HYDRIC SOILS

HYDRIC SOIL DEFINITION

THE NATIONAL TECHNICAL COMMITTEE FOR HYDRIC SOILS DEFINES A HYDRIC SOIL AS:

SOILS THAT ARE SATURATED, FLOODED OR PONDED FOR LONG ENOUGH DURING THE GROWING SEASON TO DEVELOP ANAEROBIC CONDITIONS IN THE UPPER PART.

HYDRIC SOIL DEFINITION

IMPORTANT PARTS OF THE DEFINITION ARE ANAEROBIC CONDITIONS, LONG ENOUGH DURATION, UPPER PART, SATURATED AND PONDED OR FLOODED.

LONG ENOUGH – 7 DAYS OR MORE WHEN SOIL TEMPERATURE IS 41 DEGREES F OR MORE

UPPER PART – 12” FOR SANDY SOILS AND 18” FOR NON-SANDY SOILS TO WATER TABLE

HYDRIC SOIL DEFINITION

- SATURATED – HYDRIC SOIL MORPHOLOGY WILL FORM ABOVE THE GROUNDWATER TABLE TO THE HEIGHT OF THE CAPILLARY FRINGE
- PONDED OR FLOODED (7 OR MORE CONSECUTIVE DAYS) – ACOE NOW REQUIRES PONDED OR FLOODED SOILS TO ALSO HAVE HYDRIC SOIL MORPHOLOGY

TYPICAL INDICATORS OF HYDRIC SOILS

ALL ARE DIRECTLY RELATED TO BIOLOGIC ACTIVITY

TYPICAL INDICATORS OF HYDRIC SOIL

- REDOXIMORPHIC FEATURES
- OXIDIZED RHIZOSPHERES
- ORGANIC MATTER ACCUMULATION (BOTH ON TOP OF THE SOIL AND WITHIN IT)
- SHALLOW ROOTEDNESS (PARTICULARLY WOODY ROOTS)
- POOR SOIL STRUCTURE
- ORGANIC MATTER STREAKING
- COATED SAND GRAINS
- LACK OF SOIL PROFILE DEVELOPMENT
- DARK A OR Ap HORIZONS

FIRST

A FEW SOIL BASICS

SOIL HORIZONS

O

A

E

B

C

R

WELL DRAINED GLACIAL TILL IN FOREST

MODERATELY WELL DRAINED TILL IN FIELD

SOIL TEXTURE AND HYDRIC SOIL INDICATORS

LOAMY FINE SAND OR COARSER (SANDY)

FINER THAN A LOAMY FINE SAND

REDOXIMOPRHIC FEATURES

FEATURES FORMED BY THE PROCESSES OF REDUCTION, TRANSLOCATION AND/OR OXIDATION OF Fe AND Mn OXIDES.

FORMERLY CALLED DRAINAGE MOTTLES.

