

A photograph of a forest stream with fallen logs and trees. The water is dark and reflects the surrounding trees and sky. The forest floor is covered with fallen leaves and branches. The text is overlaid on the upper part of the image.

# Landscapes & Hydric Soils

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*Hydric soils are defined as soils that formed under conditions of **saturation**, **flooding**, or **ponding long enough** during the growing season to develop anaerobic conditions in the upper part.*

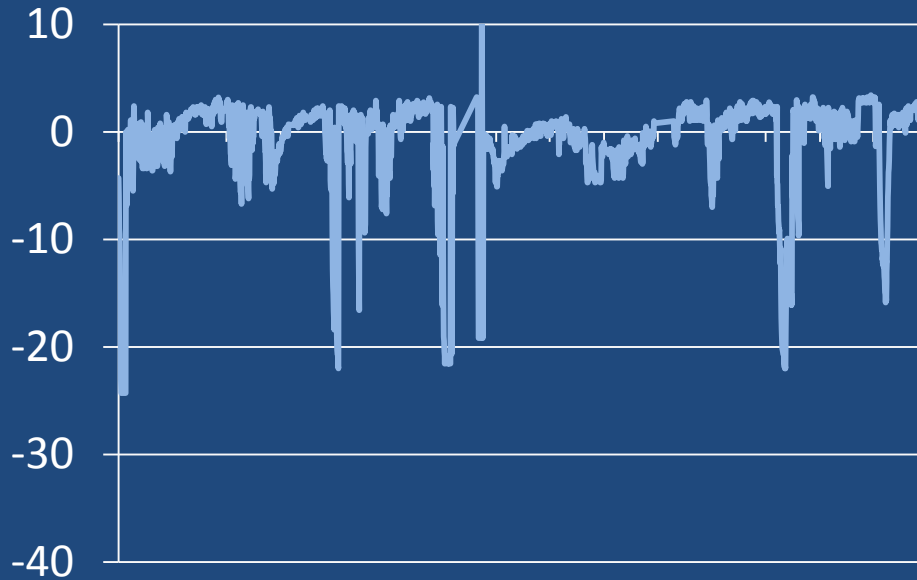


# Overview

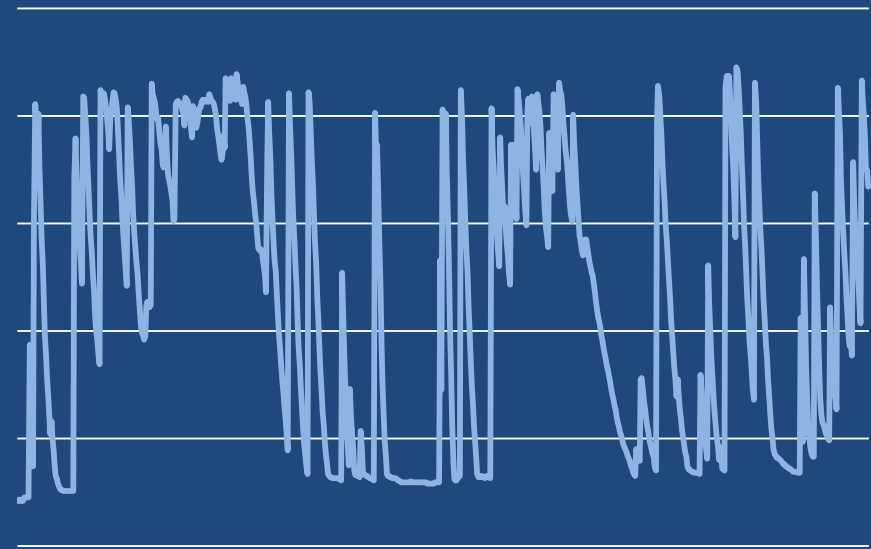
- Landscape position & the movement of water within the landscape dictate the distribution of wetlands.
- The characteristics of each wetland type are determined to a great extent by landscape position.
- Landscape position & surface shape impacts hydrologic characteristics.
- Hydric soil morphology is strongly influenced by hydrologic characteristics of a given wetland.
- Specific hydric soil morphologies are associated with each wetland type.

