SEMINAR NOTES

for

SOIL-WETLAND RELATIONSHIPS: A FIELD TOUR OF THE WEST CHICAGO PRAIRIE

Sponsored by

ILLINOIS SOIL CLASSIFIERS
ISCA
ASSOCIATION

in cooperation with

**USDA, Soil Conservation Service,
University of Illinois at
Urbana-Champaign,
Morton Arboretum and
The Forest Preserve District
of DuPage County**

September 27-28, 1990

PREFACE AND ACKNOWLEDGEMENTS

On behalf of the Illinois Soil Classifiers Association (ISCA), we would like to express our appreciation to both the speakers and the participants in this seminar and field trip on soil-wetland relationships. In addition, we thank the following for assistance given in various aspects of this program: Scott Harding, Graduate Research Assistant, Agronomy Department, University of Illinois at Urbana-Champaign; Richard Hootman, Soil Specialist, Morton Arboretum; Wayne Lampa, Biologist, DuPage County Forest Preserve; Susan Putman, Seminar Assistant Registrar; and the personnel of the Holiday Inn, Carol Stream.

ISCA Organizing Committee

Don Fehrenbacher, Area Soil Scientist, U.S.D.A. Soil Conservation Service, Bourbonnais, Ill.
Pat Kelsey, Research Soil Scientist, Morton Arboretum, Lisle, Ill.
Mark Matusiak, Soil Scientist, Environmental S/E, Glen Ellyn, Ill.
Bruce Putman, Consulting Soil Classifier, Woodstock, Ill.
John Tandarich, Soil Scientist, Hey and Associates, Inc., Chicago, Ill. (Editor of the Seminar Notes).

9.2.4. EPA 404(c) discharge prohibition applied to an area in advance of any application.

9.3. Wetland Delineation. EPA and the Corps completed field testing of slightly different techniques for delineating wetlands in 1988. After extensive negotiations among the Corps, EPA, FWS and SCS, the four agencies agreed in January of 1989 to a unified method of identifying and delineating wetlands. Under the Civiletti Opinion, EPA has the final say on how wetlands will be delineated. A 1989 MOA with EPA provides how the Corps will make the vast majority of wetland calls on EPA's behalf.

7-10 days continuous saturation (SCS)

9.4. State Transfer. Army continues to encourage EPA to loosen up on state requirements for assuming the 404 program in non-navigable waters (as directed by the President's Task Force on Regulatory Relief). EPA final regulations were published in 1988 but, in Army's opinion, are still unduly burdensome on states. Only Michigan has assumed the program to date. At the current rate, one state in 12 years, the intent of Congress expressed in the 1977 CWA amendments that the states take over regulation in non-navigable waters will be realized in the year 2577!

9.5. Nationwide Permits. The Corps is rewriting the nationwide permit regulations, 33 CFR 330, in an attempt to simplify procedures and expand coverage. Proposed rulemaking is anticipated in 1989.

9.6. Bridge Transfer. Army accepted an offer by the Department of Transportation (DOT) to transfer the bridge regulation program from the U.S. Coast Guard back to the Corps (the Corps regulated bridges from 1888 to 1967 when DOT was created). Fifty-five spaces in the Coast Guard will be transferred to the Corps when the enabling legislation is passed. DOT forwarded the legislation to Congress 28 April 1988.

9.7. Cost Recovery. With the recent surge of interest in deficit reduction, the Congress and DOD have shown vigorous interest in cost recovery in the regulatory program. The Corps believes this will be an unfortunate direction for the program. The program protects the public rights to use the nation's waters by regulating private activities that might affect those rights. The regulated sector is not allowed to unduly affect those public rights. Thus, the public at large, and not the regulated sector, should pay the costs of the program. Cost recovery will further discourage an already weary regulated sector, encourage violations, discourage proactive regulatory measures, and add further complications and work on the Corps.

9.8. Work Prioritization. ASA(CW) is now reviewing a Corps-recommended work prioritization list that, if approved, will allow the Corps to forego certain work items, otherwise required, when insufficient resources are available to accomplish all work. This list could include allowing certain activities needing a permit to proceed without authorization and no intent by the Corps to enforce against.

9.9. Takings. Guidelines have just been issued on how the Corps will comply with the 1988 Executive Order on Fifth Takings. Takings Impact Assessments will now have to be prepared for permits denied with prejudice and for some permits conditioned to the point that the applicant views the decision as tantamount to a denial.

Robert S. Whyte,
Aquatic Biologist

State, County and Local Policies Regarding Wetland Protection

LCHD, Lakes Management Unit

I. Introduction - the role and interrelationship of the various levels of government

Understanding and communication - What are the laws? Who regulates what? Where can I find technical assistance?

A. County/Local

-comprehending state/federal programs including familiarity with regulatory programs (e.g., Section 404 of the Clean Water Act)

-coordinated environmental measures

B. State/Federal

-recognition of the specific needs of local entities
-availability of resources to assist locals or conduct mandated programs locals depend on

II. Lake County, Illinois - A Case History

A. Wetland Resources of Lake County

B. Units of Government/Mechanisms and their role in wetland protection

1. Lake County Health Department
2. Stormwater Management Planning Committee
3. Lake County Zoning Ordinance
4. Soil & Water Conservation District
5. Lake County Natural Resource Mapping Advisory Comm.
6. Lake County Forest Preserve District
7. Northeastern Illinois Planning Commission

C. Lake County Health Department

1. General Policy/Goal Statement
2. Public Education Efforts
3. Technical Assistance
4. Regulatory Mechanisms

III. The State of Illinois - Proposed wetland protection measures and how they may impact local units of government.

-local units of government shall regulate wetlands through joint participation agreements between the Illinois Department of Conservation and the County Boards of Supervisors

-consolidation into a single process of all county and municipal review procedures

-development and adoption by a county of a County Wetland Preservation and Protection Plan approved by the Illinois Department of Conservation

GENESIS AND MORPHOLOGY

OF

HYDRIC SOILS

Robert G. Darmody

University of Illinois

"Deliver me out of the mire and let me not sink-"
Psalms 69:14

Table 1 - **HYDRIC SOIL DEFINITION**

A soil that is:

Saturated, flooded, or ponded long eough during the growing season to develop anaerobic conditions in the upper part.

Table 2 - **HYDRIC SOIL CRITERIA**

1. All Histosols except Folists.
2. Cumulic subgroups, Aquic suborders and subgroups, and Albolls that are:
    a. Somewhat poorly drained with water table within:
        1. 1 Ft if permeability > 6 in/hr within 20 in.*
           or
        2. 1.5 Ft if permeability < 6 in/hr within 20 in.*
3. Ponded for long or very long duration.*
4. Frequent flooding for long or very long duration.*

*During the growing season.

HYDROLOGY AND MORPHOLOGY OF HYDRIC AND NONHYDRIC SOILS

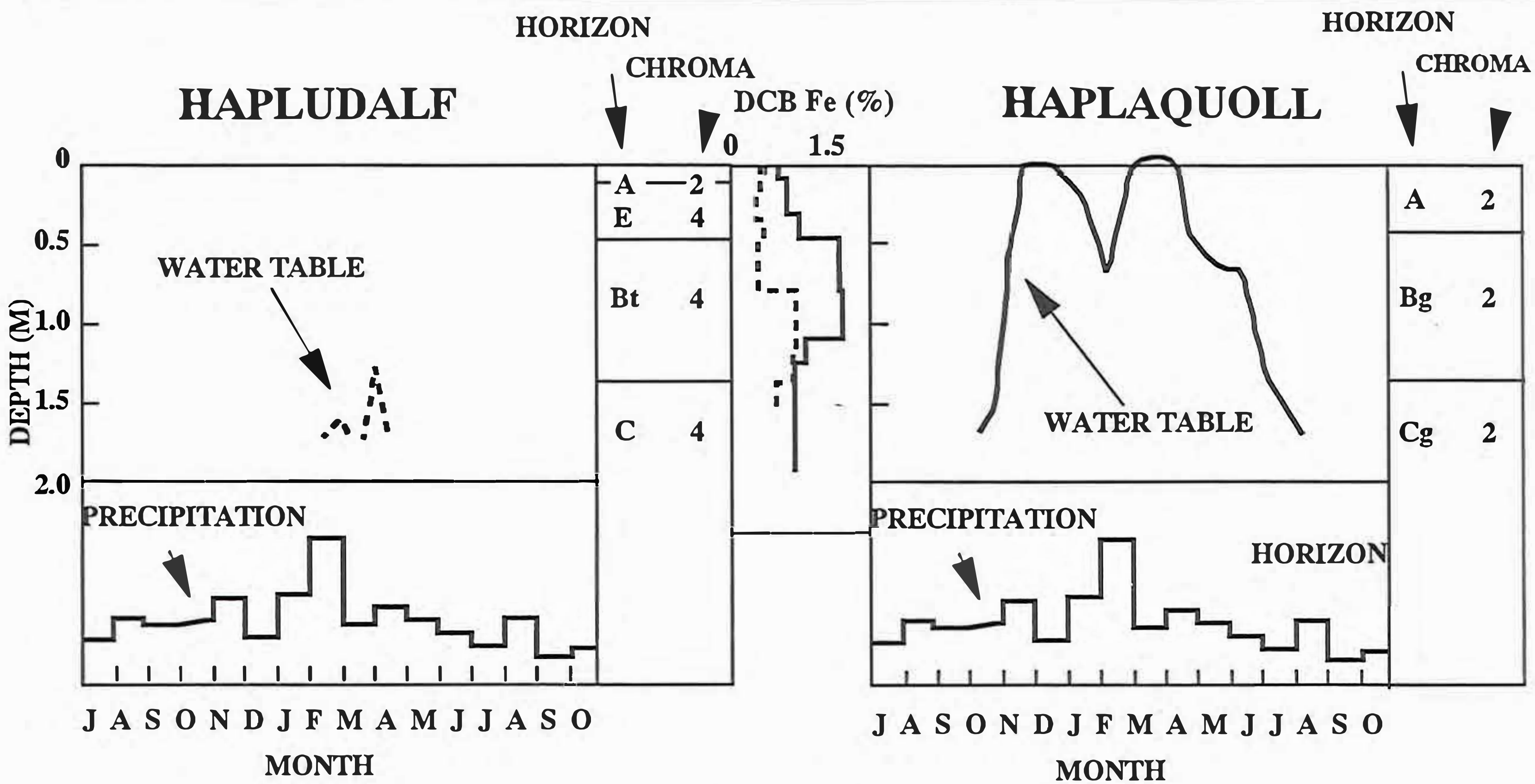


Figure 1. Water table position through 16 months in a nonhydric (Hapludalf) and hydric (Haplaquoll) soil. Note the thick A horizon, low chroma colors, and low iron content in the Haplaquoll.

Table 3 - **FIELD INDICATORS OF HYDRIC SOILS**

1. Organic Soils
2. Histic Epidedon
3. Sulfidic materials
4. n Value > 0.7
5. Peraquic moisture regime
6. Aquic moisture regime and hydric soil criteria
7. Landscape position
8. Buried surface horizon
9. Anthropedoturbation - drainage or filling

Table 4 - **GLOSSARY OF HYDRIC SOILS TERMS**

<u>ANAEROBIC:</u> Indicates absence of molecular oxygen.

<u>FLOODED:</u> Covered with flowing water.

<u>FREQUENTLY FLOODED:</u> Occurs more than 50 times in 100 years.

<u>GROWING SEASON:</u> Time of year with soil temperature >5 C.

<u>DURATION:</u> Long - 7 to 30 days; Very Long - > 30 days.

<u>PERMEABILITY:</u> Rate of water movement through saturated soil.

<u>PONDED:</u> Water standing in a closed depression.

<u>SATURATED:</u> All voids water filled.

<u>WATER TABLE:</u> Saturated zone.

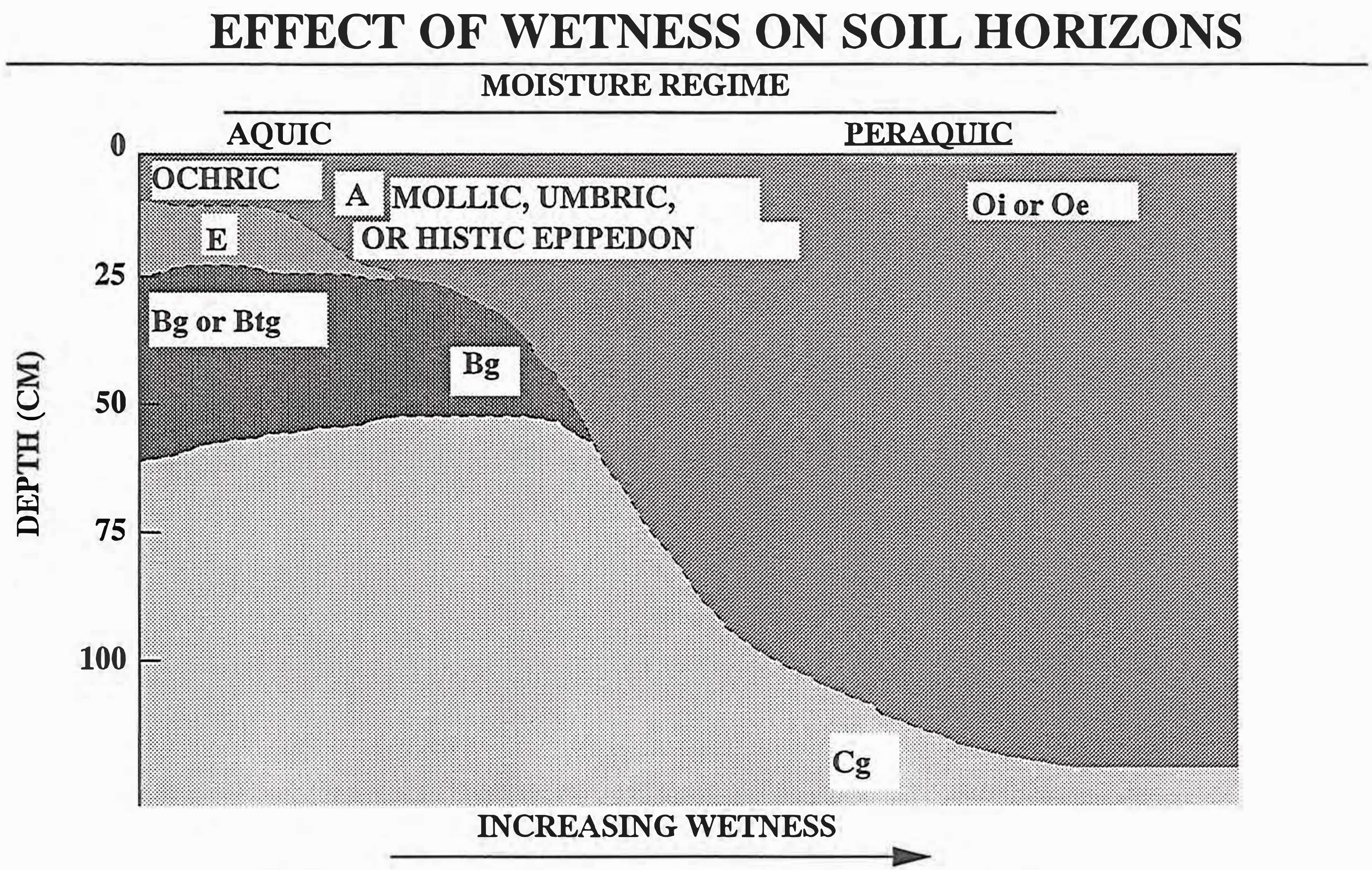


Figure 2. Theoretical changes in soil morphology across aquic to peraquic moisture regimes.