REDOX CONCENTRATION

REDDISH, YELLOWISH, BROWNISH OR BLACK CONCENTRATIONS OF IRON AND MANGANEESE

REDOX CONCENTRATIONS

MOST DIAGNOSTIC IN “Ap” HORIZONS AND SANDY SOILS

REDOX CONCENTRATIONS

BEWARE ORGANIC MATTER DECOMPOSITION OR MIXING OF “B” HORIZON

REDOX DEPLETIONS

CHROMA 2 OR LESS AND VALUE 4 OR MORE ZONES WHERE IRON AND MANGANEESE HAVE BEEN REDUCED AND TRANSLOCATED

REDOX DEPLETIONS

MOST DIAGNOSTIC IN SUBSOIL HORIZONS WHERE ORGANIC MATTER CAN NOT MASK THEM

REDOX DEPLETIONS

BEWARE OF PIECES OF “E” HORIZON

REDOXIMORPHIC FEATURES – FINE TEXTURED SOIL

REDOXIMORPHIC FEATURES – SANDY SOIL

OXIDIZED RHIZOSPHERES

RUSTY ZONES AROUND ROOTS OF PLANTS GROWING IN SATURATED SOILS CAUSED BY AIR ESCAPING FROM THE ROOTS

OXIDIZED RHIZOSPHERES

OXIDIZED RHIZOSPHERES

SHALLOW ROOTEDNESS

DUE TO SHALLOW TO BEDROCK OR HARDPAN

SHALLOW DEPTH TO SAND OR GRAVEL LAYERS

SHALLOW DEPTH TO GWT

SHALLOW ROOTEDNESS

SHALLOW ROOTING DEPTH POORLY DRAINED SOIL

GOOD ROOTING DEPTH
WELL DRAINED SOIL

“O” HORIZON THICKNESS

REFLECTION OF MICROBIAL ACTIVITY

TEMPERATURE
OR
SATURATION

CAUTION

YOU NEED TO CALIBRATE TO THE AREA UNDER EVALUATION TO DETERMINE EFFECTS OF LOCAL CLIMATE

THIN O HORIZON ON WELL DRAINED SOIL

THICK O HORIZON ON POORLY DRAINED SOIL

COMPARISON BETWEEN SOIL DRAINAGE CLASSES

DARK “A” OR “Ap”

BLACK COLOR AND THICKNESS DUE TO ORGANIC MATTER ACCUMULATION

ORGANIC MATTER ACCUMULATION IN SOIL

DARK “A” OR Ap HORIZON

SOIL STRUCTURAL DEVELOPMENT

BEST IN BETTER DRAINED SOILS

REFLECTION OF MICROBIAL ACTIVITY AND WEATHERING

STRONG SOIL STRUCTURAL DEVELOPMENT

LACK OF SOIL STRUCTURAL DEVELOPMENT

ORGANIC MATTER STREAKING STRIPPED MATRIX

SAND DUNE
COATED SAND GRAINS

CHECKING FOR COATED SAND GRAINS

SAND DUNE
WET BEFORE LAST STORM

DEPLETED MATRIX

A DEPLETED MATRIX IS A MATRIX WHERE MORE THAN 50% OF THE HORIZON OR SUBHORIZON IS HIGH VALUE AND LOW CHROMA DUE TO IRON AND MANGANEESE BEING REDUCED AND REMOVED BY THE PROCESSES OF REDUCTION AND TRANSLOCATION

DEPLETED MATRIX

VALUE 5 OR MORE AND CHROMA 1

VALUE 4 OR 5 AND CHROMA 2 WITH 2% OR MORE REDOX FEATURES

VALUE 4 AND CHROMA 1 WITH 2% OR MORE REDOX FEATURES

IRON HAS BEEN REDUCED AND HAS BEEN TRANSPORTED AWAY

REDUCED MATRIX

A REDUCED MATRIX IS A MATRIX WITH MORE THAN 50% OF THE COLOR BEING HIGH VALUE AND LOW CHROMA DUE TO IRON AND MANGANEESE BEING REDUCED BUT WHOSE COLOR CHANGES IN HUE OR CHROMA WHEN EXPOSED TO AIR BECAUSE THE IRON AND MANGANEESE ARE STILL THERE

DEPLETED MATRIX

PED FACE VERSUS PED INTERIOR

WHEN CONDUCTING A HYDRIC SOIL INVESTIGATION WHERE ONE OF THE REQUIREMENTS IS TO DETERMINE WHETHER OR NOT THE SOIL HAS A DEPLETED OR REDUCED MATRIX, IT IS IMPORTANT TO LOOK AT THE PED INTERIORS INSTEAD OF THE PED FACES

