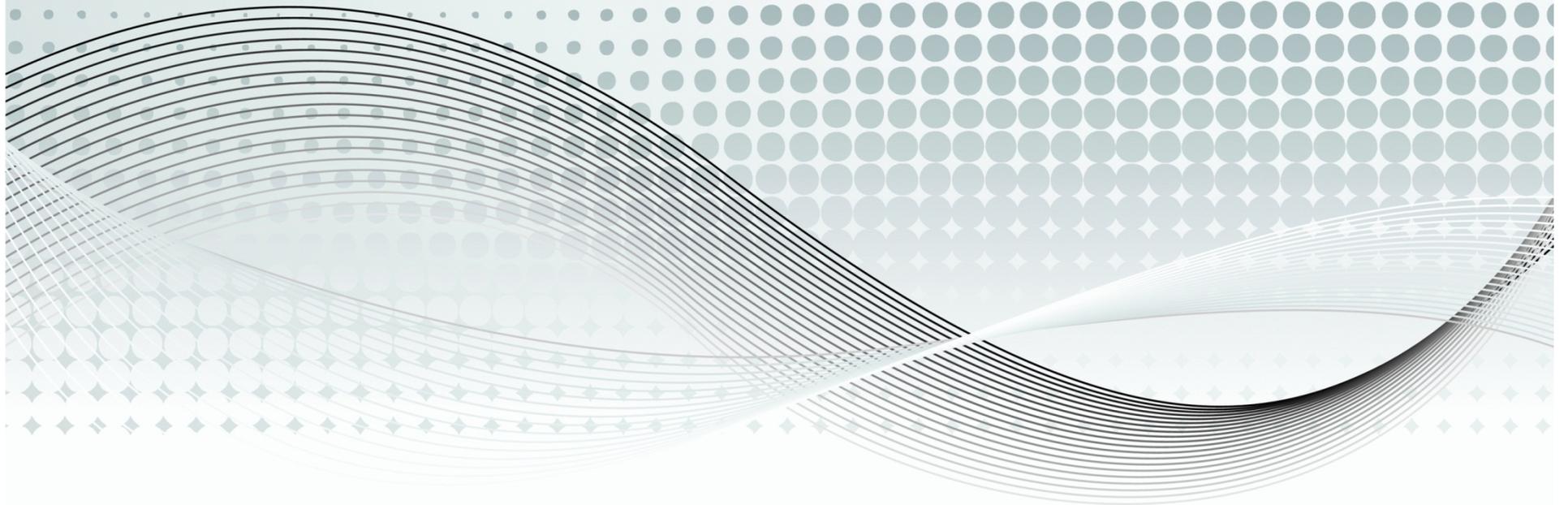
- Any color with a value ≥ 4 that appears on the gley chart is an indicator of SHWT. See Hydric Soil Indicators for gley color usage.
- *This holds true for any mineral texture.*

A COUPLE OF
"SPECIAL CASES"
WITHIN THE
LOAMY/CLAYEY
GROUPING



Redoximorphic Features in Shubuta, Cowarts, Esto and Nankin Soil Series found in the Florida Panhandle

**According to the USDA NRCS, these soils were
formed in loamy, clayey or loamy/clayey
sediments.**



- Shubuta is a well drained soil (SHWT generally >6 feet).
- Cowarts is well drained or moderately well drained with a SHWT routinely >6 feet.
- Esto is a well drained soil. Low chroma mottles are thought to be a result of the parent material and not thought to be due to wetness. SHWT is routinely >6 feet.
- Nankin is a well drained soil, with redoximorphic indicators normally occurring below 40 inches.

- Many of the gray colors in the loamy/clayey material in these soils are thought to originate from the parent material and are not a result of saturation (water movement). The gray colors are routinely mixed with the redder and yellowish-reds and browns and are not indicative of a SHWT, as the boundaries between the colors are sharp, not diffuse. **In any of these soils, should diffuse boundaries be present in the soil profile this would be an indicator of the SHWT.**

USDA Drainage Classes (agricultural)



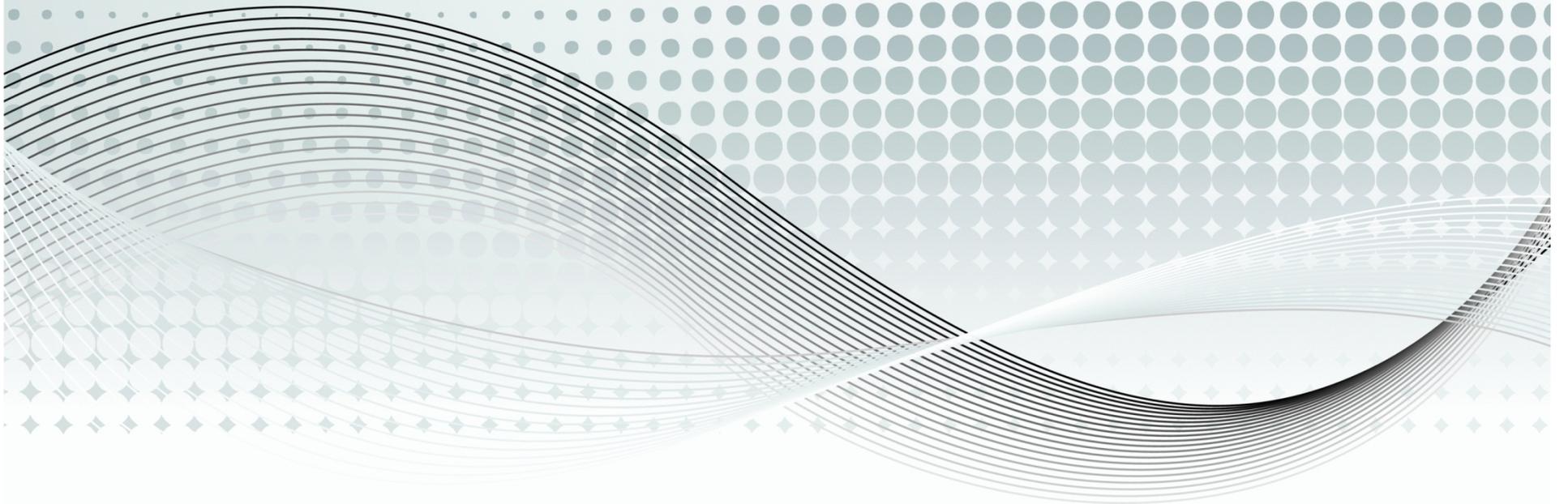
6 Classes common in Florida

- Very Poorly Drained
- Poorly Drained
- Somewhat Poorly Drained
- Moderately Well Drained
- Well Drained
- Excessively Drained

SHWT

0 - 24 above
0 -18" below
12-30" below
24-48" below
60" or more
>72"

QUESTIONS???