# Hydroperiod: seasonal pattern of water table depth (inches) in a wetland

Wetland A



Wetland B

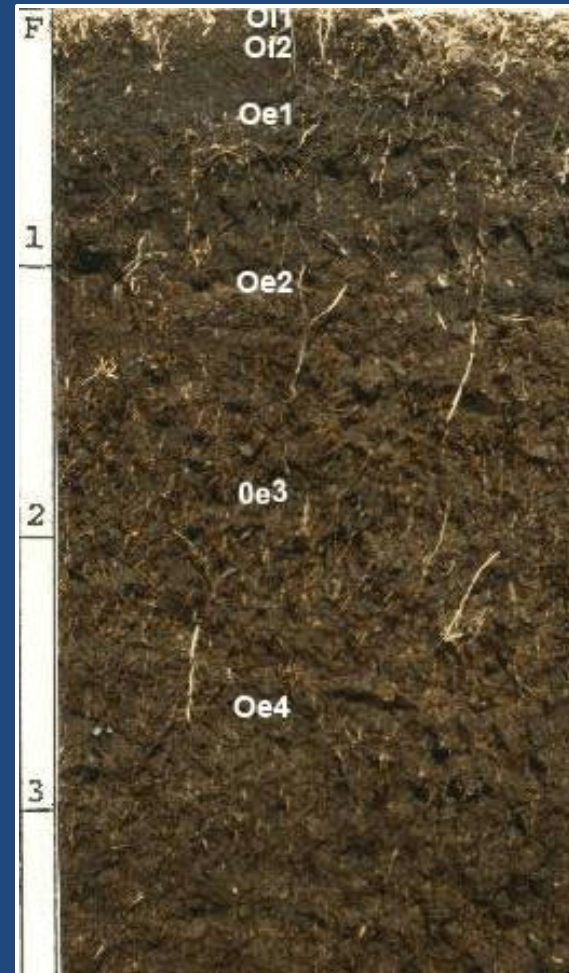


# Short Duration Saturation-Redox Concentrations



# Long Duration Saturation

Grey-Stripped mineral grains  
Black & brown-Organic matter



# Landscapes & Landforms

- Landscape: a collection of spatially-related landforms.
- Landform: a naturally-occurring physical feature on the earth's surface with a characteristic shape.
- Example: a prairie landscape is a relatively flat & grass dominated area *with hills, rivers, & depressions*.
- Wetland landscape position: location of a wetland relative to other landforms