PED FACE VERSUS PED INTERIOR

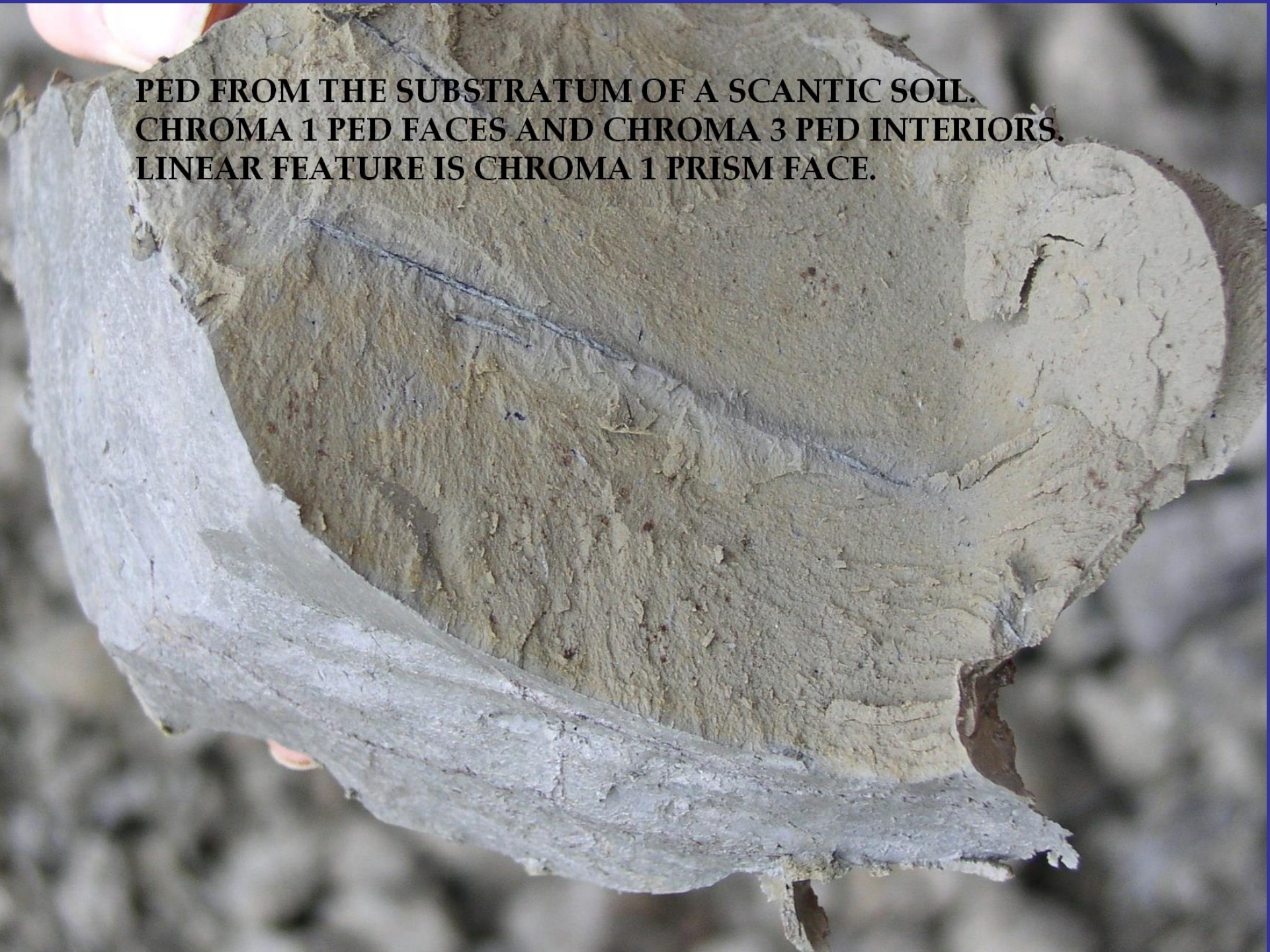
GENERALLY, IN A POORLY DRAINED SOIL WITH A HARDPAN, THE LOW CHROMA MATRIX WILL BE FOUND IN THE UPPER HORIZONS (PERCHED ABOVE THE HARDPAN). THE LOWER HORIZONS WILL BE MORE OLIVE IN COLOR WITH LOW CHROMA PED FACES

ME 009
13

PED FACES VERSUS PED INTERIORS

GENERALLY, IN VERY POORLY DRAINED SOILS, THE LOW CHROMA MATRIX IS FOUND IN BOTH PED FACES AND PED INTERIORS THROUGHOUT THE SOIL PROFILE

VERY POORLY DRAINED SOIL


PED FROM THE SUBSTRATUM OF A SCANTIC SOIL.
CHROMA 1 PED FACES AND CHROMA 3 PED INTERIORS.
LINEAR FEATURE IS CHROMA 1 PRISM FACE.

