

Soils in Minnesota

Calcareous Fens

MGWA TECHNICAL WORKSHOP
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Introduction

- Our presentation today is to show
 - ◆ What soils are in the “Fen” areas
 - ◆ How they have been mapped using soil survey reports

Soils Situation

- What are the Soils in “recognized fens”
 - ◆ In other parts of the state – maybe more like peat or peaty mucks
 - ◆ There maybe variations in the amount of calcareousness of the Fen
 - ◆ Some have been described as marl-like

Landscape Setting in Till Plains

- Fens in SE Minnesota
 - ◆ Mostly in foot and toe slopes and occasionally in the head slope part



Landscape Setting in Bedrock Controlled Upland



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Geologic Stratigraphy

- Consists of a porous material for substrate water to move
 - ◆ Sands, gravels to silt sized material over confining shale, compacted loamy glacial till or fine clays

Geologic Stratigraphy

- In glacial till areas prior shaped
 - ◆ Underlying confining material was shaped by prior geologic erosion, forming a dendritic drainage system that directs substrate flow of waters
- Size of the immediate watershed area not readily known.
- In glacial till areas it could be connected to areas where there are gravelly soils

Geologic Stratigraphy

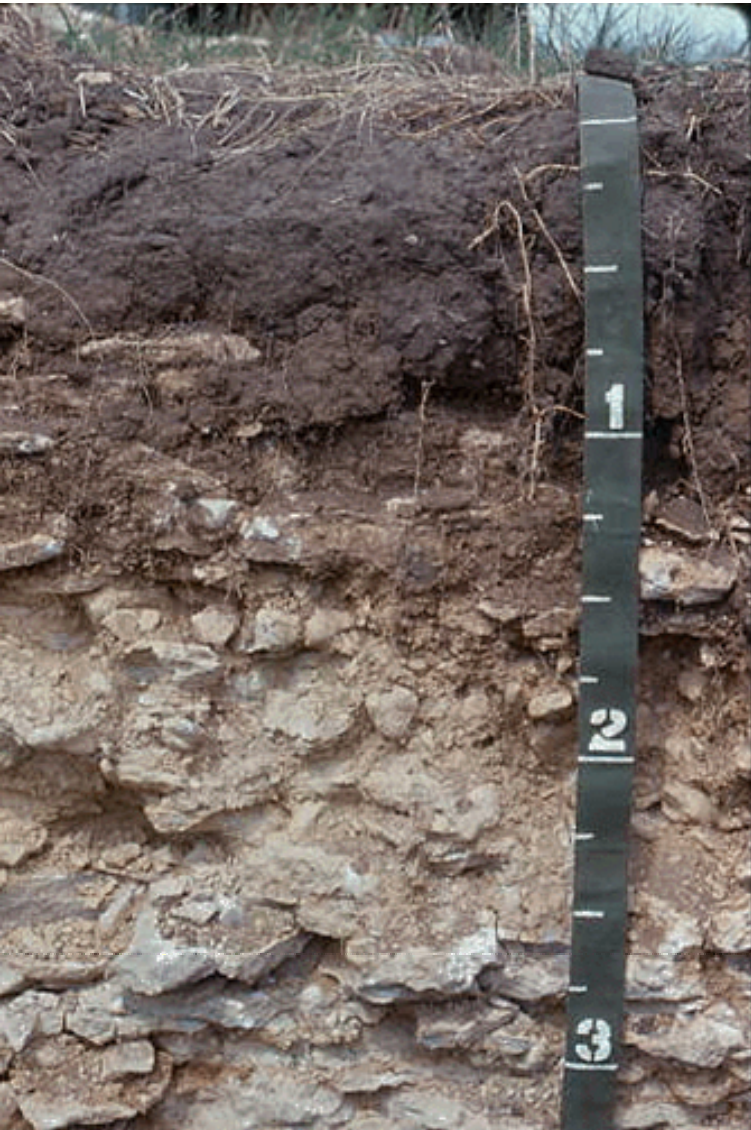


- Mapped gravelly soils include Dowagiac, a soil with low available water capacity.
- Here much of the infiltrated water is released to the underlying substrate

Bedrock Areas

- Many of the limestone bedrock areas with confining shale have sufficient tilt in them to direct substrate flow to a discharge area
- Soils are shallow to this bedrock
- There are situations too where confining lake sediment clays are in the setting and cause seepage to form

Bedrock Areas



- Near many of these areas are areas of Channahon soils, also with low available water capacity that readily releases its infiltrated waters

Bedrock Areas

- There are situations too where confining lake sediment clays are in the setting and cause seepage to form
- Glacial till areas likely have sand strata feeding the Fen connected to areas of gravelly soils

Loess Areas



- Thick soils like Seaton, with very high available water capacity, will release little water to the underlying substrate

Waters

- The drainage area feeding the Fen will vary on depending on the source
- Appears to have high levels of dissolved oxygen and basic materials such as limestone

Soils in the Fen

- Soils that form are mucks
- The residual plants that formed them are decomposed and contain little or no recognizable fibers
- The term “peat” is just the opposite; plant remains can be identified

Soils in the Fen



- To be mapped as an organic soil the muck layer should be at least 1 foot thick
- It could be as much as 6 feet