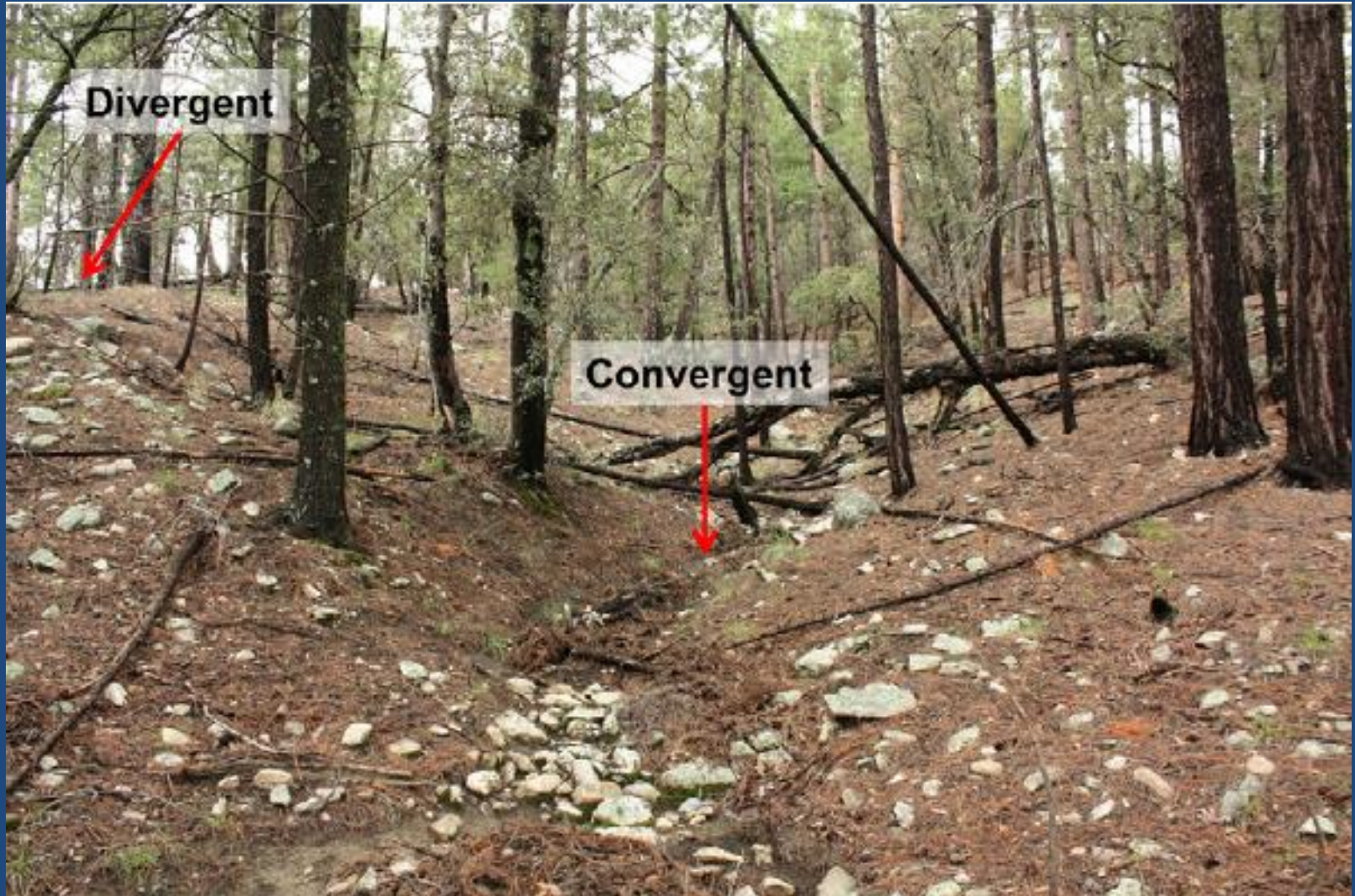
# Landscapes vs. Landforms



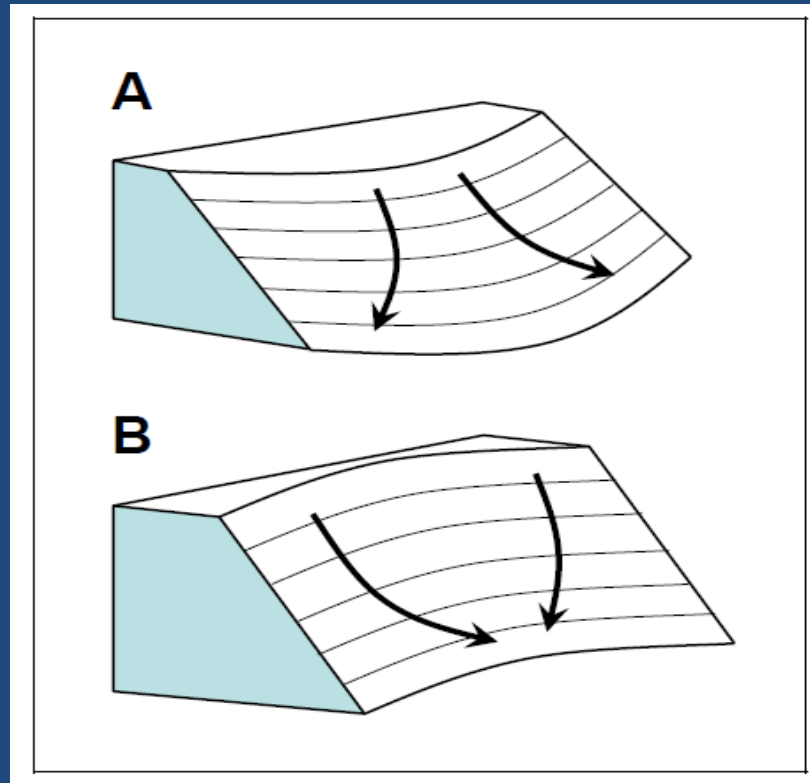
Photo by Ben Kimball, NHDFL



# Divergent & Convergent Landscape Positions



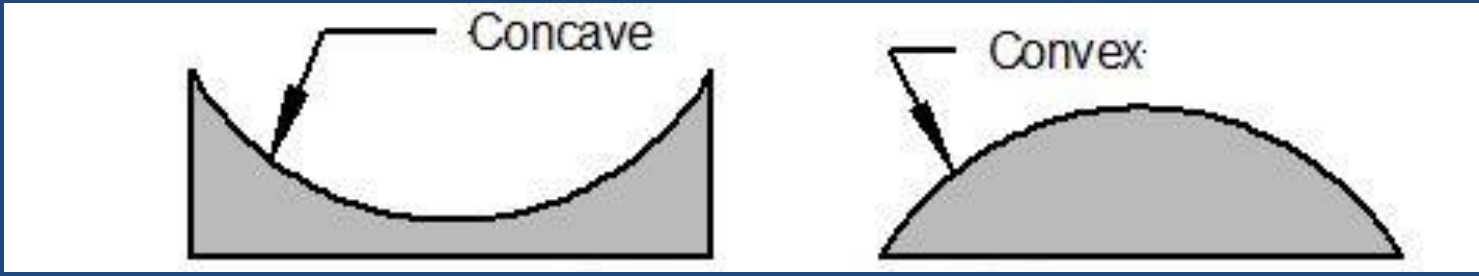
# Landscape Position-Slope Shape



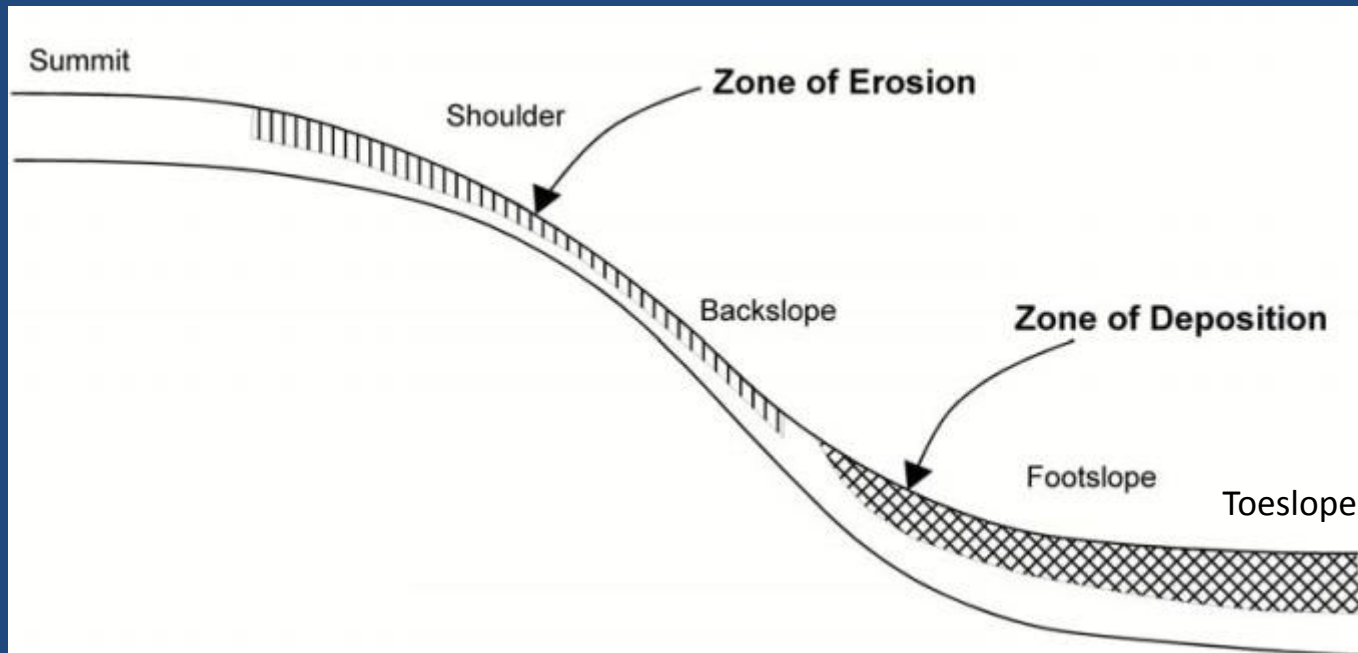
Divergent slopes (A) disperse surface water, whereas convergent slopes (B) concentrate surface water. Surface flow paths are indicated by arrows.

# Landscape Position-Surface Shape

Linear



# Hillslope Position Effects



- Erosional position:
  - Soil material moves downslope or downstream
  - Shallow soil, coarser texture, low o.m.
- Depositional position:
  - Soil material moves in from another location
  - Deep soil, finer texture, more o.m.

# Wetland Landscapes

- Tidal marshes
- Peat bogs
- Mineral soil flats
- Riverine wetlands
- Slope wetlands
- Depressions

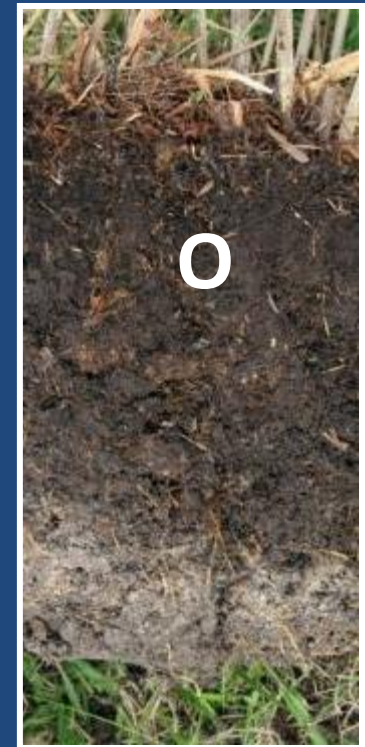
Wet



Wetter



Wettest



A horizons

Organic coated mineral grains

O horizons

Organic

# Histosols, Organic Soils

- High primary productivity
- Low decomposition rates
  - Long-term saturation/inundation
  - Low temperatures