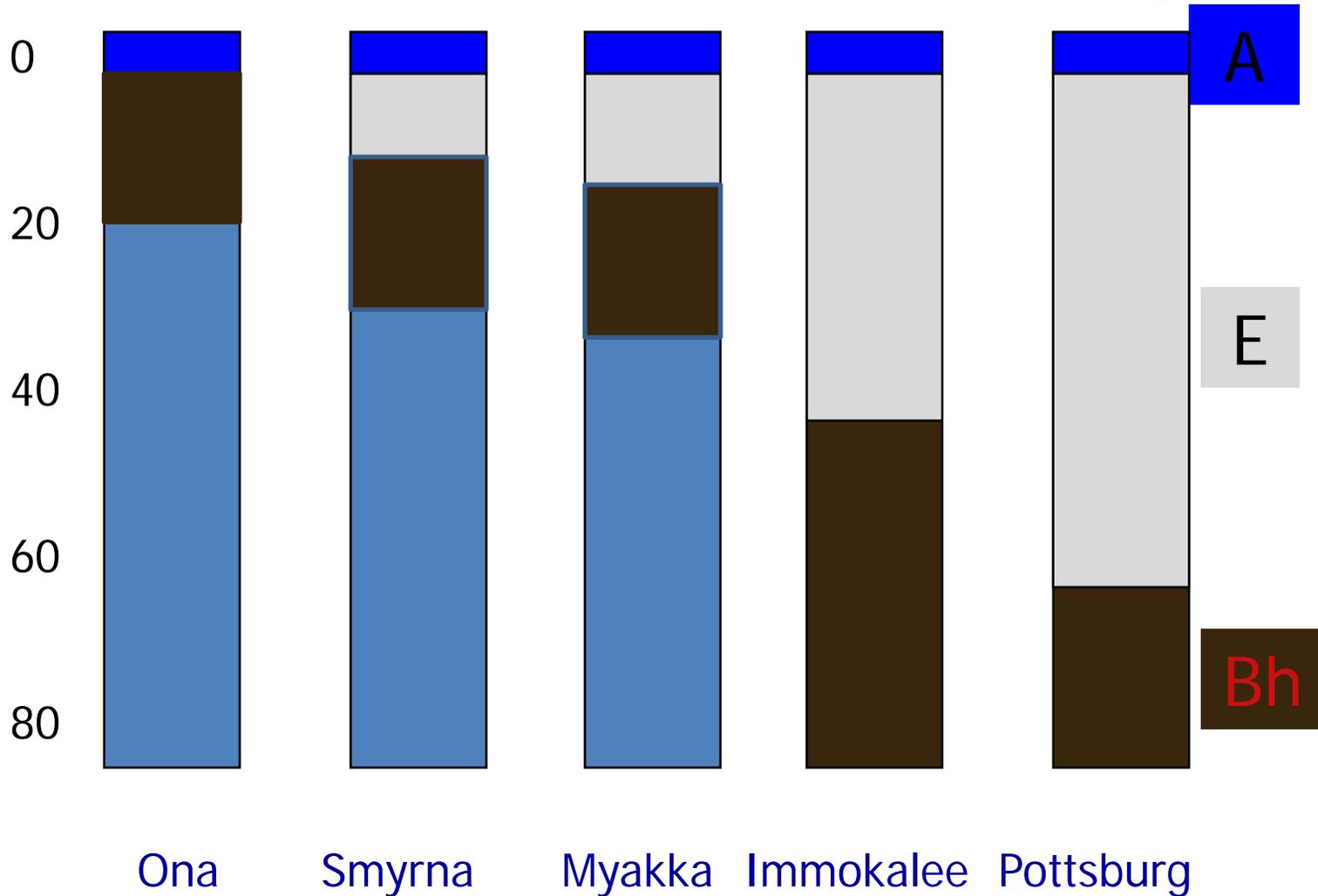


Spodosols and SHWT

Soils with spodic layers in the profile. **What do the following spodosols have in common?**



Common Spodosols of Florida



Spodics and SHWTs



- Ona Soil - Spodic is between 6-20", SHWT is within 10" of soil surface
- Smyrna Soil - Spodic starts above 30", is 4-18" thick, SHWT is within 10" of soil surface
- Myakka Soil - Spodic is between depths of 20 to 36", SHWT within 10" of soil surface
- Immokalee Soil - Spodic is below 30", about 10-50" thick, SHWT within 10" of soil surface
- Pottsburg Soil - Spodic is below 50" and about 24" thick, SHWT is within 10" of soil surface

CONCLUSIONS:



- *A spodic layer DOES NOT have a direct relationship to the SHWT, it occurs due to a fluctuating water table.*
- *The SHWT can be above, within OR below the spodic layer.*
- *The spodic layer IS NOT A SHWT indicator.*
- *High chroma colors WITHIN the spodic layer IS NOT a SHWT indicator.*