Table 5 - **ORGANIC SOIL TERMS**

Organic soil material: >12-18% organic carbon.

Fibric: >3/4 fibers.

Hemic: Intermediate decomposition.

Sapric: < 1/6 fibers.

Histosols: >1/2 organic soil materials >80 cm thick.

Histic Epipedon: Organic soil materials 20-40 cm thick.

Peat: Organic soil material slightly decomposed.

Muck: Decomposed organic soil material.

Limnic Materials:

Coprogenous Earth: Composed of fecal pellets.

Diatomaceous Earth: Composed of diatom tests.

Marl: Composed of unconsolidated $CaCO_3$.

Table 6 - **SOIL DRAINAGE CRITERIA**

During the growing season:

SOMEWHAT POORLY DRAINED

Soil is wet for significant periods.

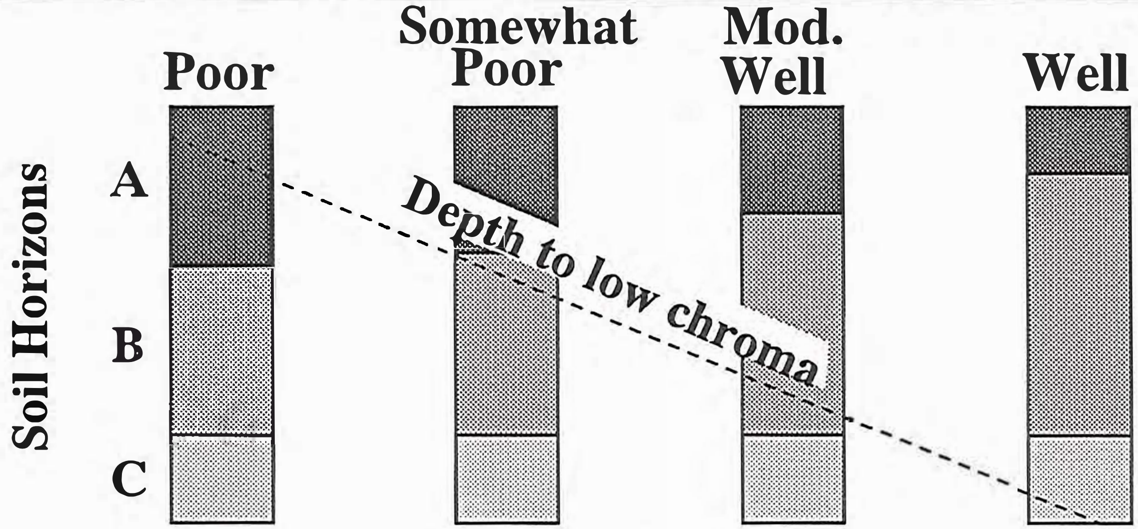
POORLY DRAINED

Soil is saturated periodically or remains wet for long periods.

VERY POORLY DRAINED

Free water remains at the surface most of the time.

COLOR PATTERNS AS A MEANS OF ASSESSING SOIL DRAINAGE CLASSES



Suggested depths are:

Drainage Class	Depth to Low Chroma Color
Well	> 40 in. (100 cm)
Moderately Well	20 - 40 in. (50 - 100 cm)
Somewhat Poor	10 - 20 in. (25 - 50 cm)
Poor	< 10 in. (25 cm)

LOW CHROMA <=2, VALUE >=5

Figure 3. Field indicators of soil drainage class.

Table 7 - **SOIL MOISTURE REGIMES**

AQUIC:

Reducing soil environment free of dissolved Oxygen caused by water saturation for some time.

PERAQUIC:

Ground water always at or near the surface.

Table 8 - **GLEIZATION**

DEFINITION:

- From the Polish word "Glej" for muddy ground.
- A response to wetness-induced reduction of iron, from Fe(III) to Fe(II), to produce gleyed colors.

REDUCE AND DESOLVE IRON:

OM

$$CH_2O + 2Fe_2O_3 + 7CO_2 + 3H_2O \rightarrow 4Fe(II) + 8HCO_3^-$$

OXIDIZE AND PRECIPITATE IRON

$$4Fe(II) + O_2 + 4H_2O \rightarrow 2Fe_2O_3 + 8H^+$$

MOTTLES:

Low Chroma - Where soluble Fe(II) has been removed to reveal the uncoated soil material.

High Chroma - Where insoluble Fe(III) has precipitated.

GENESIS OF REDDISH BROWN PED FACES IN GLAYED PRISIMS

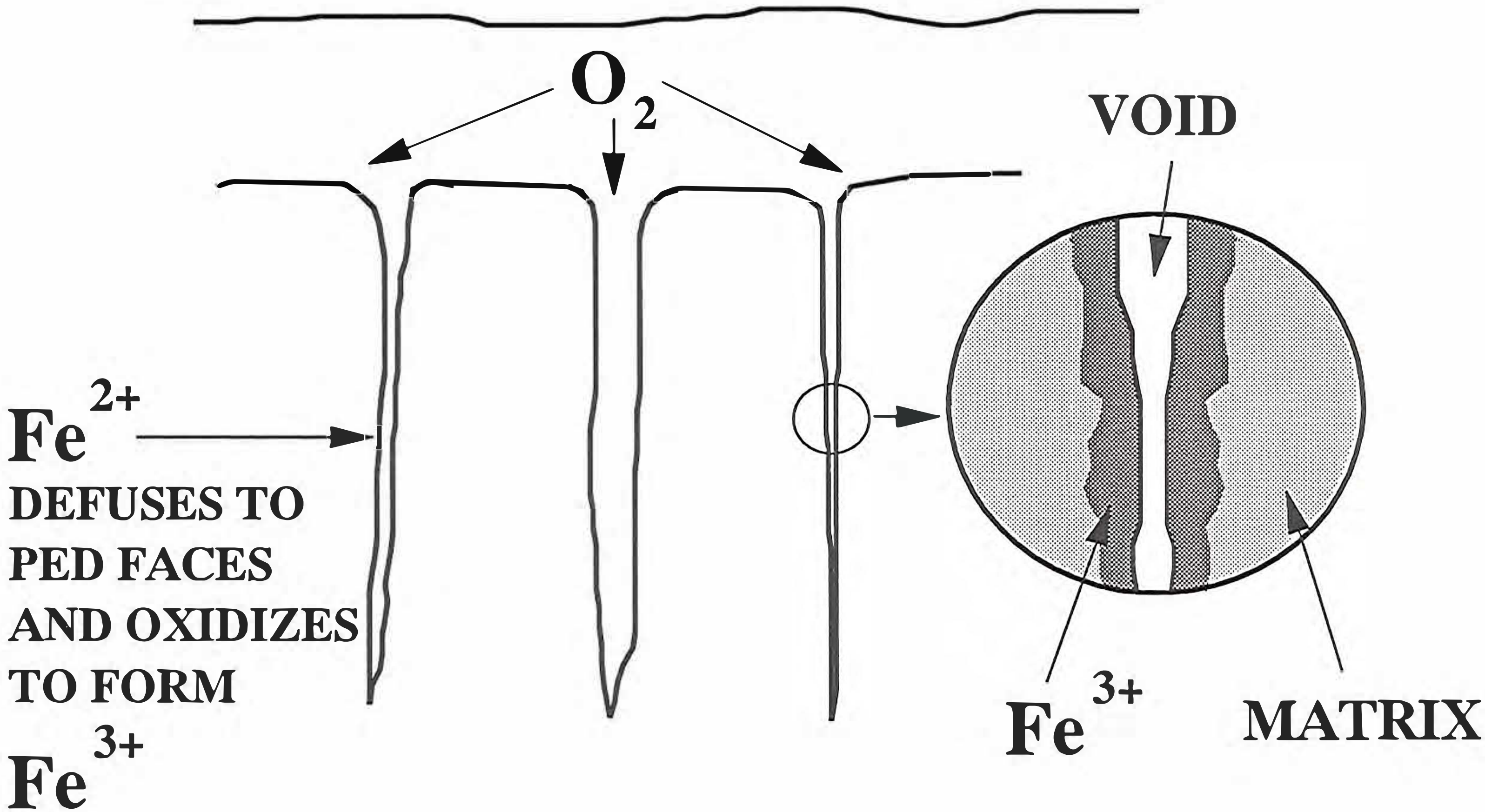


Figure 4. Model of high chroma mottle formation on gleyed ped faces.

GENESIS OF GLEYED PED FACES IN BROWN PRISIMS

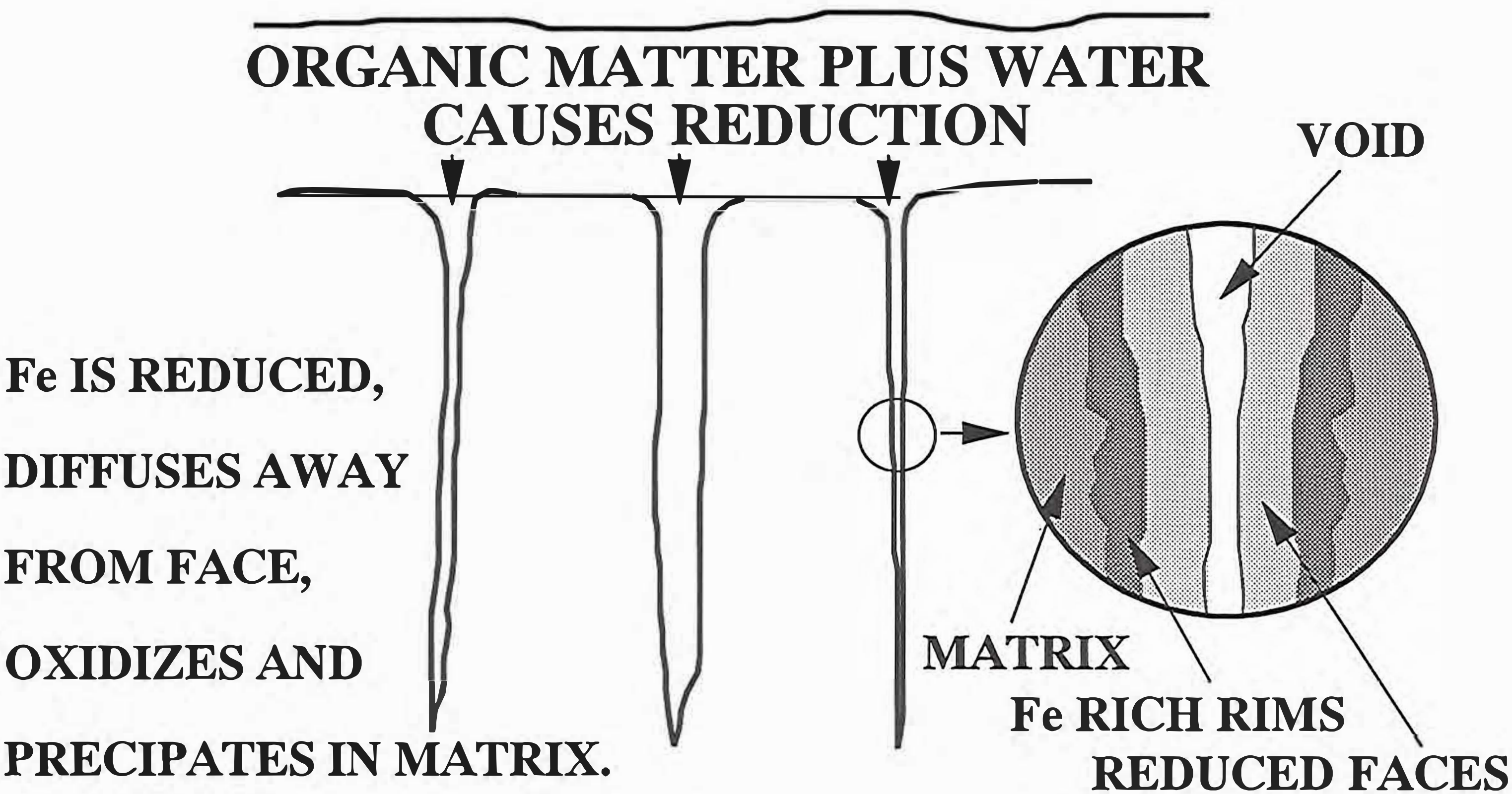


Figure 5. Model of formation of low chroma - high chroma mottles on ped faces.

Mottle formation in ped interiors is similar.

Table 9 - n **VALUE**

- A measure of physical bearing capacity of soft sediments and wet soils.
- Called "Index of Squishiness."
- Used with Peraquic moisture regimes.
- Soils include hydraquents and histosols.
- Soils with n >0.7 have never dried in place.

$$n = (A - 0.2R)/(L + 3H)$$

A = % Moisture

R = % Si + % S

L = % C

H = % Organic Matter

Table 10 - **SULFIDIC MATERIALS**

DEFINITION:

Waterlogged soil materials with >0.75% S and <3 times as much $CaCO_3$ as S.