BLACK MANGANESE STAINS
ON DRIED SCANTIC BLOCK

GLEYED MATRIX

A SOIL HORIZON MATRIX COLOR RESULTING FROM PROLONGED PERIODS OF WETNESS THAT MAKES UP MORE THAN 50% OF THE HORIZON OR SUBHORIZON WHERE IRON HAS BEEN REDUCED AND REMOVED, OR WHERE SATURATION WITH STAGNANT WATER HAS PRESERVED A REDUCED STATE.

GLEYED MATRIX

GLEY SOIL COLORS CAN BE FOUND ON THE GLEY PAGES OF THE MUNSELL COLOR BOOK

THEY SIGNIFY PROLONGED PERIODS OF SOIL SATURATION

GLEY MATRIX

STRIPPED MATRIX (NOT A REDOX FEATURE)

A LAYER WITH FEATURES ASSOCIATED WITH WETNESS IN WHICH IRON/MANGANESE OXIDES AND/OR ORGANIC MATTER HAVE BEEN STRIPPED, EXPOSING THE PRIMARY BASE COLOR OF THE SOIL MATERIALS. RESULT IS A DIFFUSE SPLOTCHY PATTERN WITH SHADES OF GRAY OR GRAYISH BROWN

STRIPPED MATRIX

ITS WHAT WE USED TO CALL ORGANIC MATTER STREAKING

ONLY APPLIES TO “E” HORIZONS

STRIPPED MATRIX IN E HORIZON OF SANDY SOIL

STRIPPED MATRIX

STRIPPED MATRIX

MUCK

VERY HIGHLY DECOMPOSED ORGANIC MATTER THAT DEVELOPED DUE TO WETNESS

VALUE AND CHROMA

BASED ON MUNSELL COLOR CHART

MUNSELL COLOR BOOK

“A” OR “Ap” VALUE AND CHROMA: 3/2 OR LESS

LOW VALUE AND CHROMA

EVIDENCE OF ORGANIC MATTER ACCUMULATION

“Bh” OR “Bhs” HORIZON

LOW CHROMA AND LOW VALUE: 3/2 OR LESS

EVIDENCE OF ORGANIC MATTER ACCUMULATION

“Bhs” OR “Bh” HORIZON

ONLY ACCUMULATE DUE TO REDUCED MICROBIAL ACTIVITY

IN SOUTHERN/CENTRAL MAINE USUALLY LIMITED TO SANDY SOILS

“Bhs” OR “Bh” HORIZONS

2” THICK OR THICKER AND VERY DARK

ALMOST ALWAYS AN INDICATOR OF WETNESS IN SOUTHERN/CENTRAL MAINE

SUBSOILS CHROMA AND VALUE

HIGH VALUE AND LOW CHROMA 4 OR MORE/2 OR LESS

EVIDENCE OF REDUCTION

CONDUCTING A HYDRIC SOIL INVESTIGATION

*LOOK AT POSITION IN THE LANDSCAPE

*CALIBRATE BY EXCAVATING A SERIES OF PITS IN DIFFERENT POSITIONS IN THE LANDSCAPE

*EXCAVATE PITS DEEP ENOUGH

*EVALUATE SOIL FROM THE BOTTOM UP

*LOOK FOR MULTIPLE WETNESS INDICATORS

USE COMMON SENSE

HYDRIC SOIL KEYS

- MAINE ASSOCIATION OF PROFESSIONAL SOIL SCIENTISTS DRAINAGE KEY
- FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND
- FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES

HYDRIC SOIL KEYS

ALL THREE KEYS HAVE SEPARATE CRITERIA FOR SANDY SOILS AND FINE TEXTURED SOIL

MAPSS SOIL DRAINAGE KEY

- SIMPLE SINGLE PAGE (TWO SIDED) KEY THAT INCLUDES ALL DRAINAGE CLASSES INCLUDING THOSE FOR HYDRIC SOILS AND FOR UPLAND SOILS
- IDENTIFIES 99% OF HYDRIC SOILS IDENTIFIED IN NE AND NATIONAL INDICATORS
- USES SOIL HORIZON TERMINOLOGY