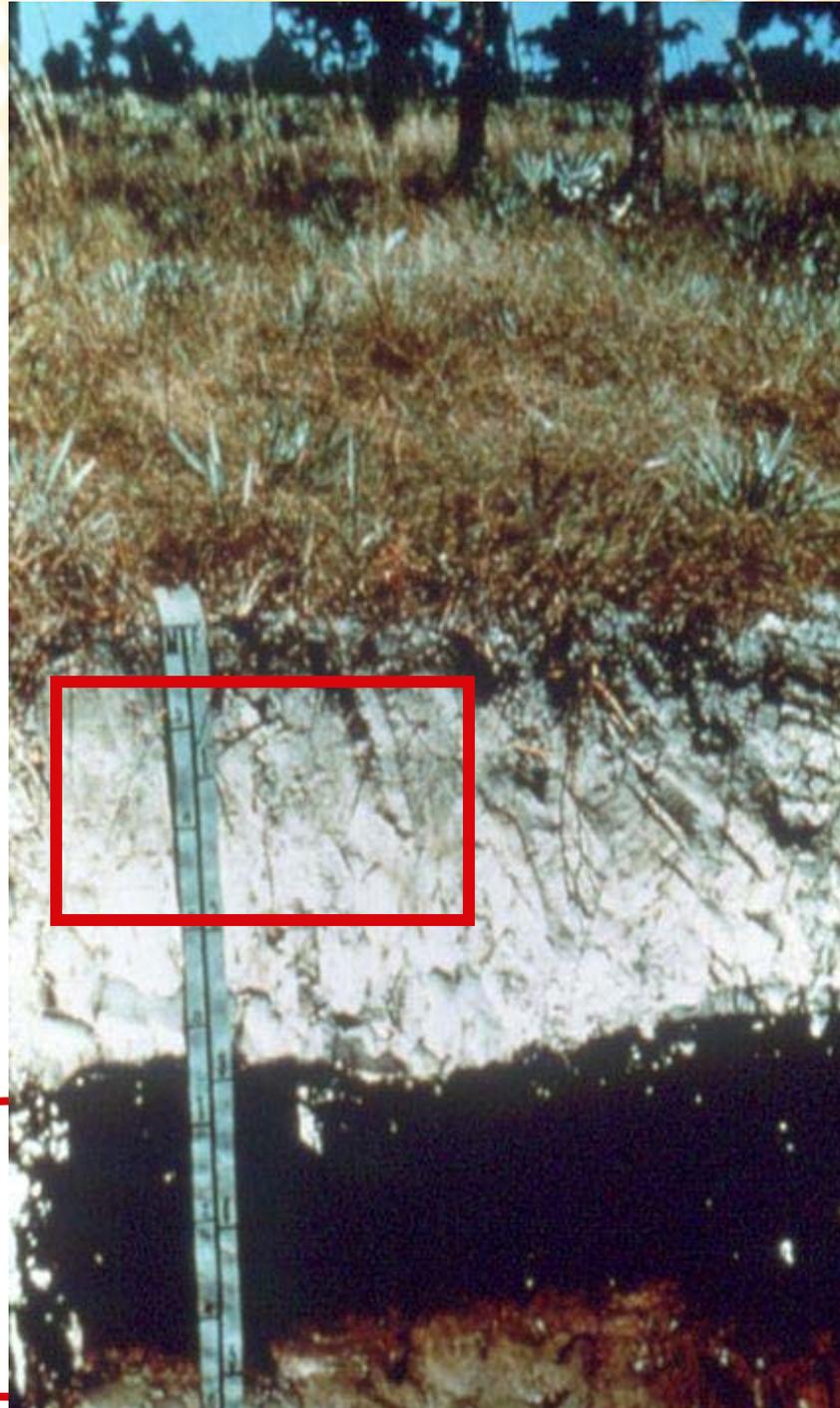
There are approximately 80 differentiated spodosols in Florida

- *Only about 3 of them have seasonal high water tables found normally below the spodic layer.*

Spodosol

**SHWT
found in
this area**

Spodic layer



Spodosol







Leon soil,
Bay County,
FL
SHWT at
12"

Spodic Material – Note different colors



Spodosol in a pit – observe differences



Example of a Common Spodic Layer Description

Myakka Series





Myakka Soil

Spodic is between depths of 20 to 36", SHWT within 10"

Bh1--20 to 24 inches; black (N 2/0) sand; weak coarse subangular blocky structure; many fine and medium roots; sand grains coated with organic matter except for common fine pockets of uncoated sand grains; very strongly acid; clear wavy boundary. (2 to 13 inches thick)

Bh2--24 to 32 inches; dark reddish brown (5YR 2/2) sand; common coarse faint vertical tongues of very dark brown (10YR 2/2) weak coarse subangular blocky structure; many fine and medium roots; sand grains coated with organic matter; very strongly acid; clear smooth boundary. (0 to 23 inches thick)

Bh3--32 to 36 inches; dark reddish brown (5YR 2/2) sand; weak fine granular structure; very friable; few fine roots; sand grains coated with organic matter; strongly acid; clear wavy boundary. (0 to 16 inches thick)

Myakka Soil



- Spodic is between depths of 20 to 36”, SHWT within 10”
- Bh1--20 to 24 inches; black (N 2/0) sand; weak coarse subangular blocky structure; many fine and medium roots; sand grains coated with organic matter except for common fine pockets of uncoated sand grains; very strongly acid; clear wavy boundary. (2 to 13 inches thick)
- Bh2--24 to 32 inches; dark reddish brown (5YR 2/2) sand; common coarse faint vertical tongues of very dark brown (10YR 2/2) weak coarse subangular blocky structure; many fine and medium roots; sand grains coated with organic matter; very strongly acid; clear smooth boundary. (0 to 23 inches thick)
- Bh3--32 to 36 inches; dark reddish brown (5YR 2/2) sand; weak fine granular structure; very friable; few fine roots; sand grains coated with organic matter; strongly acid; clear wavy boundary. (0 to 16 inches thick)

A word about Spodic Soils

What if you don't see redox features??



- Other indicators of the SHWT would be the thickness and color of the surface layer (“A” horizon), and stripped matrix, if present.
- *Note that high chroma colors WITHIN the spodic IS NOT a SHWT indicator. Stripped matrix can occur within the spodic and can be used.*

SHWT and SPODIC LAYERS



- The spodic layer is not specifically a SHWT indicator, therefore cannot be used as a “sole source” to determine the SHWT.
- Except for very few spodosols, you normally would have some type of indicator above the spodic.