ORIGIN:

Accumulate in soils saturated with brackish water:

$$8\ SO^{2-}_4 + 2Fe_2O_3 + 16CH_2O + O_2 \rightarrow 4FeS_2 + 16HCO^-_3 + 8H_2O$$

When drained, S oxidizes and lowers pH:

$$4FeS_2 + 6H_2O + 15\ O_2 \rightarrow 4FeSO_4(OH) + 4H_2SO_4$$

FIELD TEST FOR SULFIDIC MATERIALS

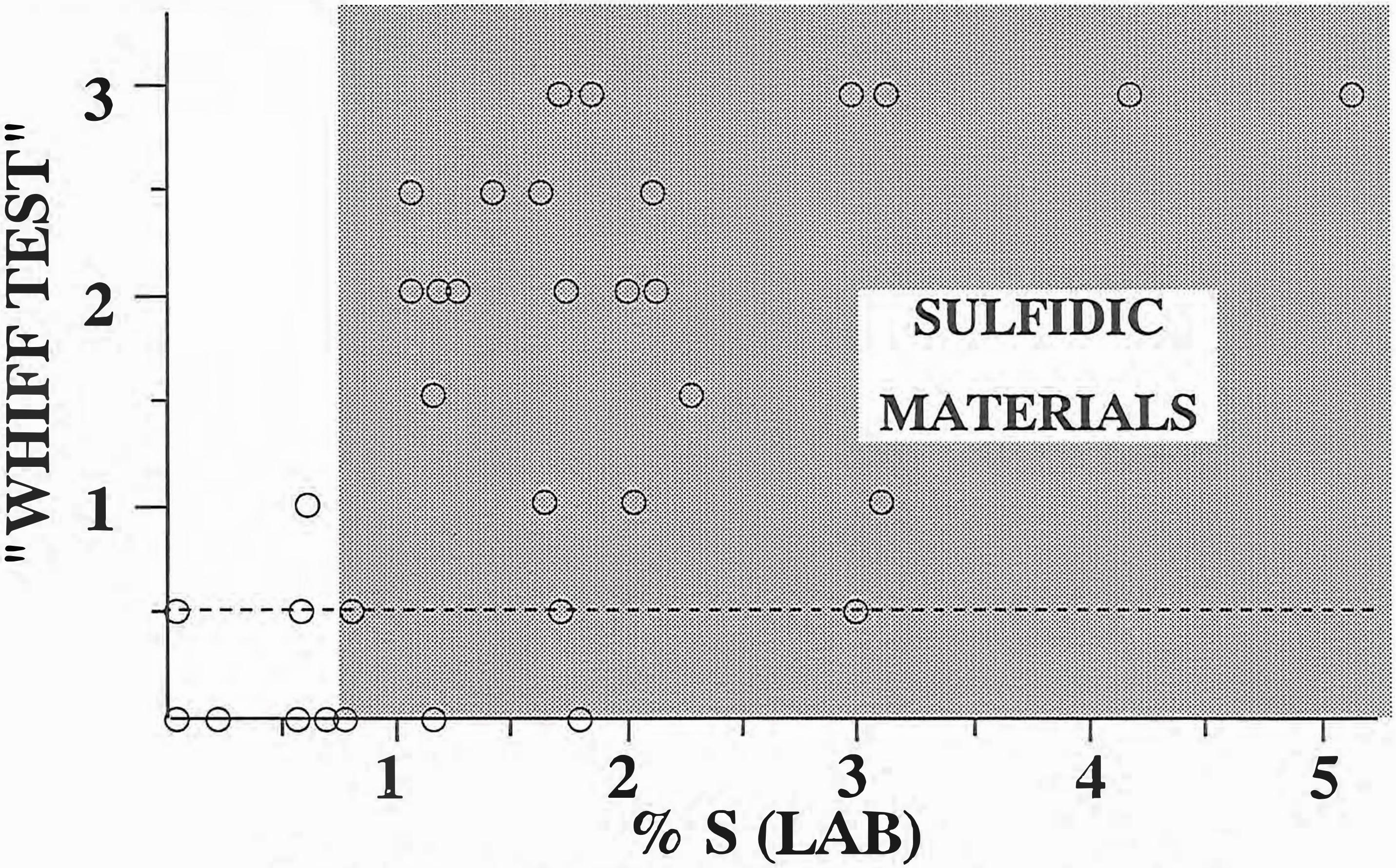


Figure 6. Field observation of sulfur odor (whiff >0.5) usually indicates the presence of sufficient S (>0.75 total S) for sulfidic materials. Calcium carbonate content would have to be checked.

R.G.D.

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Soil Survey Staff. 1990. Keys to soil taxonomy. Soil Management Support Services. AID USDA.

Fanning, D.S., and M. C. B. Fanning. 1989. Soil morphology, genesis, and classification. John Wiley & Sons, New York.

HYDROLOGY, SOILS AND VEGETATION OF WETLANDS
by
Jim L. Richardson

CONCEPTS

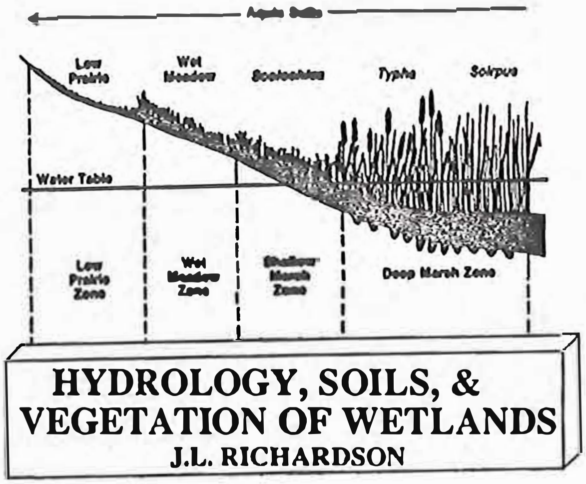
1. Vegetation zones and water permanence; closed surface flow systems.
2. Saturated flow and unsaturated flow.
3. Equipotential and stream lines; recharge, discharge, flowthrough; lateral flow conditions; evaporative discharge.
4. Through flow - an example; transient flow above the water table.
5. Darcy's Equation; clay = recharge; sands = discharge; steep gradients = discharge; flat gradient recharge; anisotrophic.
6. Hydrologic model - Unifying concept of wetland development.
7. Depression focused recharge and discharge; water table mounding; flow reversals.
8. Shorelines and edges.

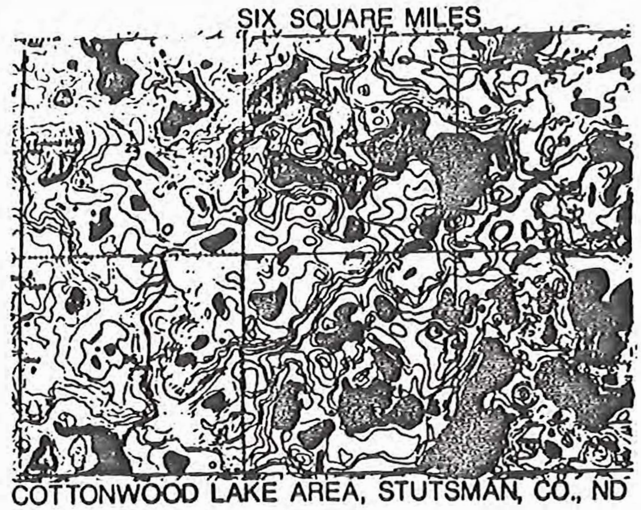
SOILS OF WETLANDS

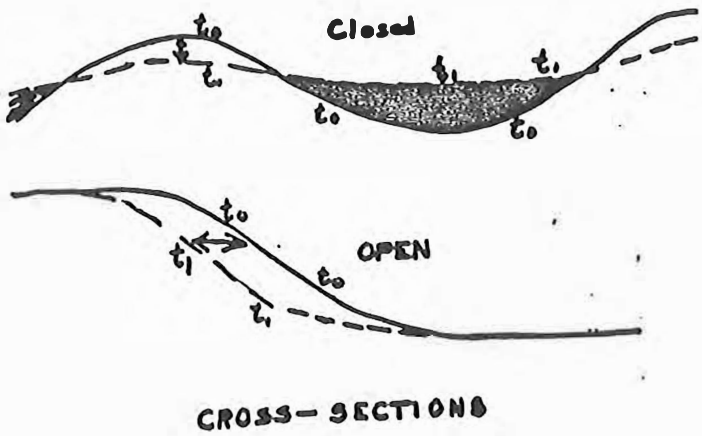
1. Recharge, flowthrough and discharge wetlands.
2. Climate - east to west.
3. Basin characteristics.
4. Position in wetlands: a) platforms; b) depressional zones, edge effect - basin, edge effect platform.
5. Texture of strata: a) sand hills; b) fens.

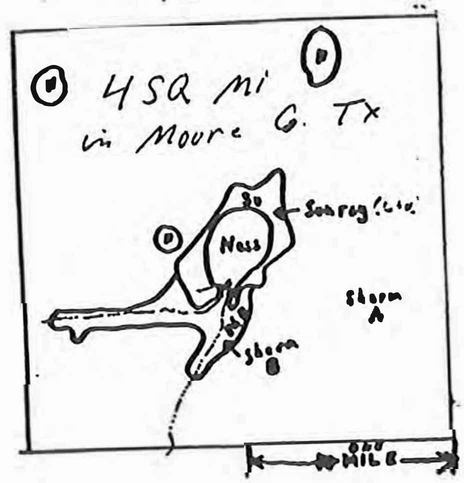
MODELS AND COURT CASES

1. Edges of lakes; Devils Lake and Red Lake.
2. Sewage Lagoons.
3. Model of mottles.







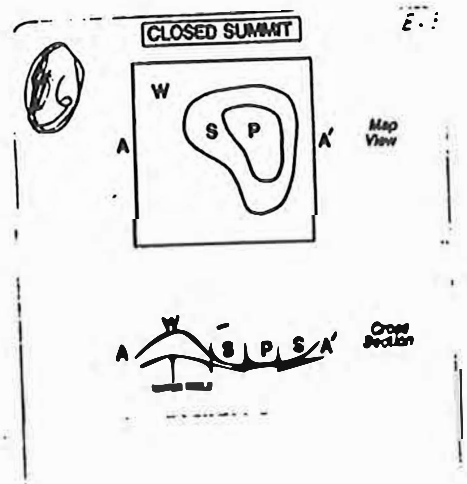


CLOSED LANDSCAPES

SURFACE WATER DOES NOT FLOW BY STREAMS FROM THE SYSTEM.

INDICATORS FOR CLOSED LANDSCAPES

1. WETLANDS, WET SOILS, LAKES, TYPHA
2. LOW RELIEF (USUALLY)
3. DEPOSITIONAL FEATURES
4. FEW STREAMS
5. TILL, DUNE, FLOODPLAIN, LAKE & COASTAL PLAIN

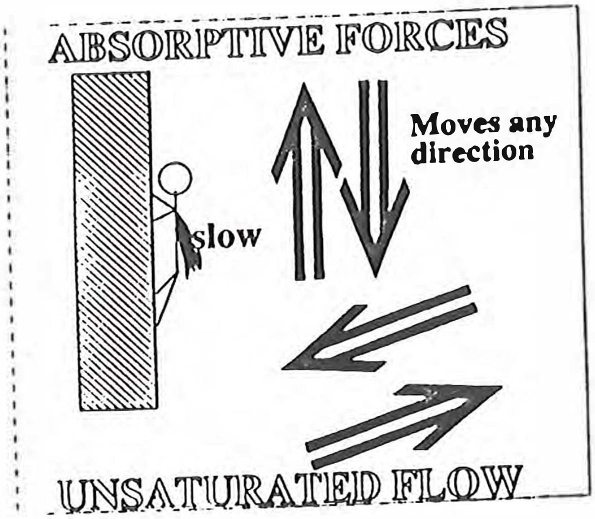


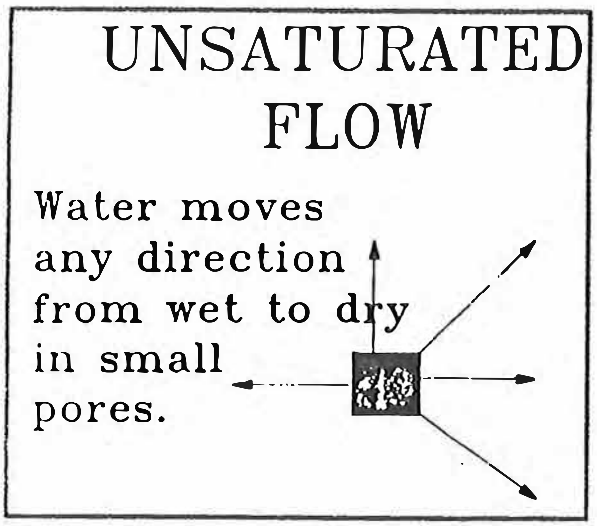
$$\psi_t = \psi_g + \psi_m + \psi_o$$

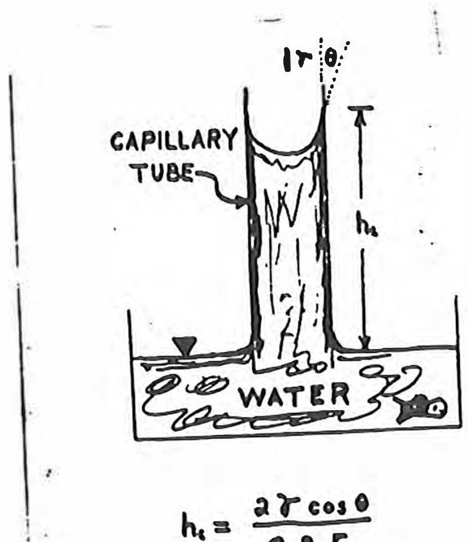
Gravity
Matric
Osmotic

POTENTIAL WATER FLOW

J.L. RICHARDSON



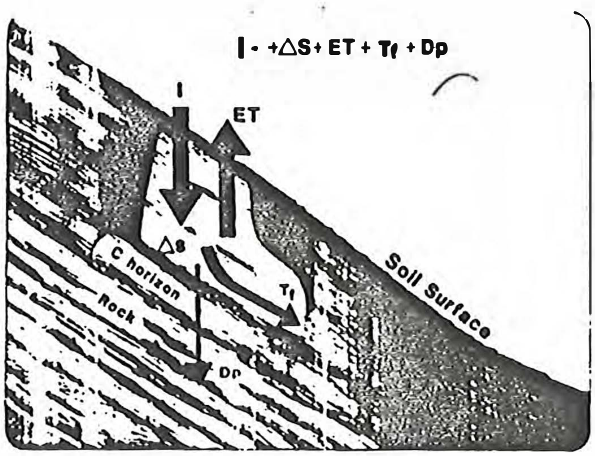


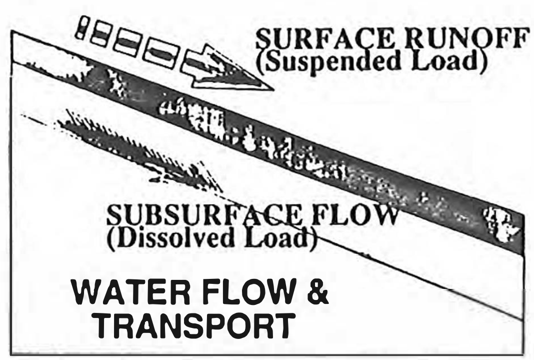


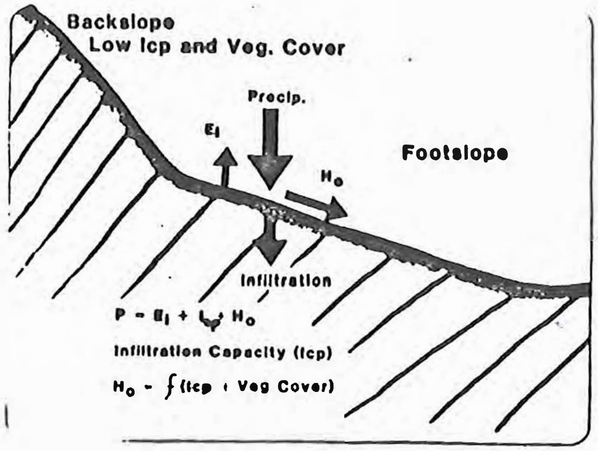
$$h_c = \frac{2\gamma \cos\theta}{\rho g r}$$