# Tidal Marshes

**Surface water-tidal**

**Peraquic moisture regime: always saturated**

**High primary productivity**

**Erosional & depositional surfaces**

**Hydrogen sulfide-rotten egg smell**





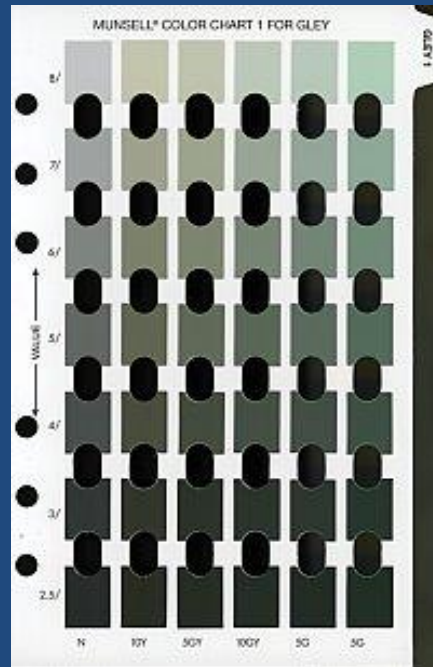
# Tidal Marsh Soils

- Soil forming processes: sedimentation & organic matter accretion
- Subsiding landscape-relative sea level rise

1. organic soils, 2. mineral soils, 3. soils with upland characteristics



# Tidal Marsh Soils



# Acid Sulfate Soils

High levels of iron sulfide minerals (Pyrite,  $\text{FeS}_2$ )

Submerged: benign

Disturbed:  $\text{FeS}_2 + \text{O}_2 = \text{sulfuric acid} + \text{iron}$



# Organic Soil Flats-Northern Peat Bog

Permanently saturated

Low temperatures, acidic conditions

Low decomposition rates-organic soils



# Riverine Wetlands

Overbank flow, groundwater discharge

Transient flooding to long-term ponding

Floodplains may be both erosional & depositional depending on the energy in the moving water.

- High energy: erosional-low o.m., sandy soils
- Low energy: depositional-loamy soils



# Riverine Wetlands-Accretion Floodplains

Overbank flooding

*Young soils: limited development*



# Floodplain-Stratified Layers

- Multiple thin horizons representing different parent materials.
- Large variability in textures
- Buried 'O' & 'A' horizons



# Riverine Wetlands-Backswamps

Groundwater discharge

Infrequent overbank flooding

Long-duration ponding

Organic soils





# Backslope Wetlands

Discharge systems release groundwater to the land surface (seeps, springs).