Spodosol with SHWT below the Spodic Layer – KUREB Series



- Kureb –Rapid permeability. Depth to seasonal high water table is more than 6 feet during most of the year.
- A--0 to 3 inches; dark gray (10YR 4/1) sand; single grained; loose; organic matter and quartz grains have salt and pepper appearance; many fine and large roots; neutral; clear wavy boundary. (2 to 5 inches thick)
- E--3 to 26 inches; light gray (10YR 7/1) sand; single grained; loose few large roots; neutral; clear irregular boundary. (4 to 45 inches thick)
- C/Bh--26 to 51 inches; brownish yellow (10YR 6/6) sand; single grained; loose; few tongues of light gray (10YR 7/1) extend from above horizon; dark brown (7.5YR 3/4) and few bands and bodies (Bh) of dark reddish brown (5YR 3/2); bands are intermittent at horizon contact and vertically along walls of tongues; many clean and coated sand grains; neutral; gradual wavy boundary. (4 to 46 inches thick)
- C--51 to 89 inches; pale brown (10YR 6/3) sand; single grained; loose, slightly acid.



KUREB Soil (Franklin County, FL



KUREB Soil (Franklin County, FL

QUESTIONS???



Indicators/Non-indicators



- **Muck** - muck at surface, SHWT is at or above the surface (depending on landscape position) (HSI)
- **Mucky Sand** - within 6 inches of natural soil surface, SHWT is at 0 - 6 inches (HSI)
- **Tongues** - are not mottles but are old root channels (*not an indicator of SHWT*)
- **Lamellae** - are not mottles, are subsoil accumulations of clay in bands and contrasting colors (*not an indicator of SHWT unless is low chroma colors*)

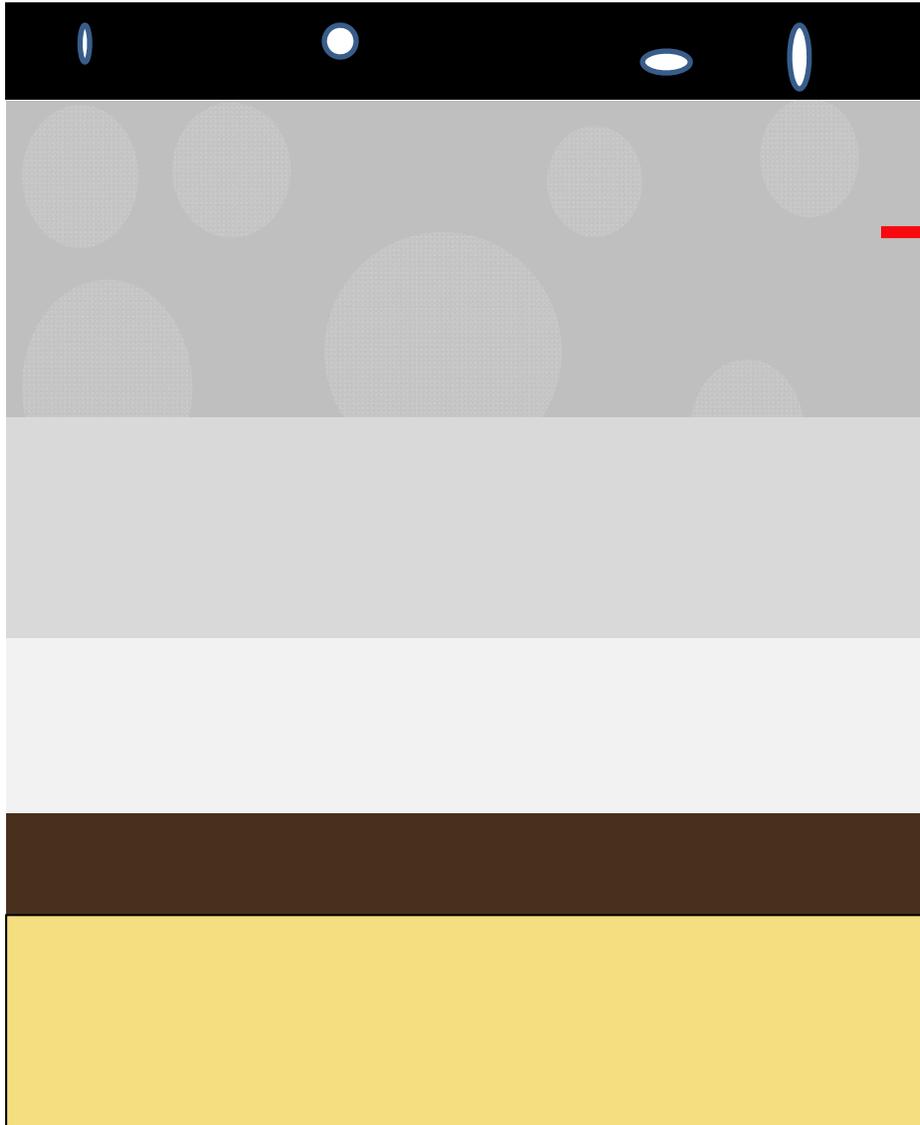
Stripped Matrix (Stripping)



- Used in *Sandy soils only (except for LVFS)*. The following definition has been adjusted to allow for non-hydric soils (compare to later definition found in hydric soil presentation)

- An area in which iron/manganese oxides and/or organic matter have been stripped from the matrix exposing the primary base color of soil materials. The stripped areas and translocated oxides and/or organic matter form a faint diffuse splotchy pattern of two or more colors. The stripped zones are 10% or more of the volume; they are rounded and approximately 1 to 3 cm (approximately 0.5 to 1 inches) in diameter.