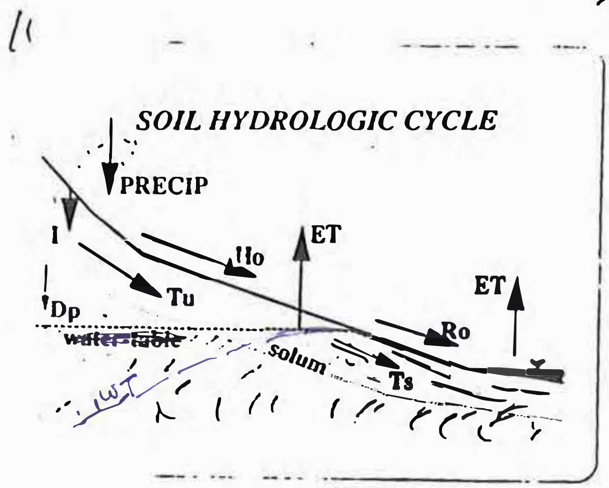
See Richardson & Hole. 197[illegible] Soil Sci Soc. Am J. 42:[illegible]

Tf- Throughflow
Dp - deep penetration






Backslope
Low Icp and Veg. Cover
Precip.
Ho
Footslope
Infiltration
Infiltration Capacity (Icp)


SOIL HYDROLOGIC CYCLE
PRECIP
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ET
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Dp
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solum
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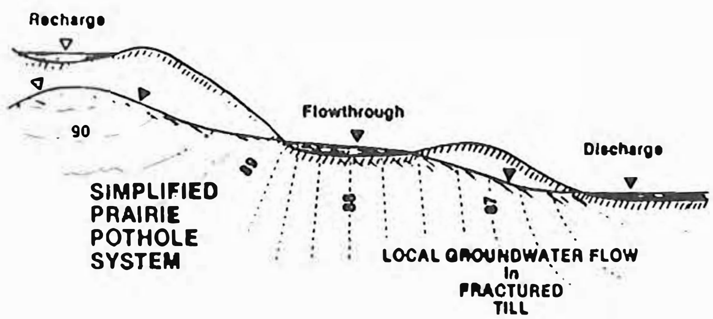
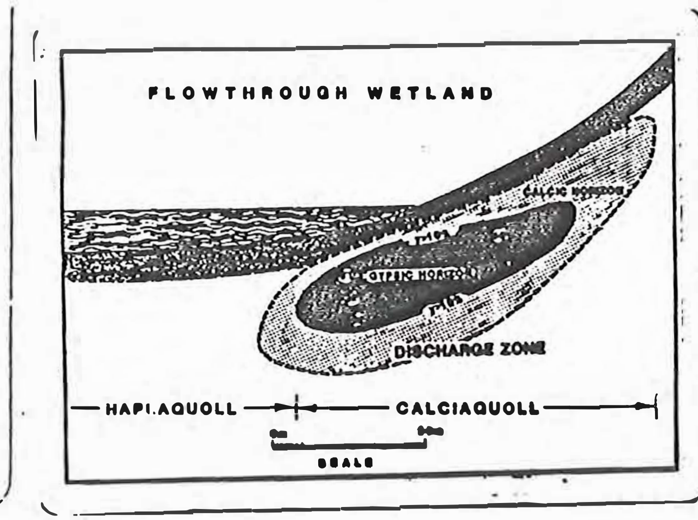
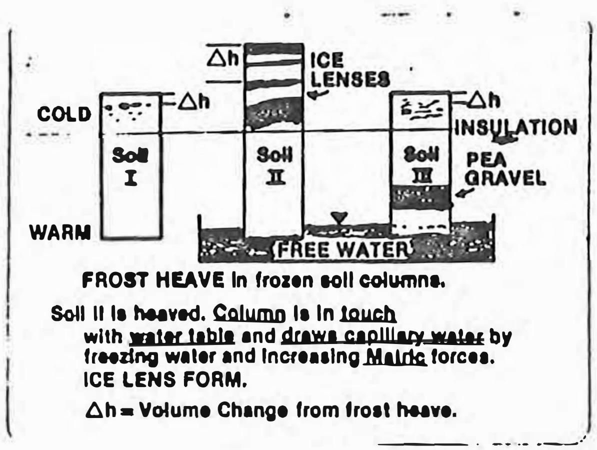
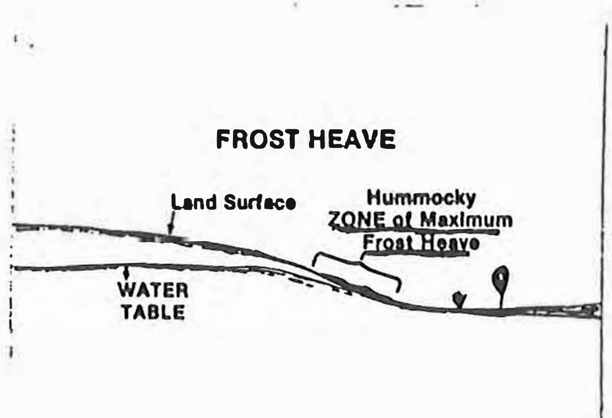
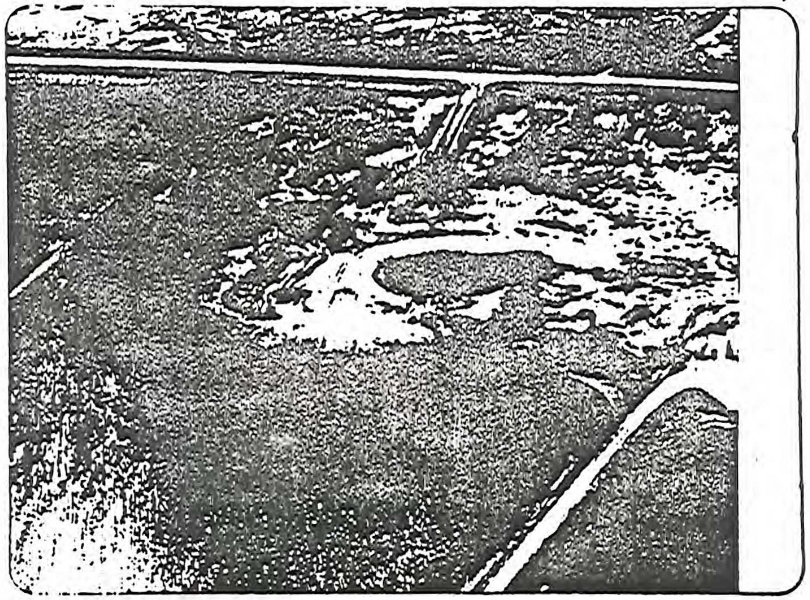
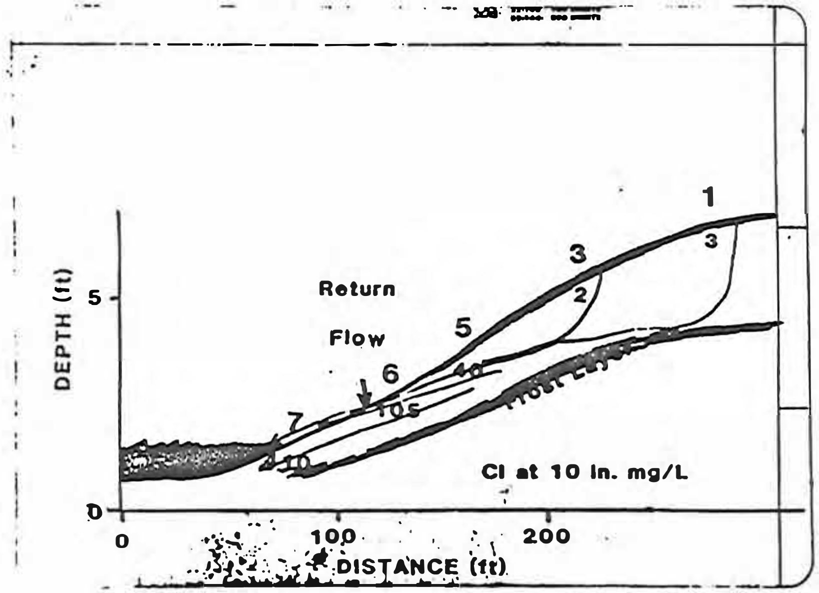

Recharge
90
Flowthrough
Discharge
SIMPLIFIED
PRAIRIE
POTHOLE
SYSTEM
LOCAL GROUNDWATER FLOW
in
FRACTURED
TILL


FLOWTHROUGH WETLAND
CALCIC HORIZON
GYPSIC HORIZON
DISCHARGE ZONE
HAPLAQUOLL
CALCIAQUOLL
SCALE

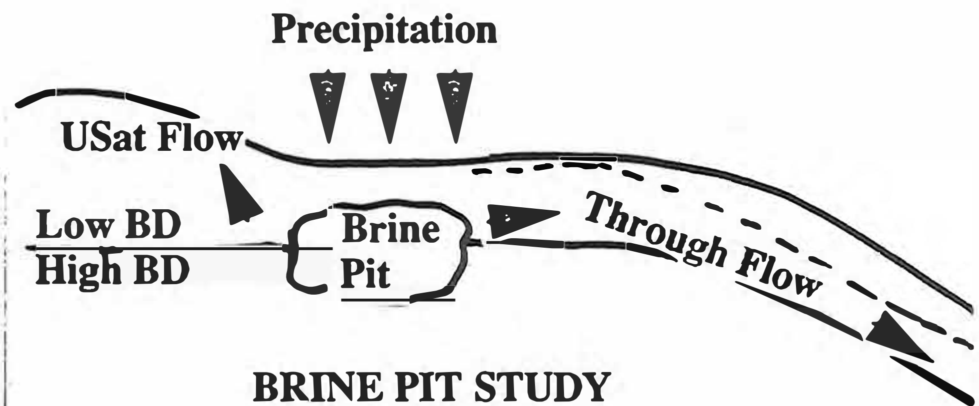

Δh
ICE
LENSES
COLD
Δh
Δh
INSULATION
Soil
I
Soil
II
Soil
III
PEA
GRAVEL
WARM
FREE WATER
FROST HEAVE in frozen soil columns.
Soil II is heaved. Column is in touch
with water table and draws capillary water by
freezing water and increasing Matric forces.
ICE LENS FORM.
Δh = Volume Change from frost heave.