Erosional surface: shallow soils

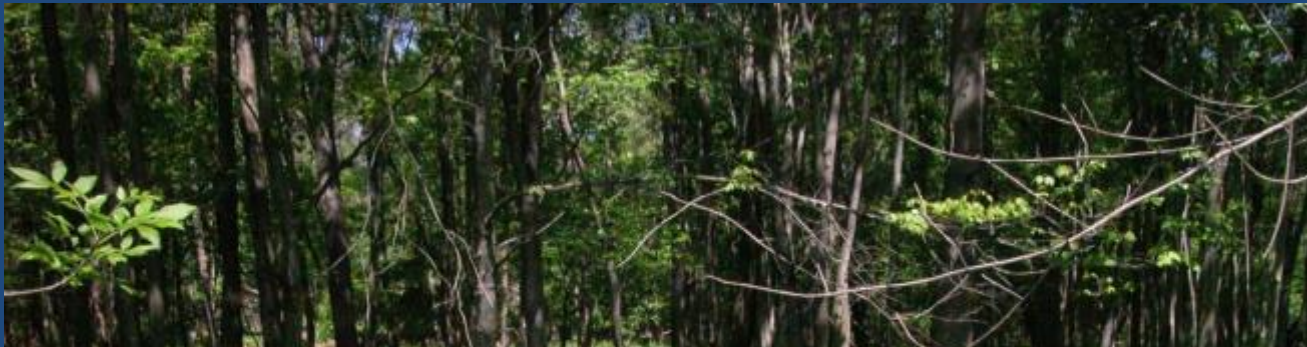


# Toeslope Wetlands

Depositional surface: deep soils

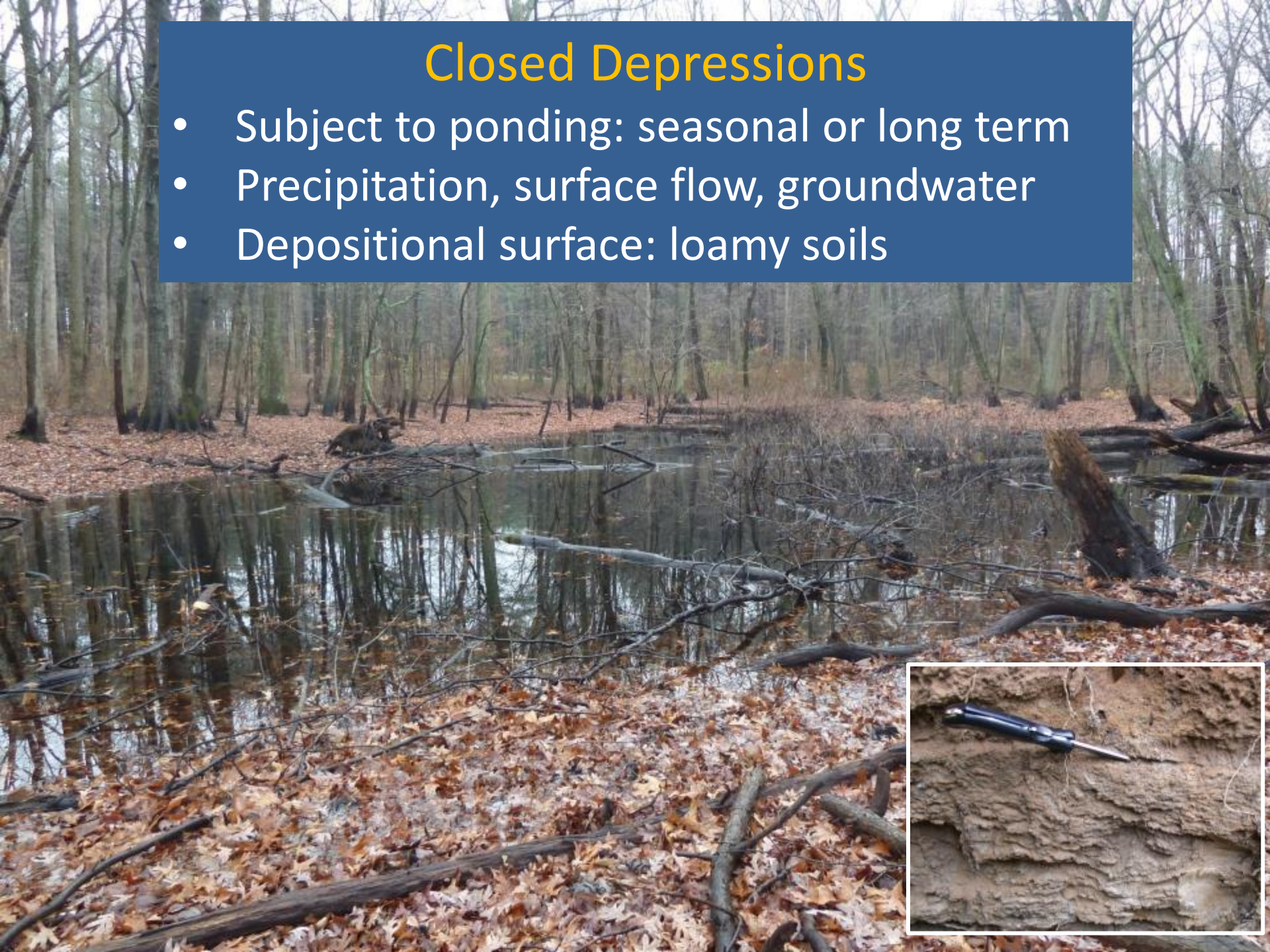
Seasonal to near-permanent inundation

Floodplain characteristics

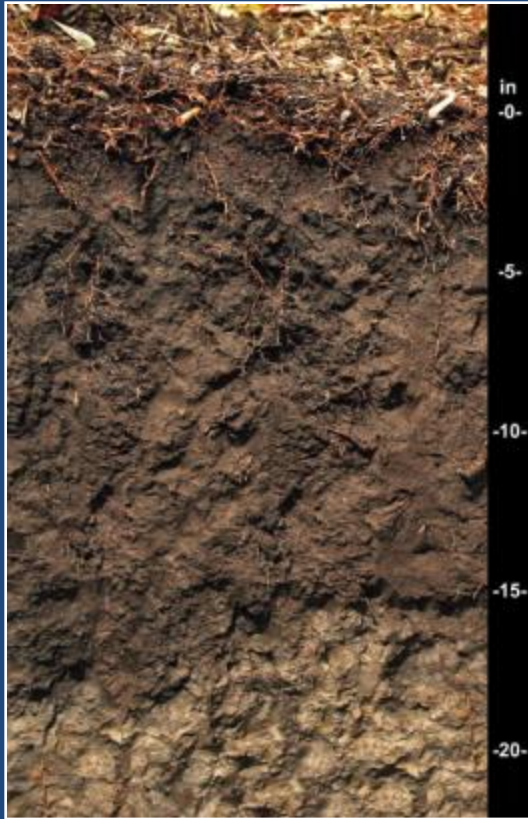


## Closed Depressions

- Subject to ponding: seasonal or long term
- Precipitation, surface flow, groundwater
- Depositional surface: loamy soils



# Depressional Wetlands



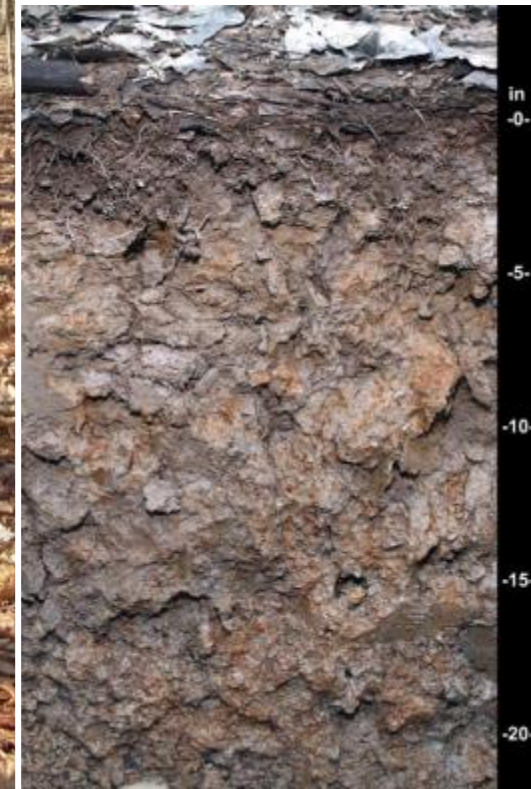
Center: seasonal ponding  
Umbric surface-thick, dark 'A'



Edge: transient ponding  
Thin 'A', redox concentrations

# Mineral Soil Flats

Seasonally saturated  
Seasonal or no inundation  
Dynamic water table  
'O' thin or absent  
Thin 'A'  
Redox concentrations



## Take Home Messages

1. Hydric soil morphology reflects ecosystem characteristics, especially landscape position & long-term hydrologic condition.
2. Landscape position & surface shape has a strong influence on hydrologic characteristics of each wetland.

# Take Home Messages

3. Since each wetland class has characteristic hydrologic conditions, each wetland class has characteristic hydric soils.
  - a. Long-term inundation &/or near-constant shallow saturation: organic soils (tidal marsh, peat bog)
  - b. Seasonal inundation: well developed 'O'; thick, dark 'A' (depressions)
  - c. Seasonal saturation: 'O' is thin or absent (mineral soil flats)
  - d. Flowing surface water: stratified layers (floodplains, toeslopes)