Typical of Stripped Matrix



**STRIPPED AREAS
LIGHTER IN COLOR
AND ARE ROUNDED
AND ARE IN FAINT
COLOR CONTRAST TO
MATRIX**

Stripped Matrix (also has high chroma redox)



Stripped Matrix and Sandy Redox



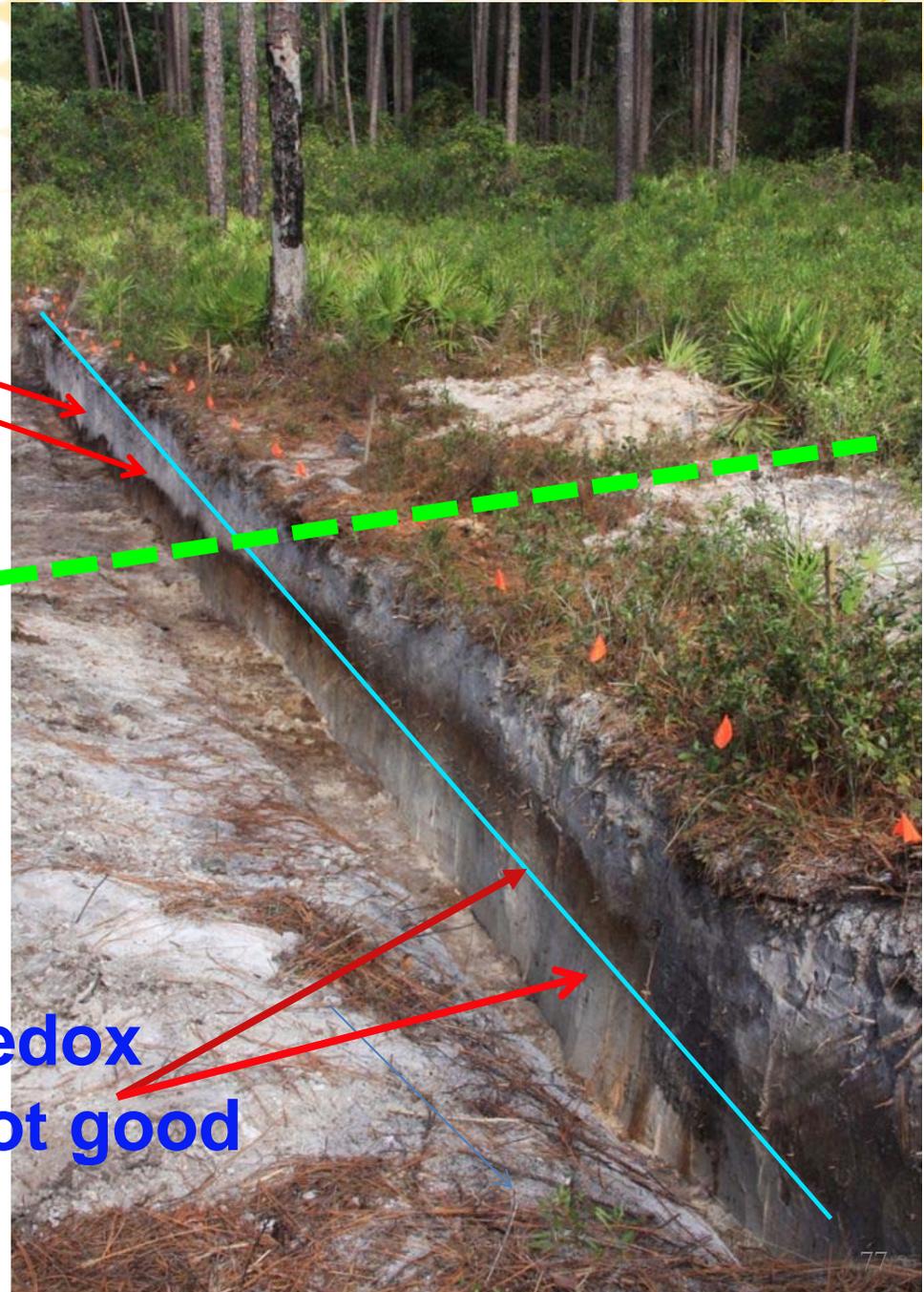


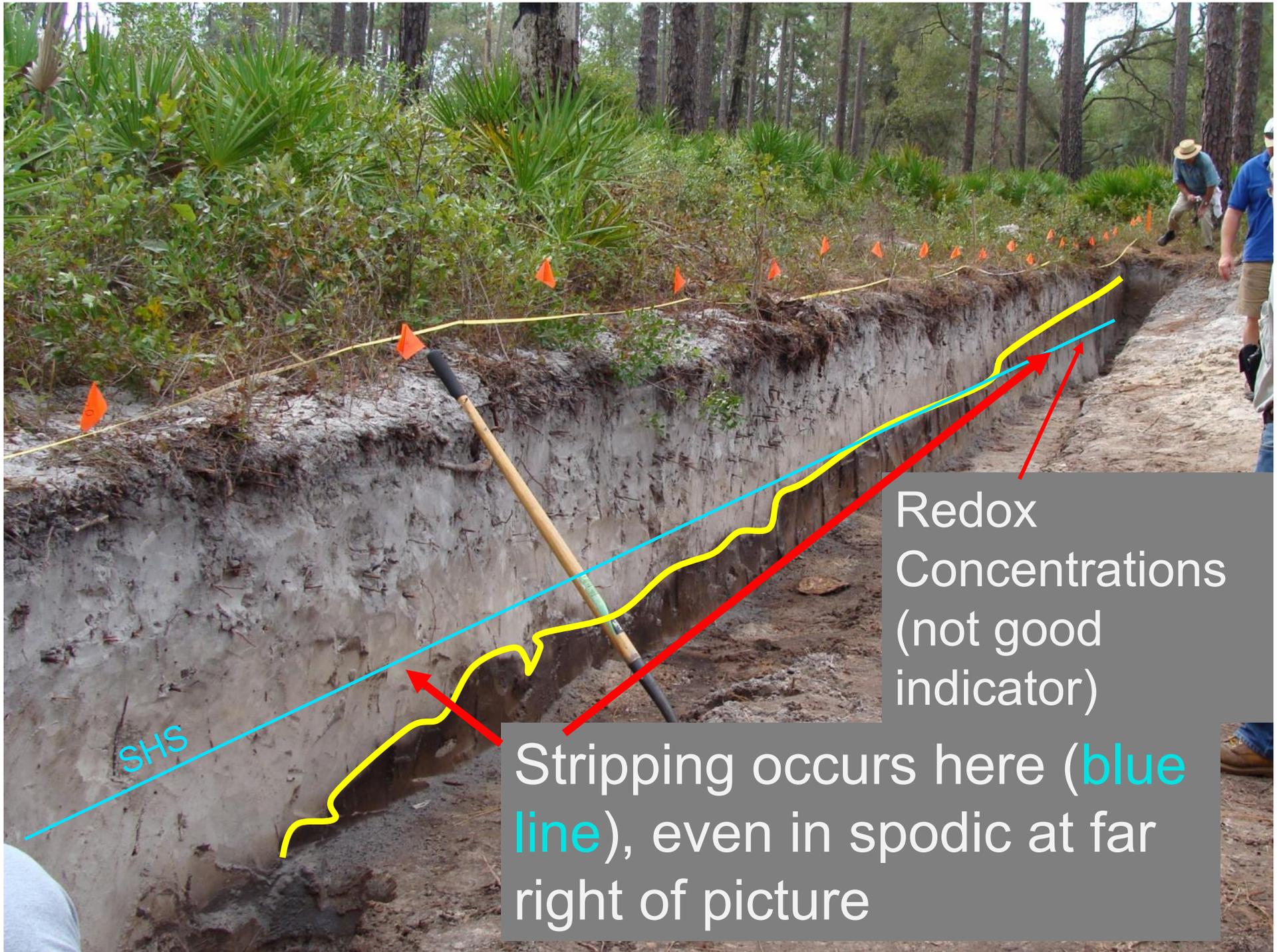
Stripping

Flatwoods

Sandhill

Stripped matrix and “redox concentrations” (RC not good indicator in spodic)





Redox
Concentrations
(not good
indicator)

Stripping occurs here (blue
line), even in spodic at far
right of picture



A photograph of a soil profile. The top layer is dark, almost black, and appears to be rich in organic