FROST HEAVE
Land Surface
Hummocky
ZONE of Maximum
Frost Heave
WATER
TABLE



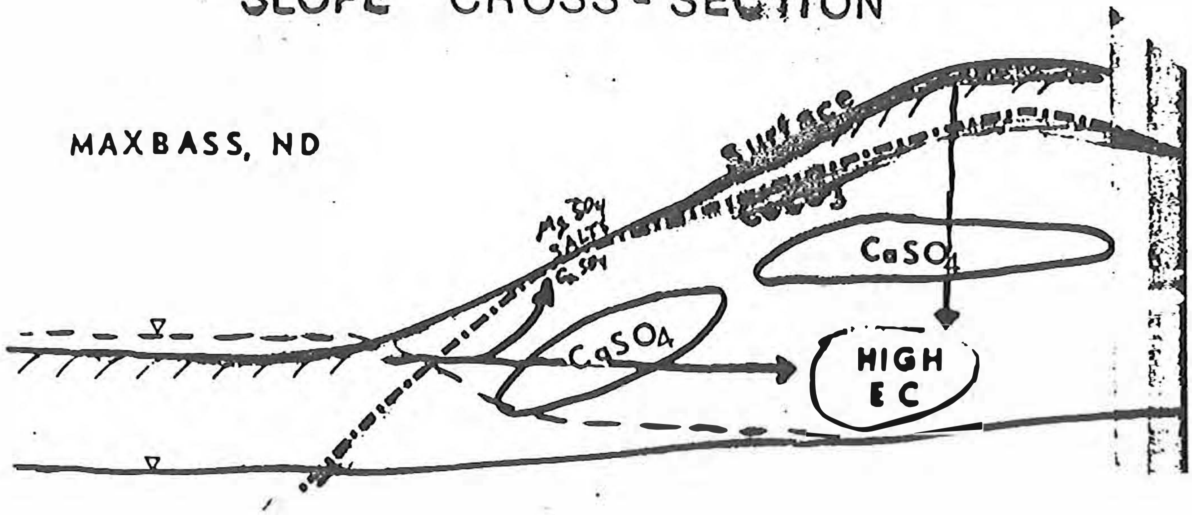


BRINE PIT STUDY NORTHWEST NORTH DAKOTA



BRINE PIT STUDY
Cross-Section

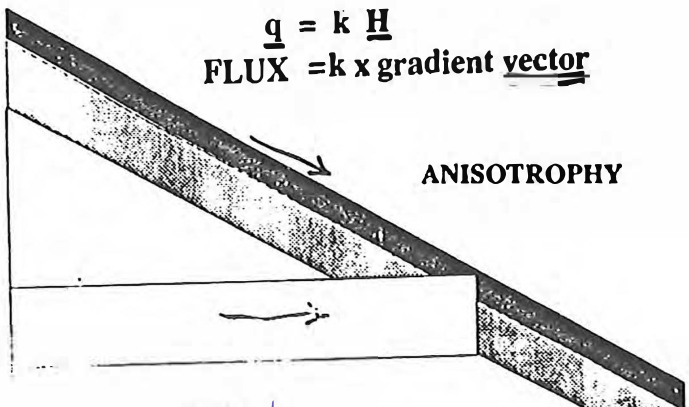
SLOPE CROSS-SECTION



DARCY'S LAW

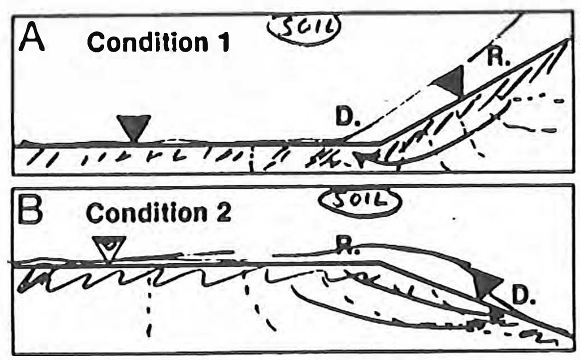
$\underline{q} = k\ \underline{H}$

FLUX =k x gradient vector

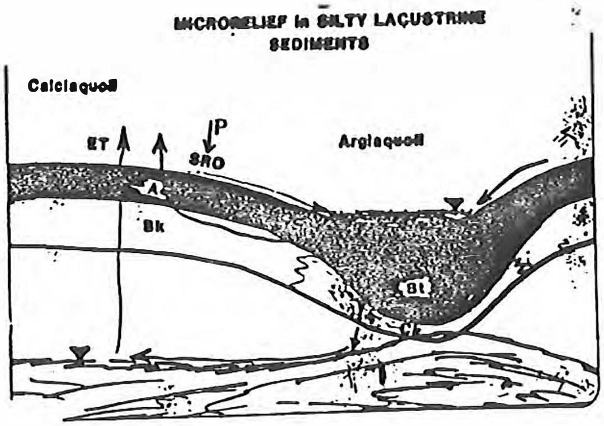


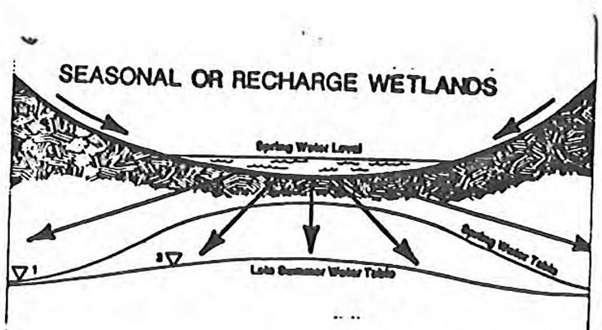
k - hydraulic conductivity
q - discharge

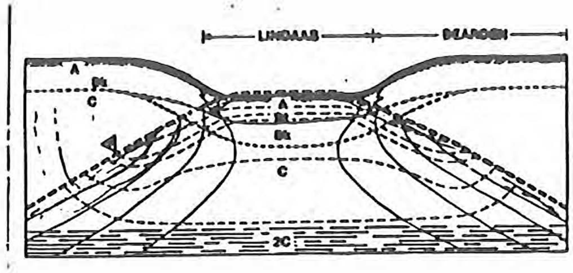
sandier soils discharge more than clay soils

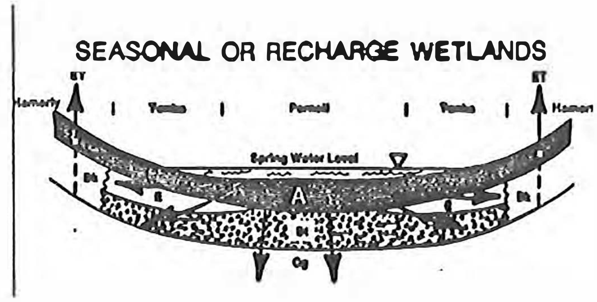


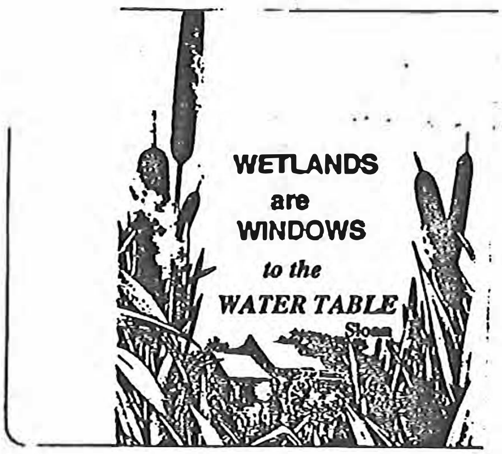
LATERAL FLOW CONDITIONS

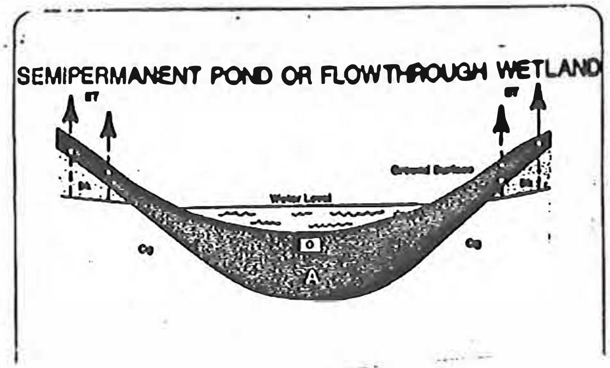


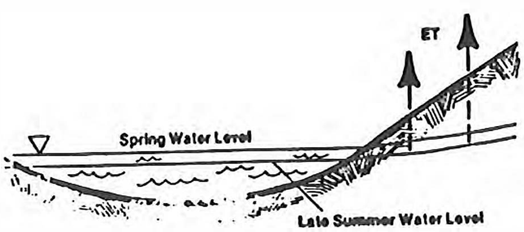


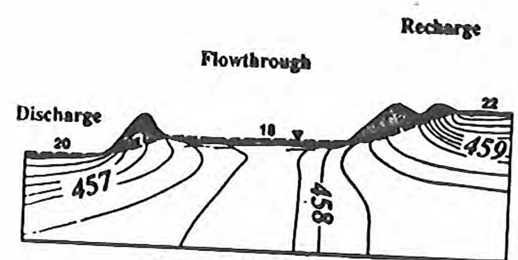




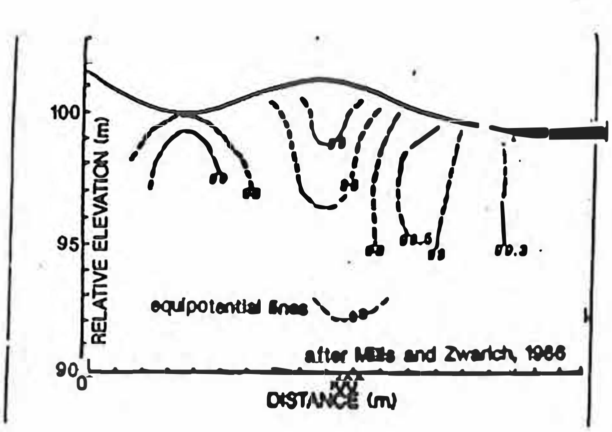


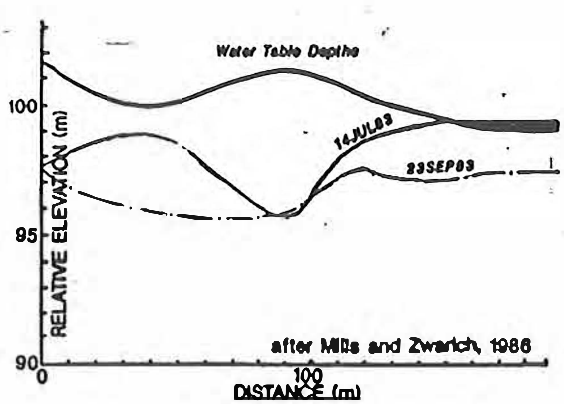




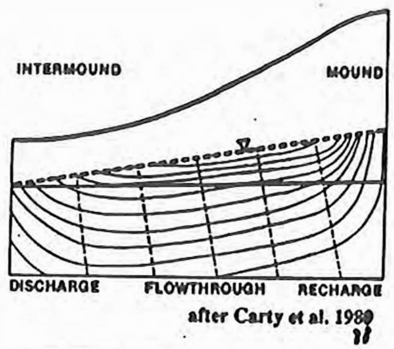


PRAIRIE WETLANDS
Nelson Co., ND

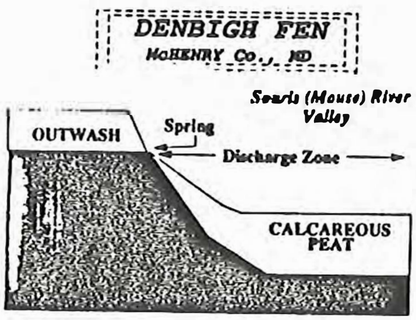


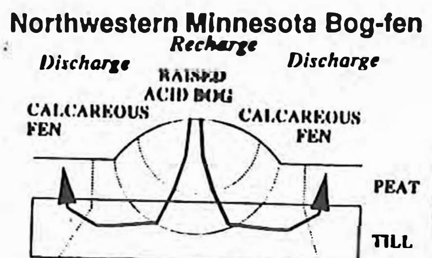


After Wilding, Odell, Fehrenbacker, Beavers, 1963
1963 Soil Sci. Soc. Am. Proc.