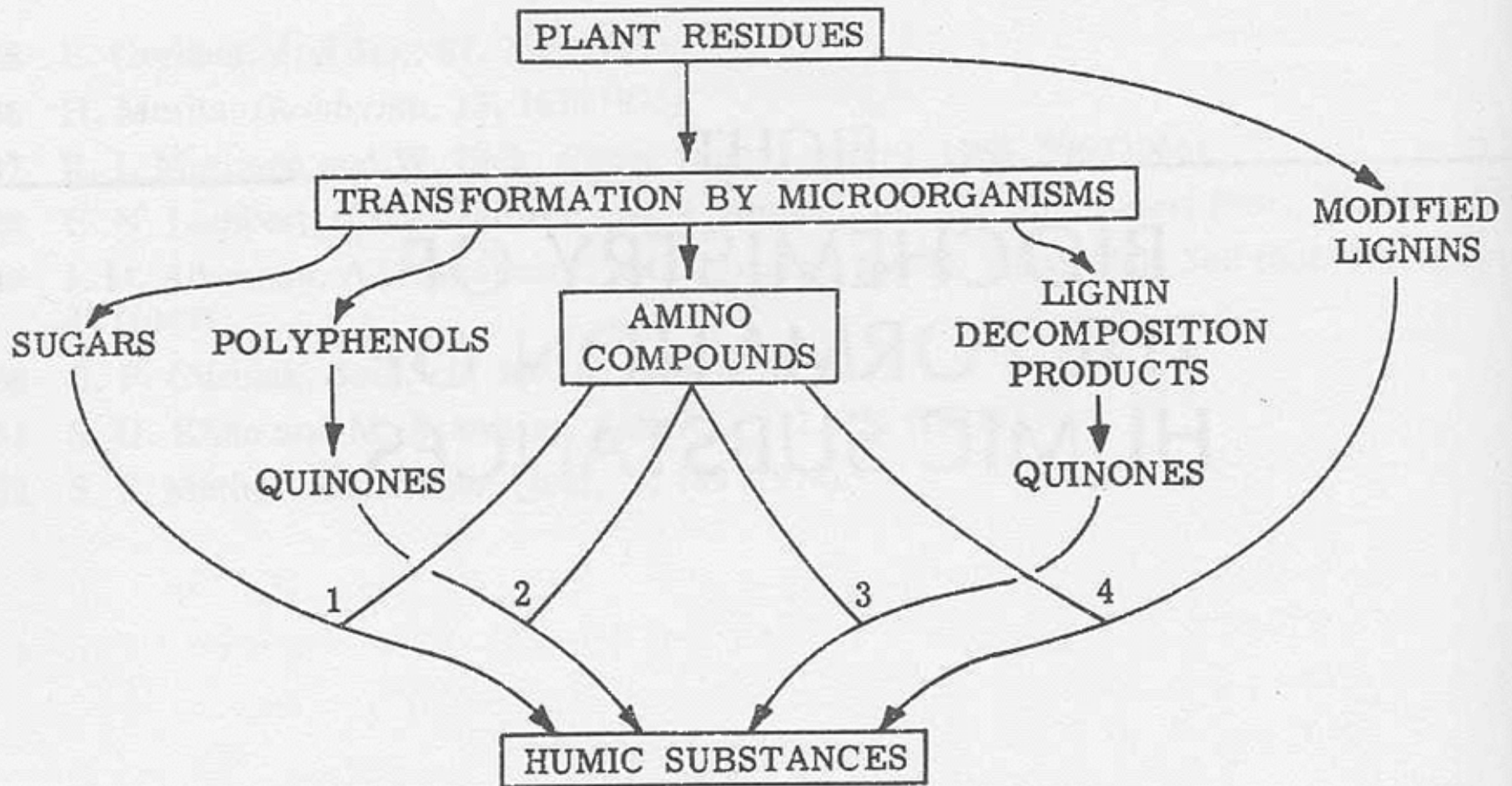
Soils Prospective

- F. J. Stevenson in his book titled “Humus Chemistry indicates a series of pathways that organic soils form and are shown in this slide

Soils Prospective

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Biochemistry of the Formation of Humic Substances



Physical State

- Stevenson also points out in his text that the formed particles are either “macromolecular” or in a “colloidal” state and tend to have a net negative charge

Inherent Fertility

- Soil fertility people recognize that the CEC cation exchange capacity enters here and its numbers are very high, which adds to the statement that fens are nutrient rich
- In this situation too, it has a very high buffering capacity and high in both N and P

Inherent Fertility

- Peat soil by contrast are low in this type of measure
- Undecomposed materials are mostly inert chemically

Commonly Mapped Soils

- 528B Palms Muck 1to 6 % slopes (Klossner – current name)
- Approximately 665 acres shown mapped in Olmsted County and many of its areas are included in other wet soils because of its areas are too small to be shown on the maps

Soil Mapping History

- Shown on early maps as peats and mucks land types
- Not significant to agriculture, so a series type was used

Soil Mapping History

- Olmsted County Soil Survey used the name Palms (Michigan soil)
- More recently named Klossner, but now may require a new series to be named to identify it

Soil Research Needs

- Plan to assess all fens, especially in terms of soil series