matter. The bottom layer is a lighter, reddish-brown color, indicating iron oxide accumulation. A blue horizontal line is drawn across the middle of the profile, separating the two horizons. The text 'Sandy' is written in white on the dark layer, and 'Loamy/clayey' is written in white on the reddish-brown layer. The text '(redox concentrations and/or stripping)' is written in white below 'Sandy', and '(redox depletions)' is written in white below 'Loamy/clayey'. The letters 'SHS' are written in blue on the right side of the profile.

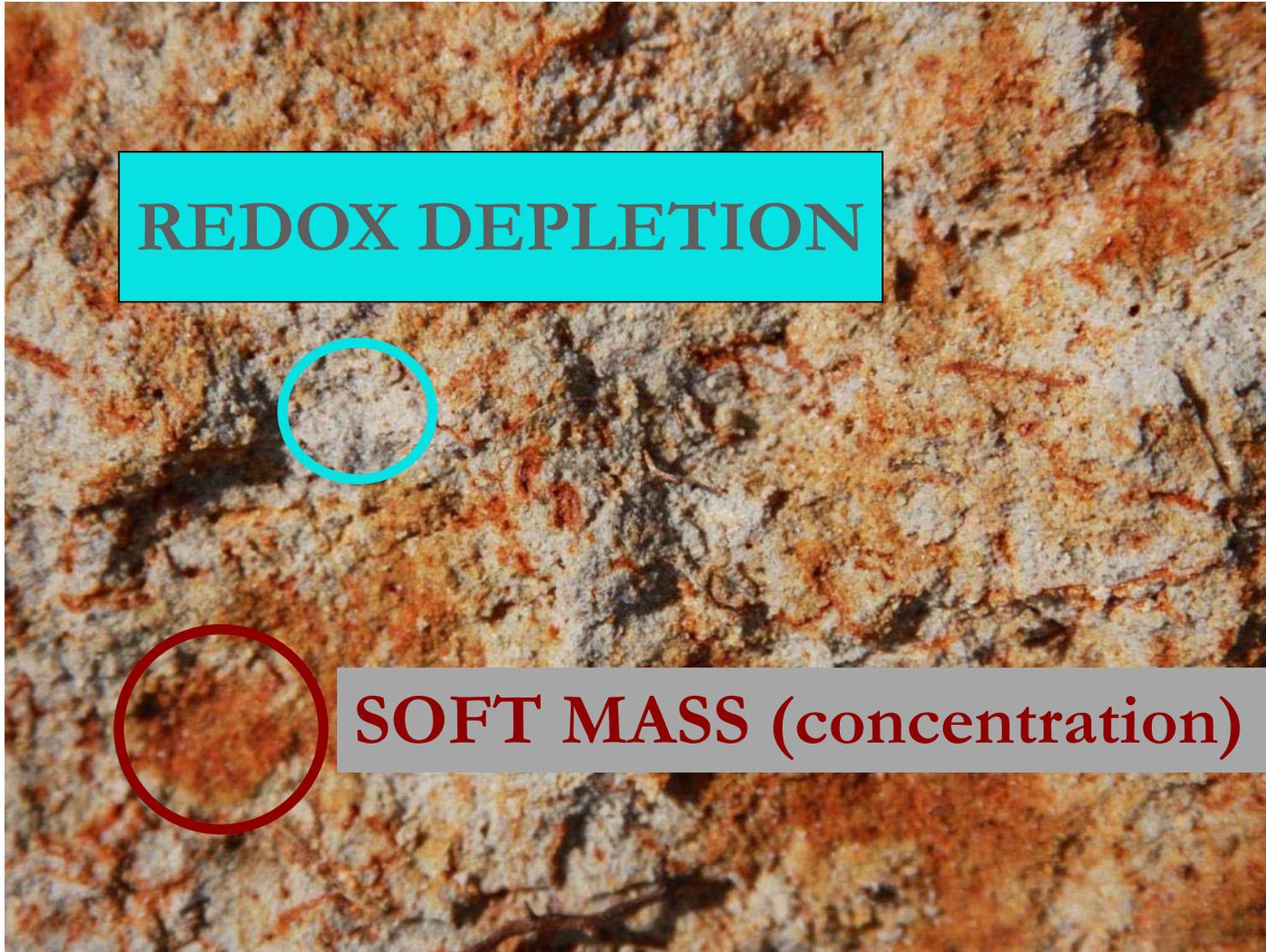
Sandy

(redox concentrations and/or stripping)