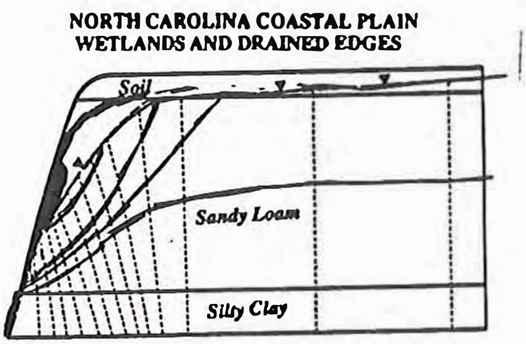


after Carty et al. 1989

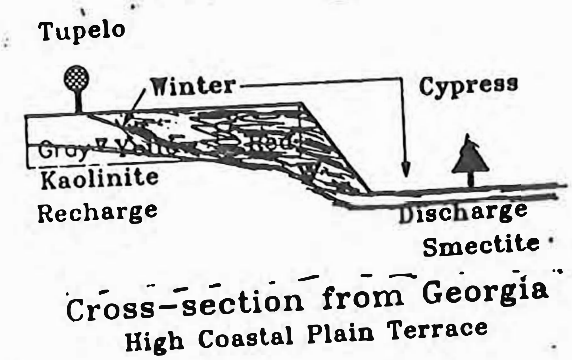


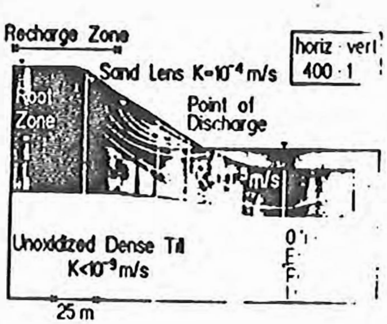


after Siegel & Glaser, 1988



after Daniels et al. 1971





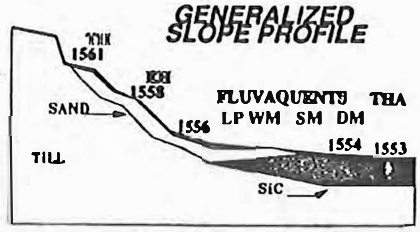
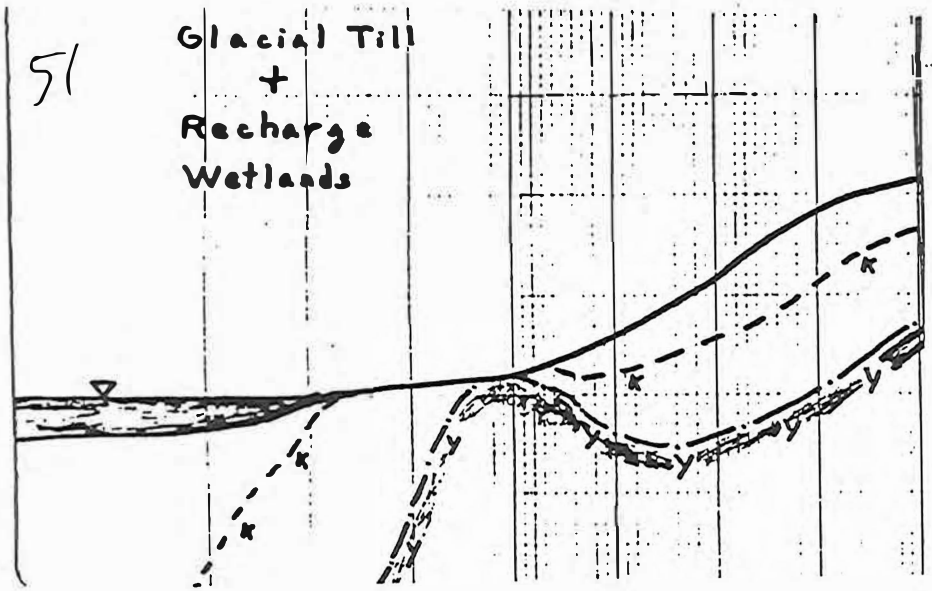
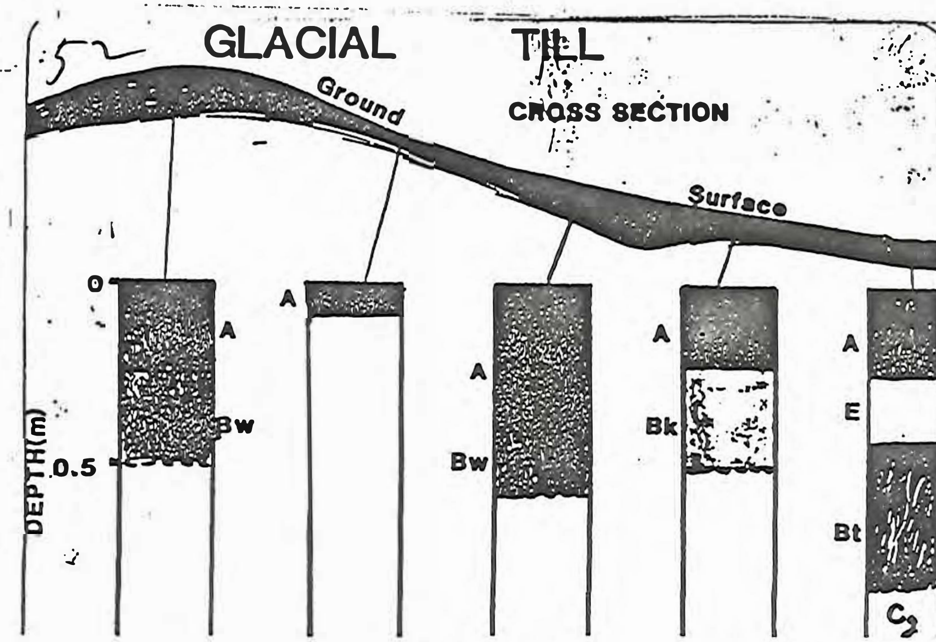
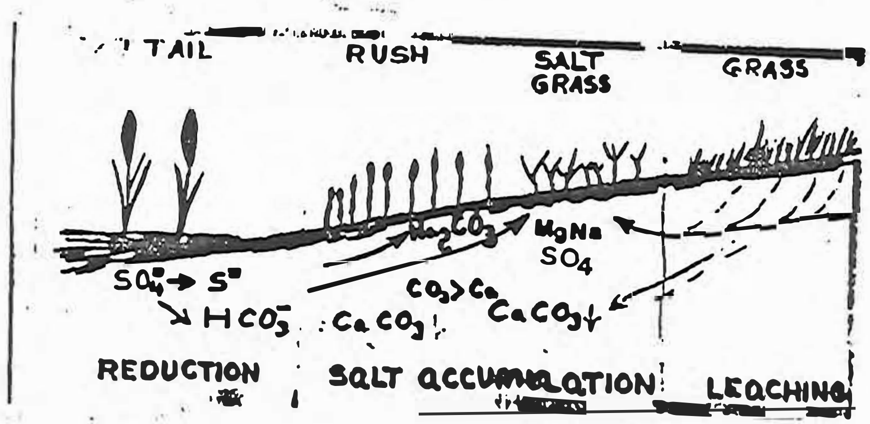


Fig. 4. The generalized slope profile for the steep and intermediate slopes around Red Lake. The till has deposits of sand and gravel on it in the beach zones and silty clay lake sediments (SiC) lower on the slopes in near and offshore positions. The elevations are in feet. LP is low prairie; WM is wet meadow; SM is shallow marsh; and DM is deep marsh. TH is Typic Haplaquolls; EH is Entic Haplaquolls; THA is Typic Haplaquents.


51
Glacial Till
+
Recharge
Wetlands


52
GLACIAL TILL
CROSS SECTION
Ground
Surface
DEPTH(m)
0
0.5
A
Bw
A
A
Bw
A
Bk
A
E
Bt
C2


TAIL
RUSH
SALT GRASS
GRASS
Na2CO3
MgNa SO4
SO4= → S=
HCO3-
CO3>Ca
CaCO3
CaCO3
REDUCTION
SALT ACCUMULATION
LEACHING

ASPECTS OF WETLAND SOILS
by
Jim L. Richardson

Based on my experience, the wetland soils of the Prairie Pothole Region should be categorized by five criteria.

1. Hydrology includes general nature of flow at any given soil pedon (recharge, flowthrough, frequent flow reversals, or discharge conditions). Also evaporation discharge from evapotranspiration. Soil interacts with hydrology and effects hydrology. In turn hydrology effects soil.
2. Climate includes humid, subhumid, and semiarid conditions. Climate means average annual precipitation, evapotranspiration, temperature as well as seasonal and long-term shifts in conditions. Climate effects hydrology by controlling the amount of water in the system.
3. Basin size, and shape includes here if the nature of the basin is palustrine, palustrine and lacustrine, or lacustrine. The geomorphology and age of the soils varies with all three.
4. Position in wetland implies vegetational zones includes edge (wet meadow), shallow-marsh, deep marsh, and open water zones.
5. Texture of the surrounding landscape is divided into two classes: coarse textured (sands, sandy loam, sand and gravels) or fine textured (other textures). Hydrologic factors are obviously influenced by these textures.

The chemistry is also influenced as well. In North Dakota, for instance, all fens I have seen occur in coarse textured terrains.

Hydrology

The soils in recharge wetlands have a strong downward flow with some lateral flow. The soils are leached deeply of carbonates and other salts. Generally these soils possess an argillic horizon. Frequently these are fine textured soils. The large gradient losses in fine textured soils promote groundwater mounding and slow transfer of water. Recharge conditions are promoted by fine textured soils.

Discharge wetland soils in the prairie tend to be organic with a high base status in the east (humid) and saline Entisols in the west (semiarid). The presence of evaporite indicates discharge. The soils are poorly developed and are frequently permanent wetlands.

Flowthrough wetlands are more complex in that lateral flow with both recharge and discharge occur in the same pond. These soils, in eastern North and South Dakota, have thick A-horizons and contain calcium carbonate. Lateral water flow or frequent flow reversals often characterize the movement of water in these soils.

Climate

In humid regions the water table tends to replicate the topography. In semiarid regions, the water table is highest under the depressions (Figure 1). In these conditions, the latter is a recharge conditions and the first is a discharge condition. Note also that water permanence is less and fluctuation of the water levels greater. This also promotes more "recharge" type flow.

Using my experience, going from Mahnomen County, MN on the east to Burke County, ND in the west, the following changes (Figure 2) were noted in wetlands of very similar size, shape and appearances. All are silty clay loam soils. A similar sequences could be developed from Story County, Iowa to Brule County, SD. Recharge wetlands are unusual in the east and abundant in the west across these climatic zones also.

Palustrine or Lacustrine Basin

Palustrine

In similar Des Moines lobe, Cary-aged, clay-loam, calcareous till, the landscapes (Figures 3a & b) have developed. In Palustrine conditions, the difference from till to pond sediment is not great and the slope geomorphology does not indicate and age break.

Palustrine-Lacustrine

In some ponds, the pond becomes a lake during periods of extra precipitation (Figure 4). In 1951 for instance, this pond lost enough water that storm waves would erode on the Arthent headland. The waves during the lacustrine phase sent the soils back past go the they cannot collect $200. The palustrine phase soils develop into a Typic Haplaquoll. In nearly palustrine wetlands with the same water permanence, the soils are Cumulic Haplaquolls.

In lasturine systems, a complete beach, near-shore, offshore sediment system of Entisols occurs with rather striking textural segregation (Figure 5).

Position in the Wetland

Edge soils in the wet meadow zone are often in sites that lose water by evapotranspiration. Generally wetlands in the prairies have a ring of calcareous soils surrounding the ponds. These sorts classify us Typic Calciaquolls; in the Canadian system these are Gleysalic Rego soils. The Canadians call these "Rego rings". Such rings are found in Saskatchewan south to Texas; from Iowa through the Dakotas. The pond interiors have soils as mentioned above. See the soils with Bk-horizons in Figures 3a and b.

Sandy Versus Fine Textured Landscapes

Nearly all ponds in the Nebraska Sand Hills are discharge wetlands with very alkaline water (Figure 6a) (Winter, 1988). Water moves rapidly in these landscapes. In sand hills that have deep water tables, the recharge-discharge situation does occur (Figure 6b).

Seeps from sandy materials often results in fen development. These are calcareous Histosols. Associated with fens are large areas of natric soils (Figure 7). In Polk County, MN the calcareous fens are numerous. Often these fens occur on slopes up to 5%.

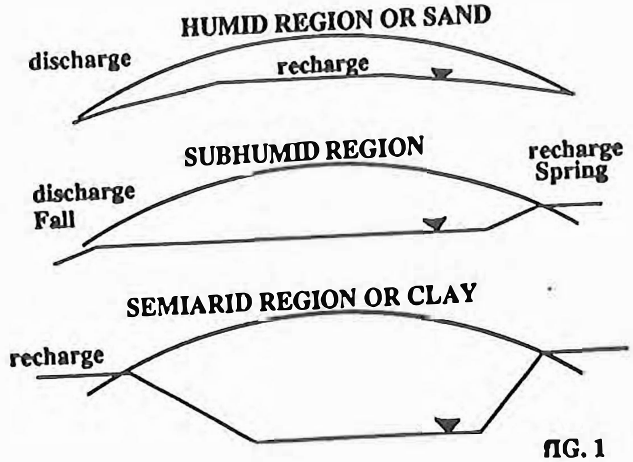


fIG. 1

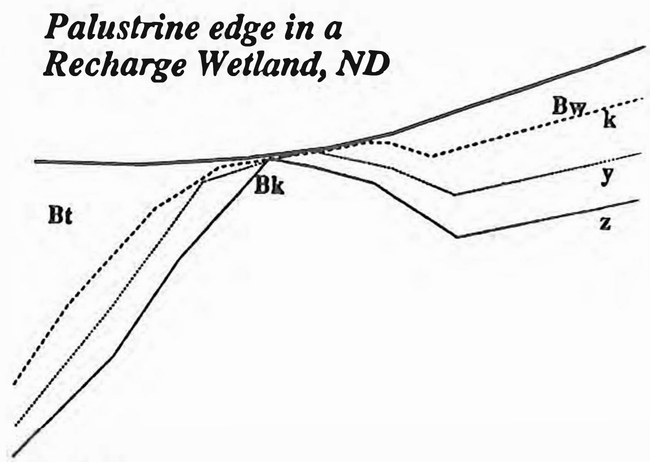


Fig. 3a

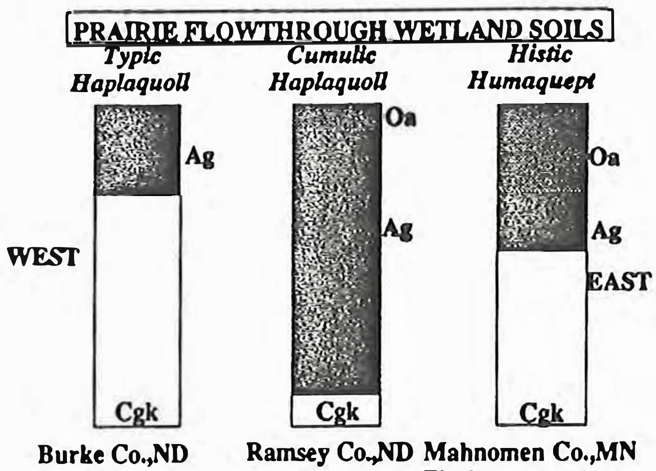


Fig.2

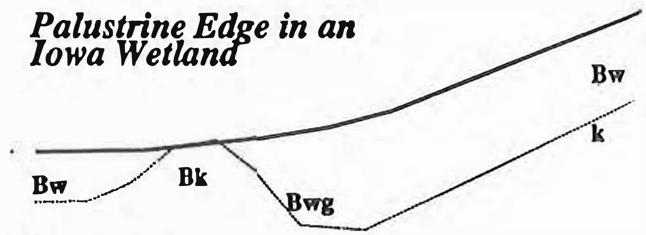


Fig. 3b

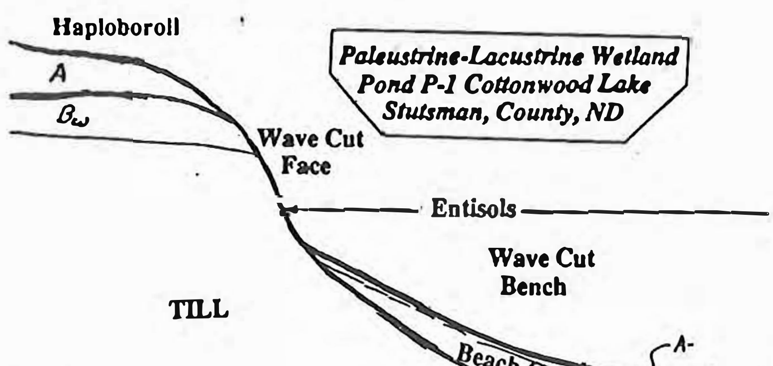
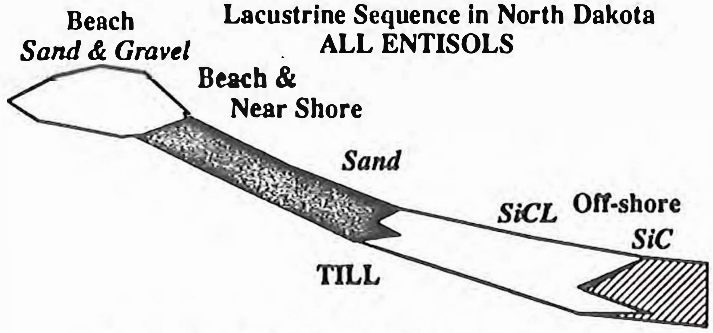


Fig. 4



Horsehead and Devils Lake Examples

Fig. 5

IN LOW DUNES, PRECIPITATION EASILY RECHARGES THE WATER TABLE AND CREATES A GROUND WATER DIVIDE.