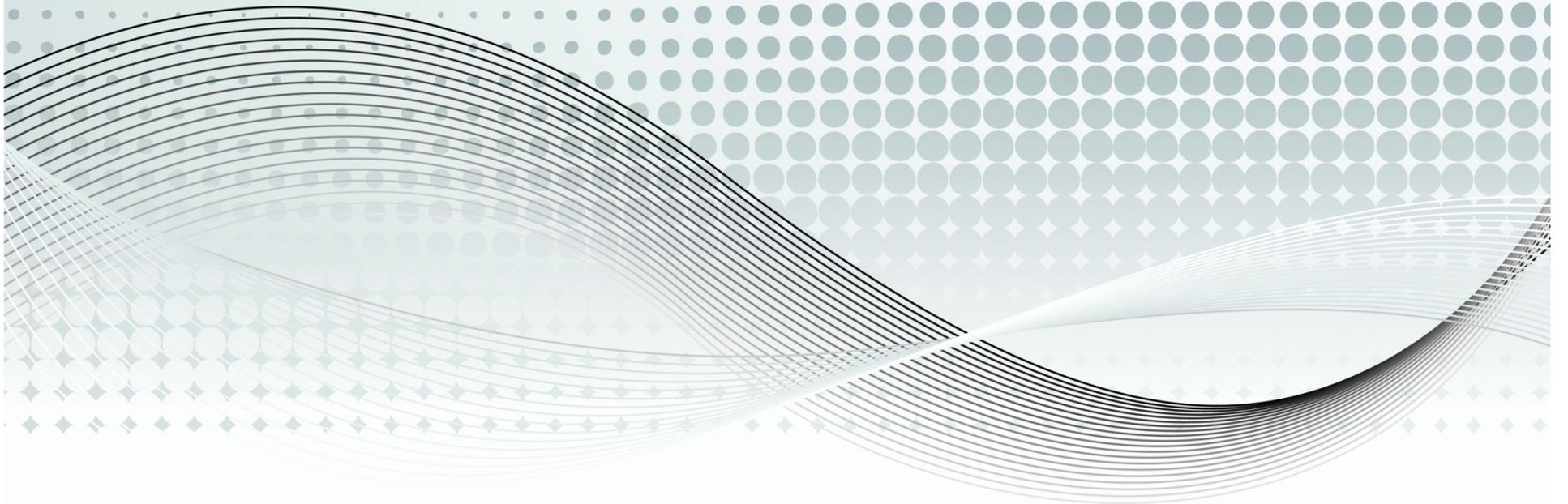
SHS

Loamy/clayey

(redox depletions)



QUESTIONS???



Seasonal High Water Table indicators in Organic Soils



- **Muck** - muck at surface, SHWT is at or above the natural soil surface.
- **Mucky Sand** - SHWT is at 0 - 6 inches below the natural soil surface.
- **Peat** - SHWT is at 0 - 6 inches from the natural soil surface.

Barring anything else---



What if there is really no redox features at all??

- Make note of whole landscape hydrology.
- Make multiple soil profile observations.
- Observe natural vegetation
- Ask co-workers who have been in area
- Consult with USDA NRCS Soil Scientist

Where no other indicators:



- The following moist colors of surface horizons (the A horizon) can be correlated with SHWT's:
- Black--0 to 9 inches (within 12")
- Very Dark Gray--about 12 inches (9-15")
- Dark Gray--greater than 15 inches
- DIG LOTS OF HOLES IF NECESSARY AND BE OBSERVANT !!!!

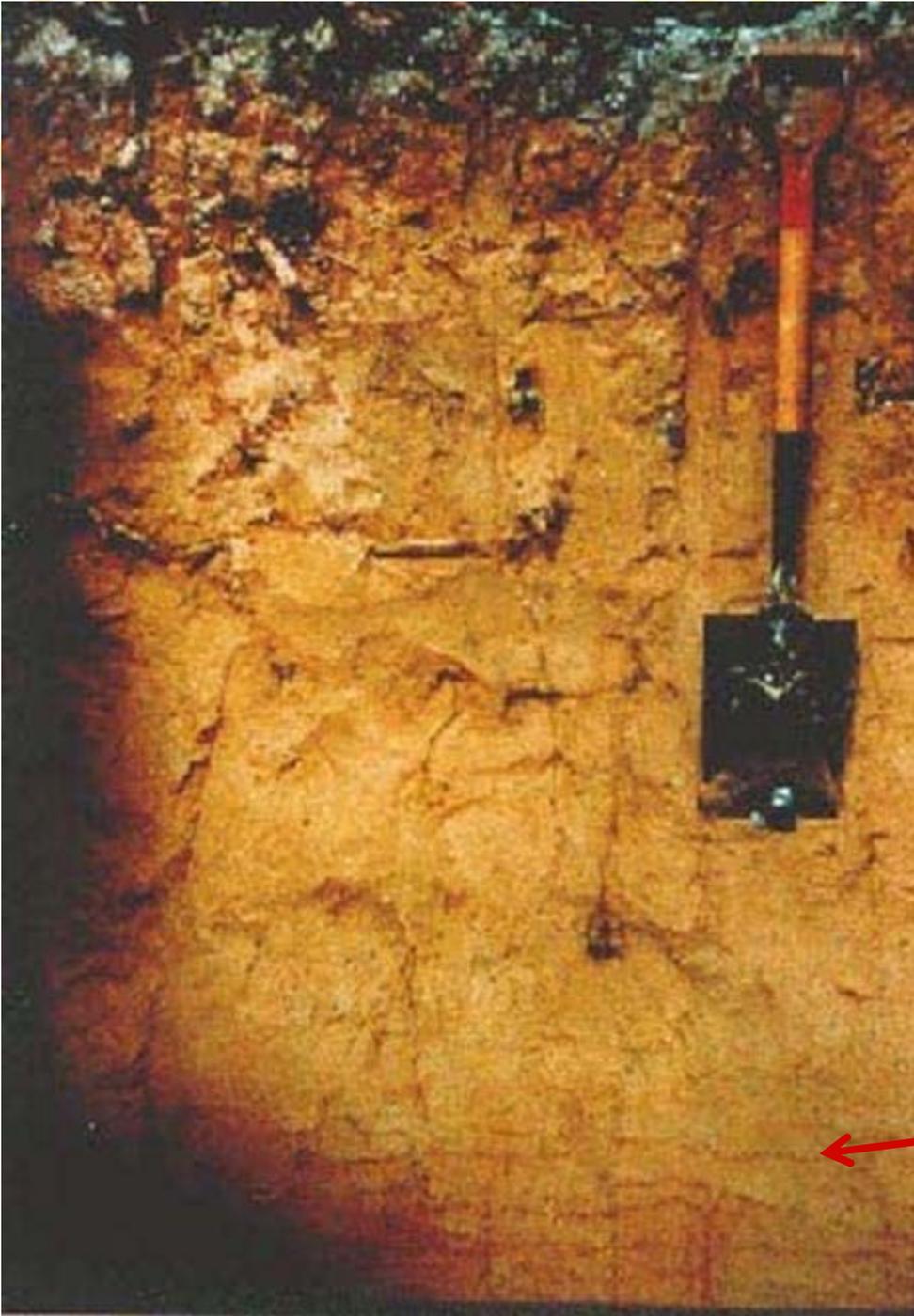
Some things that
ARE NOT indicative of the
SHWT



Lamellae



- *Some sandy soils contain a subsoil accumulation of clay that is distributed in fine lateral bands called LAMELLAE. Lamellae usually appear in contrasting colors, and are not indicative of wetness (unless the lamellae are low chroma colors).*





Lamellae

Lamellae



Plinthite



- Plinthite is rich in iron, highly weathered mixture of clay with quartz and other materials. It commonly occurs as red mottles that can be removed from the soil in one piece. Usually they are platy, polygonal or reticulate patterns.
- Plinthite can be crushed between the fingers. In moist soil, can be cut with a spade.
- Changes irreversibly to ironstone or irregular aggregates on repeated wetting and drying, especially if exposed to heat from the sun.



**Plinthite
in SCL**

Plinthite – can crush between fingers

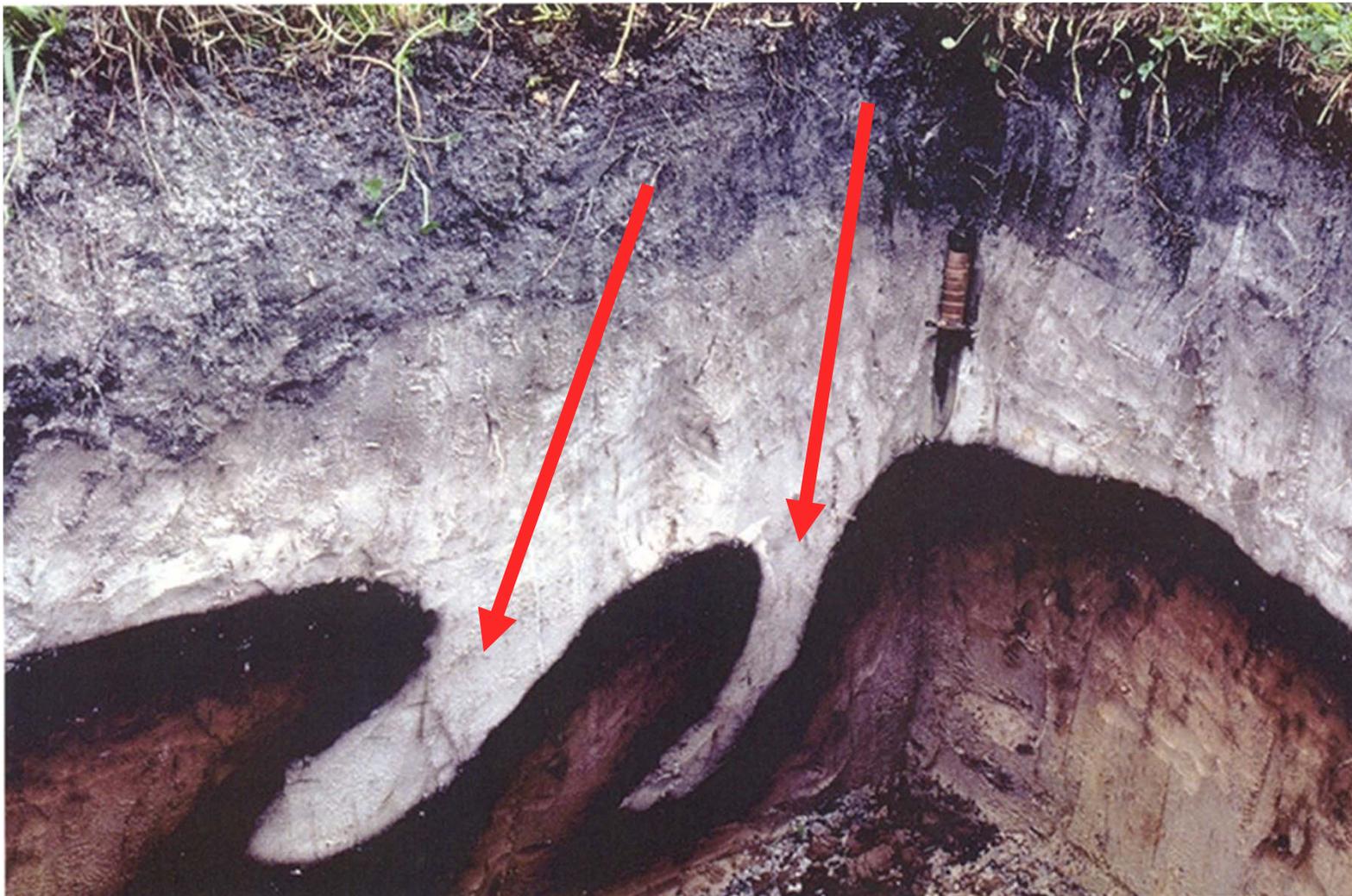


Tongues



- Are not mottles or redoximorphic features, but are old root channels left in the soil from when the root rotted away.
Could also be animal burrows.

Tongues of E horizon into spodic layer



THE END



QUESTIONS???