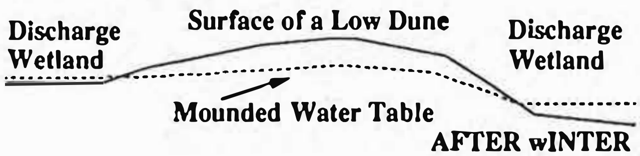


Fig. 6a

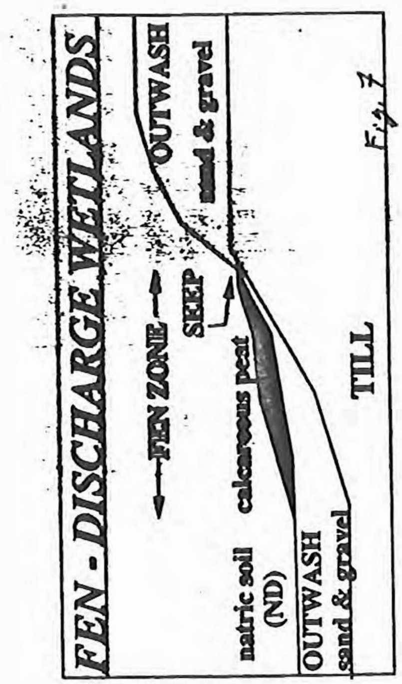


Fig. 7

HIGH DUNES IN NEBRASKA DO NOT RECHARGE THE WATER TABLE EASILY

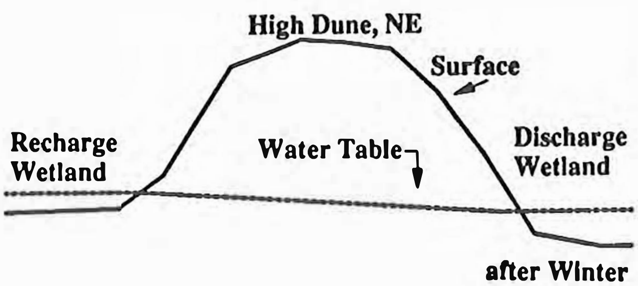


Fig. 6b

Hydric Soils and the Wetland Delineation Process: An Example from New England: Peter Fletcher, Wetland Liaison, U.S.D.A. Soil Conservation Service and U.S. Army Corps of Engineers, Middleboro, Massachusetts

Hydric Soils

2.6. Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (U.S.D.A. Soil Conservation Service 1987). In general, hydric soils are flooded, ponded, or saturated for usually one week or more during the period when soil temperatures are above biologic zero 41° F as defined by "Soil Taxonomy" (U.S.D.A. Soil Survey Staff 1975). These soils usually support hydrophytic vegetation.

Hydric Soil Criterion

"1. All Histosols except Folists; or

2. Soils in Aquic suborders, Aquic subgroups, Albolls suborder, Salorthids great group, or Pell great groups of Vertisols that are:

   a. somewhat poorly drained and have water table less than 0.5 feet from the surface for a significant period (usually a week or more) during the growing season, or

   b. poorly drained or very poorly drained and have either:

      (1) water table at less than 1.0 feet from the surface for a significant period (usually a week or more) during the growing season if permeability is equal to or greater than 6.0 inches/hour in all layers within 20 inches, or

      (2) water table at less than 1.5 feet from the surface for a significant period (usually a week or more) during the growing season if permeability is less than 6.0 inches/hour in any layer within 20 inches; or

3. Soils that are ponded for long duration or very long duration during the growing season; or

4. Soils that are frequently flooded for long duration or very long duration during the growing season."

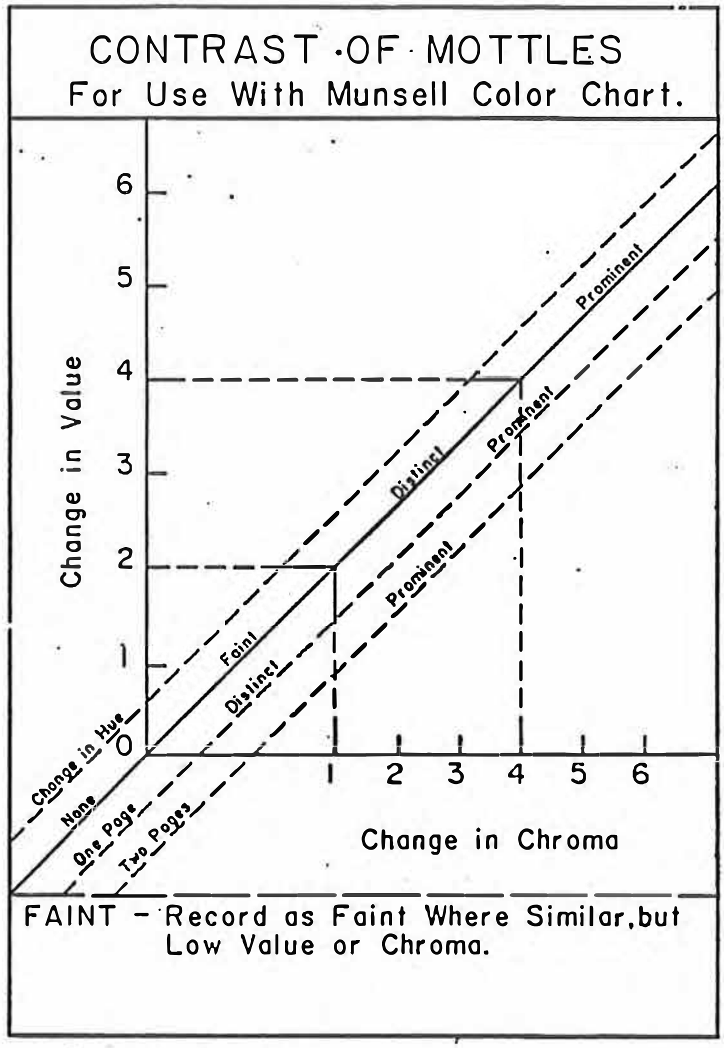
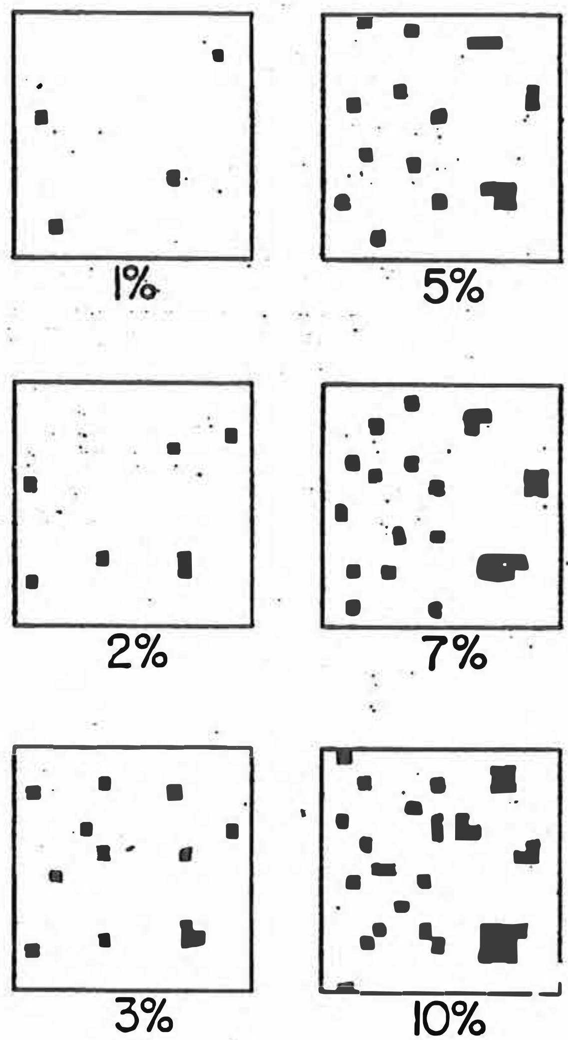


CHART DIRECTIONS:

A. Select Change in HUE (None Ref. to Some Page).
B. Record Greatest Contrast of VALUE or CHROMA at HUE Line Intercept (Faint, Distinct or Prominent).

CHARTS FOR ESTIMATING PROPORTIONS OF MOTTLES AND COARSE FRAGMENTS



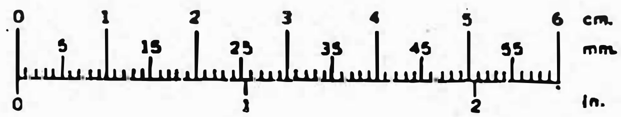
MOTTLING: A description of mottling requires a notation of the colors and of the pattern. Colors may be noted by Munsell symbols for the matrix and color names for the mottles. Pattern may be noted in terms of:

(1) Abundance:

few	(mottles <2% of surface) ...	f
common	(mottles 2 - 20% of surface)	c
many	(mottles >20% of surface) ..	m

(2) Size:

fine	(<5 mm.)	... 1
medium	(5 - 15 mm.)	... 2
coarse	(>15 mm.)	..., 3



(3) Contrast:

faint	(Hue and chroma of matrix and mottles closely related)	... f
distinct	(Matrix and mottles vary 1-2 hues and several units in chroma and value)	... d
prominent	(Matrix and mottles vary several units in hue, value, and chroma)	... p

Thus a medium-gray horizon mottled with yellow and reddish brown is noted as: 10YR 5/1, c3d, yellow and reddish brown (See pp. 191-193).

Project Title: File Number:

Transect: Plot: Date:

DATA -- VEGETATION	Stratum and Species (DOMINANTS ONLY)	Dominance Ratio	Percent Dominance	NWI Status

Tally (Dominants ONLY):	OBL:	FACW:	FAC:	FACU:	UPL:	SUM:

100 x Dominant(OBL+FACW+FAC)/Tally Sum =

Area Disturbed? Y ☐ N ☐

Describe Problem Area:

DATA -- SOIL

Parent Material:

Drainage Class:

Soil Taxonomy:

Published Soil Survey:

Depth	Horizon	Matrix Color (Munsell, Moist)	Color of Mottles (Munsell, Moist) Abundance/Contrast	USDA Texture AND Other Appropriate Features

Remarks:

Sketch Landscape Position:

DRAFT

DRAFT - Field Data Form

C.O.E. New England Division

CENEDOO-R Draft Version 23Jul90

NON-TECHNICAL SOIL DETERMINATION

IMPORTANT: 1. Absence of all of the following DOES NOT mean that the soil is not hydric. (See Technical Determination for Hydric Soils of New England) 2. Presence of one or more of the following is strong evidence that the soil is HYDRIC.

- ☐ 1. All dominant plants are OBL.
- ☐ 2. All dominant plants FACW AND OBL and the topographic boundary is abrupt
- ☐ 3. Surface horizon has at least 8-inch thickness of muck and/or peat.
- ☐ 4. Distinct rotten eggs smell (hydrogen sulfide gas).
- ☐ 5. Measured redox potentials less than +200 millivolts.
- ☐ 6. Observed positive colormetric test for ferrous iron.
- ☐ 7. Iron or manganese concentrations found in subsurface horizons associated with mottles or matrix colors less than chroma 2.
- ☐ 8. Immediately below A-horizon or at 10 inches, whichever is less:
  - ☐ A. Matrix chroma 2 or less with mottles.
  - ☐ B. Matrix chroma is 1 or less.
- ☐ 9. Listed as Hydric Soil on National List of Hydric Soils

TECHNICAL SOIL DETERMINATION

IMPORTANT: 1. Absence of all of the following is evidence that the soil is NOT HYDRIC. 2. Presence of one or more of the following is strong evidence that soil is HYDRIC

YES NO

☐ ☐ 1. Soil is a Histosol (except Folists)

☐ ☐ 2. Soil is in Aquic suborder or subgroup and is either

a. Somewhat poorly drained AND has

☐ ☐ (1) Common to many, distinct or prominent mottles within 6 inches of the surface or immediately below the A or Ap Horizon OR

☐ ☐ (2) Any evidence of mottling within 6 inches of the surface where the Ap Horizon extends below 6 inches of the surface OR

☐ ☐ (3) Oxidized root channels within 6 inches of the surface.

b. Poorly drained or very poorly drained AND has either:

☐ ☐ (1) Histic epipedon OR

☐ ☐ (2) Textures are finer than loamy fine sand in some or all subhorizons within 20 inches of the surface, AND within 1.5 feet of the surface either the matrix or mottles (common to many, distinct or prominent) have a chroma of 2 or less OR

☐ ☐ (3) Textures are loamy fine sand or coarser in all subhorizons within 20 inches of the surface AND there are common to many, distinct or prominent mottles within 1.0 foot of the surface AND/OR

☐ ☐ (a) Organic-rich surface horizon which is at least 3 inches thick and has a value and chroma less than 3, OR

☐ ☐ (b) Dark vertical streaking of subsurface horizons by organic matter

c. Spodosol that has either:

(1) Textures are finer than loamy fine sand in some or all subhorizons within 20 inches of the surface AND ONE OR MORE of the following within 1.5 feet of the surface:

☐ ☐ (a) Mottles within the albic horizon

☐ ☐ (b) Organic-rich spodic horizon with chroma and value of 3 or less

☐ ☐ (c) Prominent or distinct mottles in the spodic horizon

☐ ☐ (d) Iron concretions or nodules

☐ ☐ (e) Manganese concretions or nodules

☐ ☐ (f) An ortstein layer that is nearly continuous

(2) Texture are loamy fine sand or coarser in all subhorizons within 20 inches of the surface AND has ONE OR MORE of the following within 1.0 foot of the surface:

☐ ☐ (a) Mottles within the albic horizon

☐ ☐ (b) Organic-rich spodic horizon with chroma and value of 3 or less

☐ ☐ (c) Prominent or distinct mottles in the spodic horizon

☐ ☐ (d) Iron concretions or nodules

☐ ☐ (e) Manganese concretions or nodules

☐ ☐ (f) An ortstein layer that is nearly continuous

☐ ☐ 3. Soils that frequently are ponded for long or very long duration during the growing season (If Yes, state method of documentation and dates)

☐ ☐ 4. Soils that are frequently flooded for long or very long duration during the growing season (If Yes, state method of documentation and dates)

5. All dominant plant species are:

☐ ☐ a. OBL; or

☐ ☐ b. FACW AND OBL and the topographic boundary is abrupt.

DATA & DETERMINATION HYDROLOGY

IMPORTANT: 1. Hydrology is often the most difficult feature to observe. 2. Interpretations must consider the appropriateness of the observations in light of the season, recent weather conditions, and alterations within the watershed, etc. 3. Interpretation of hydrology may require repeated observations over more than one season.

☐ No Recorded Data Available

☐ Recorded Data:

Stream, lake or tidal gage Identification: __________

Aerial Photograph Identification: __________

Other Identification: __________

Observations:

Depth to Standing Water: __________

Depth to Saturation: __________

☐ Inundated	☐ Saturated in upper 12in.	☐ Water Marks
☐ Oxidized Rhizospheres	☐ Drift Lines	☐ Water Stained Leaves
☐ Water-borne Sediment Deposits	☐ Surface Scoured Areas	☐ Wetland Drainage Patterns

☐ No Evidence of Significant Hydrological Modification AND Morphological Plant Adaptations SUCH AS:

☐ Pneumatophores	☐ Buttressed Trees	☐ Hypertrophied Lenticels
☐ Stooling	☐ Adventitious Roots	☐ Inflated Leaves, Stems, or Roots
☐ Shallow Root Systems	☐ Floating Leaves	☐ Aerenchyma in Roots & stems
☐ Polymorphic Leaves		

☐ Hydric Soils and NO visible evidence of significant hydrological modification

DRAFT - FIELD DATA FORM

C.O.E. - New England Division

CONCLUSIONS

Project Title:

Delineator:

Transect: Plot: Date:

	Yes	No
Hydrophytic Vegetation Criterion Met?	☐	☐
Hydric Soils Criterion Met?	☐	☐
Wetland Hydrology Criterion Met?	☐	☐

IS THIS DATAPOINT WITHIN A WETLAND? Yes ☐ No ☐

Remarks:

CENEDOD-R Draft Version 25Jul90

NON-TECHNICAL SOIL DETERMINATION	IMPORTANT:	1. Absence of all of the following DOES NOT mean that the soil is not hydric. (See Technical Determination for Hydric Soils of New England) 2. Presence of one or more of the following is strong evidence that the soil is HYDRIC.

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☐ 6. Observed positive colormetric test for ferrous iron.
☐ 7. Iron or manganese concentrations found in subsurface horizons associated with mottles or matrix colors less than chroma 2.
☐ 8. Immediately below A-horizon or at 10 inches, whichever is less:
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- ☐ B. Matrix chroma is 1 or less.

☐ 9. Listed as Hydric Soil on National List of Hydric Soils

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- ☐ ☐ (2) Any evidence of mottling within 6 inches of the surface where the Ap Horizon extends below 6 inches of the surface OR
- ☐ ☐ (3) Oxidized root channels within 6 inches of the surface.

b. Poorly drained or very poorly drained AND has either:
- ☐ ☐ (1) Histic epipedon OR
- ☑ ☐ (2) Textures are finer than loamy fine sand in some or all subhorizons within 20 inches of the surface, AND within 1.5 feet of the surface either the matrix or mottles (common to many, distinct or prominent) have a chroma of 2 or less OR
- ☐ ☐ (3) Textures are loamy fine sand or coarser in all subhorizons within 20 inches of the surface AND there are common to many, distinct or prominent mottles within 1.0 foot of the surface AND/OR
  - ☐ ☐ (a) Organic-rich surface horizon which is at least 3 inches thick and has a value and chroma less than 3, OR
  - ☐ ☐ (b) Dark vertical streaking of subsurface horizons by organic matter.

c. Spodosol that has either:
- (1) Textures are finer than loamy fine sand in some or all subhorizons within 20 inches of the surface AND ONE OR MORE of the following within 1.5 feet of the surface:
  - ☐ ☐ (a) Mottles within the albic horizon
  - ☐ ☐ (b) Organic-rich spodic horizon with chroma and value of 3 or less
  - ☐ ☐ (c) Prominent or distinct mottles in the spodic horizon
  - ☐ ☐ (d) Iron concretions or nodules
  - ☐ ☐ (e) Manganese concretions or nodules
  - ☐ ☐ (f) An ortstein layer that is nearly continuous
- (2) Texture are loamy fine sand or coarser in all subhorizons within 20 inches of the surface AND has ONE OR MORE of the following within 1.0 foot of the surface:
  - ☐ ☐ (a) Mottles within the albic horizon
  - ☐ ☐ (b) Organic-rich spodic horizon with chroma and value of 3 or less
  - ☐ ☐ (c) Prominent or distinct mottles in the spodic horizon
  - ☐ ☐ (d) Iron concretions or nodules
  - ☐ ☐ (e) Manganese concretions or nodules
  - ☐ ☐ (f) An ortstein layer that is nearly continuous

☐ ☐ 3. Soils that frequently are ponded for long or very long duration during the growing season (If Yes, state method of documentation and dates)

___

☐ ☐ 4. Soils that are frequently flooded for long or very long duration during the growing season (If Yes, state method of documentation and dates)

___

5. All dominant plant species are:
- ☐ ☐ a. OBL; or
- ☐ ☐ b. FACW AND OBL and the topographic boundary is abrupt.

DATA -- SOIL	Parent Material: Glacial till

Drainage Class: Poorly Drained

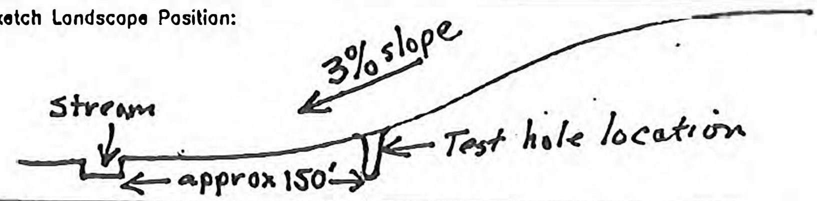
Soil Taxonomy: Aeric Haplaquept

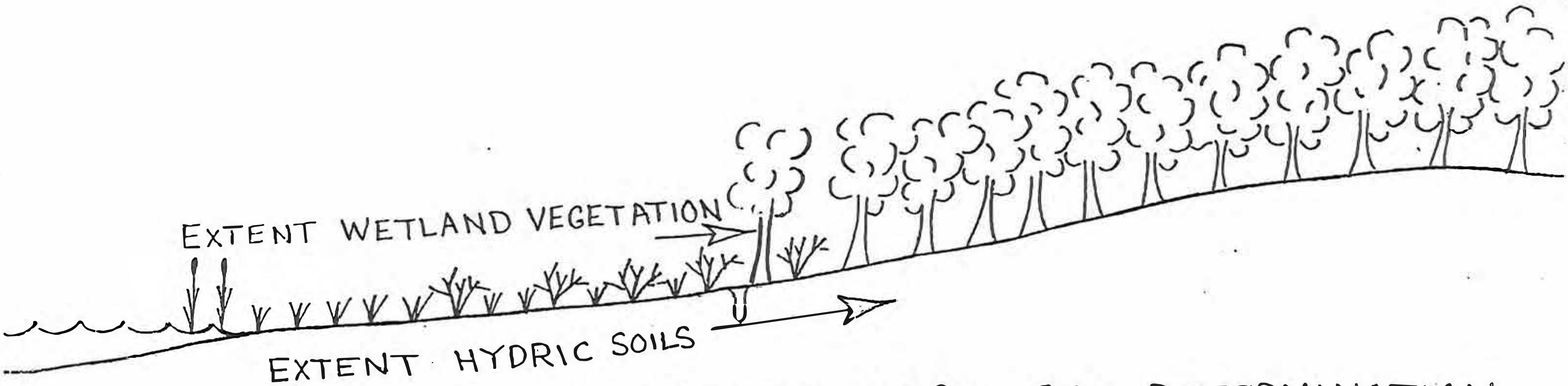
Published Soil Survey: Plymouth Co. Soil Survey – ReA

Depth INCHES	Horizon	Matrix Color (Munsell, Moist)	Color of Mottles (Munsell, Moist) Abundance/Contrast	USDA Texture AND Other Appropriate Features
0-6	A	10YR 2/1		fine sandy loam, few oxidized root Channels - many roots
6-16	Bw1	2.5Y 5/2	7.5YR 4/4 m, 2, P	fine sandy loam, Common roots upper part - None below
16-26	Bw2	5Y 6/2	7.5YR 5/6 c, 2, P	fine sandy loam
26-30	Cd	5Y 5/3	5Y 6/1 c, 2, d	Sandy loam, compact basal till (restrictive Layer)

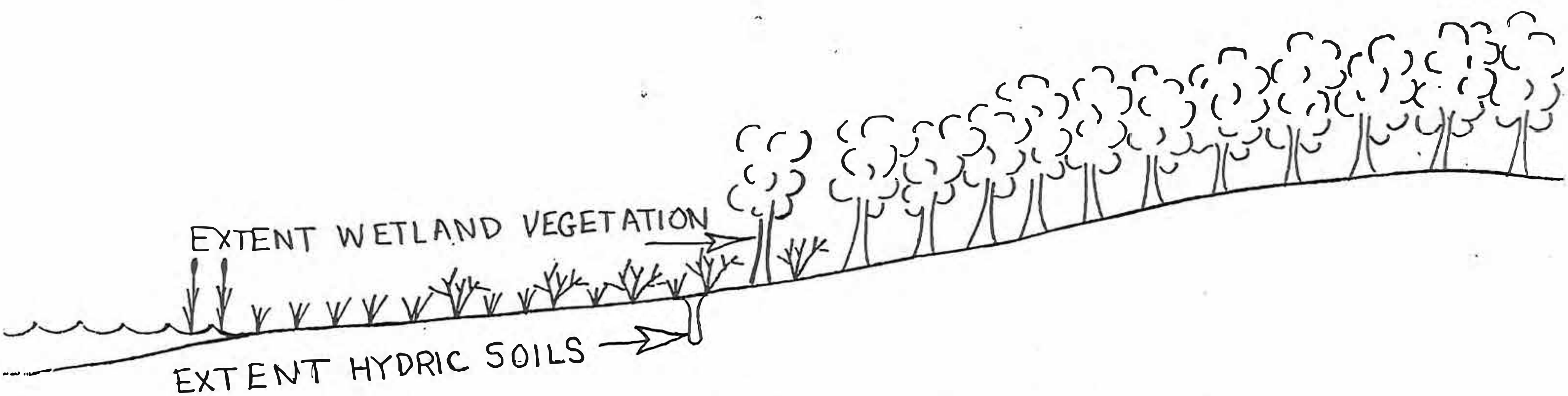
Remarks:

Sketch Landscape Position:





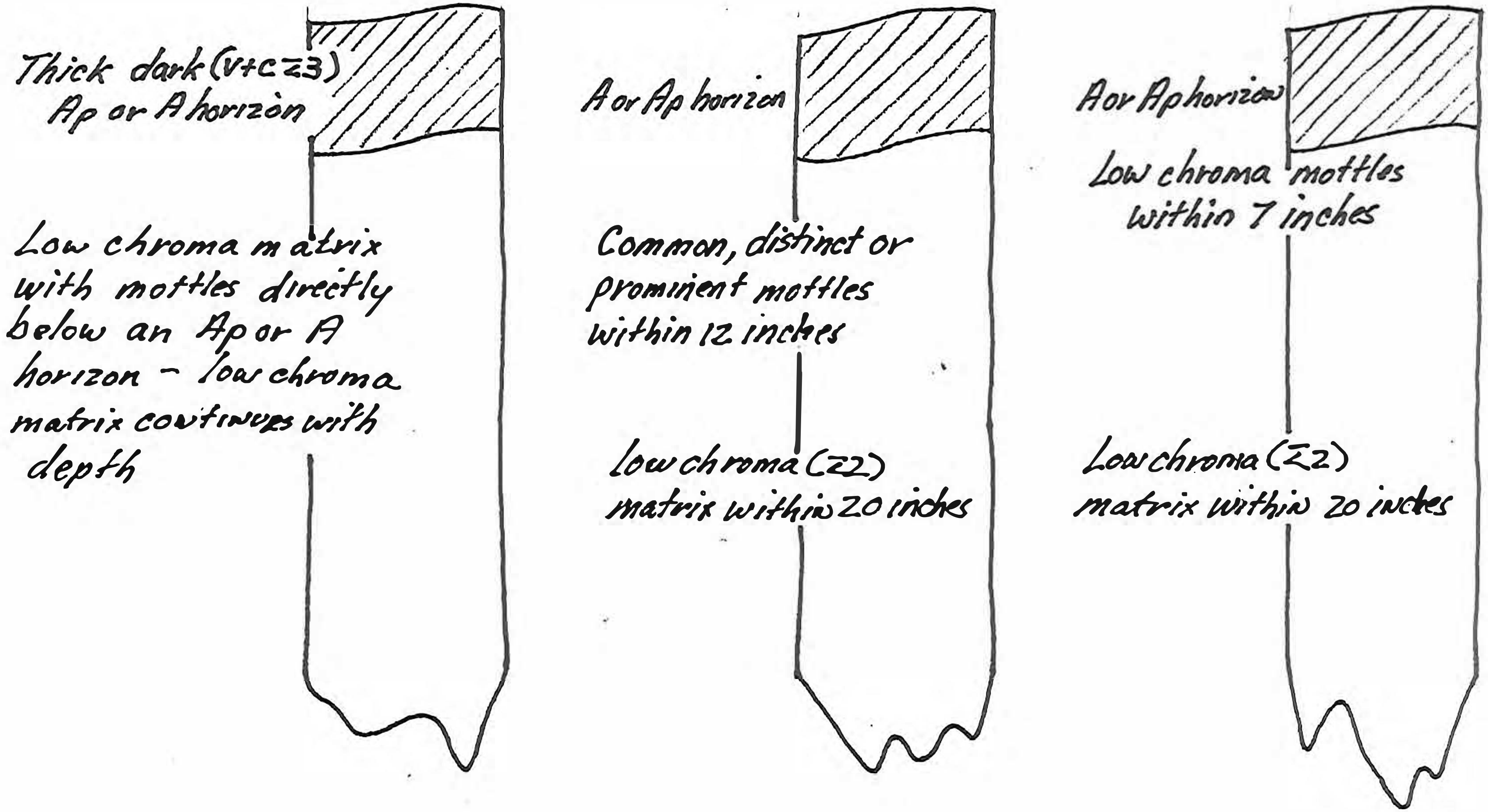
NON-TECHNICAL SOIL DETERMINATION



TECHNICAL SOIL DETERMINATION

POORLY DRAINED SOIL

AQUEPTS, AQUENTS (Loamy), AQUALFS



MODAL CONCEPT | HISS STANDARDS | MAPSS STANDARDS