MAPSS DRAINAGE KEY

VERY POORLY DRAINED
POORLY DRAINED

ARE HYDRIC

NEW ENGLAND INDICATORS

- DEVELOPED OVER A PERIOD OF 25+ YEARS BY INTERESTED PARTIES FROM THROUGHOUT NEW ENGLAND
- CONTINUALLY UPDATED – CURRENTLY USING THE FOURTH EDITION

NEW ENGLAND INDICATORS

INCLUDES ALL APPLICABLE NATIONAL INDICATORS

AND

A FEW INDICATORS FOR USE ON PROBLEM HYDRIC SOILS

NATIONAL INDICATORS

FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES

HAVE BEEN INCORPORATED INTO A NORTHEAST AND NORTH CENTRAL REGIONAL SUPPLEMENT TO THE 1987 ACOE WETLAND MANUAL

EACH INDICATOR EXPLAINS WHAT REGIONS OR PARTS OF REGIONS OF THE U.S. THEY APPLY TO

NATIONAL INDICATORS AND NEW ENGLAND INDICATORS

*DO NOT USE SOIL HORIZON TERMINOLOGY

*INSTEAD REFER TO “LAYERS” WHICH ARE SUPPOSED TO BE EASIER TO UNDERSTAND AND USE BY NON-SOIL SCIENTISTS

*STRIPPED MATRIX INDICATOR ONLY APPLIES TO SANDY SOILS

*REQUIRES 60% FOR MATRIX COLOR

WETLAND DELINEATION MANUALS

NE/NC SUPPLEMENT HAS SIGNIFICANT CHANGE FROM 1987 MANUAL

WETLAND/NON-WETLAND MOSAICS (PIT AND MOUND TOPOGRAPHY) SUGGESTS DETERMINING PERCENTAGES INSTEAD OF CLASSIFYING ON THE BASIS DOMINANT CONDITION (BOUNDARIES)

WETLAND DELINEATION MANUALS

WETLAND/NON-WETLAND MOSAICS

MAPPING PERCENTAGES WOULD NOT ADDRESS DELINEATING BOUNDARIES

ACOE NEW ENGLAND DIVISION TO CONTINUE USING CURRENT PROTOCOL OF DOMINANT CONDITION

MOST FREQUENTLY USED NATIONAL INDICATORS FOR WETLAND BOUNDARIES IN MAINE ARE A11, F3 S5 AND S6

PROBLEM HYDRIC SOILS

- SPODOSOLS
- SANDY SOILS
- SOILS WITH ALTERED HORIZONS
- SOILS WITH ORGANIC MATTER ADDED
- COMPACTED SOILS
- SOILS FORMED IN COOL ENVIRONMENTS
- SOILS WITH LIMESTONE GHOSTS (AROOSTOOK COUNTY)

PROBLEM HYDRIC SOILS

- SOILS WITH DARK PARENT MATERIAL (VERMONT)
- SOILS WITH RED PARENT MATERIAL
- ALLUVIAL SOILS
- SOILS ON LONG SLOPING SITES (OXYAQUIC CONDITIONS) – MAJOR ISSUE IN MOUNTAINS WITH WINDFARM ROADS

SPODOSOLS

SPODIC HORIZON IS THE DARKER HORIZON DIRECTLY BELOW THE “E” HORIZON

SPODOSOLS

LOOK AT “E” HORIZON

LOOK AT “Bhs” HORIZON

SPODOSOLS

"E" HORIZON IN WELL DRAINED SOILS IS THIN AND ALMOST WHITE

IN POORLY DRAINED SOILS IS THICK AND DULLER

SPODOSOLS

“Bhs” HORIZONS IN POORLY DRAINED SOILS IS THICK AND MUCH DARKER COLORED

VALUE 3 OR LESS AND CHROMA 2 OR LESS

WELL DRAINED SPODOSOL
KIBBY

HYDRIC SANDY SPODOSOL
LEEDS, MAINE

HYDRIC SPODOSOL
SCARBOROUGH, MAINE

WET TO DRY SPODOSOLS

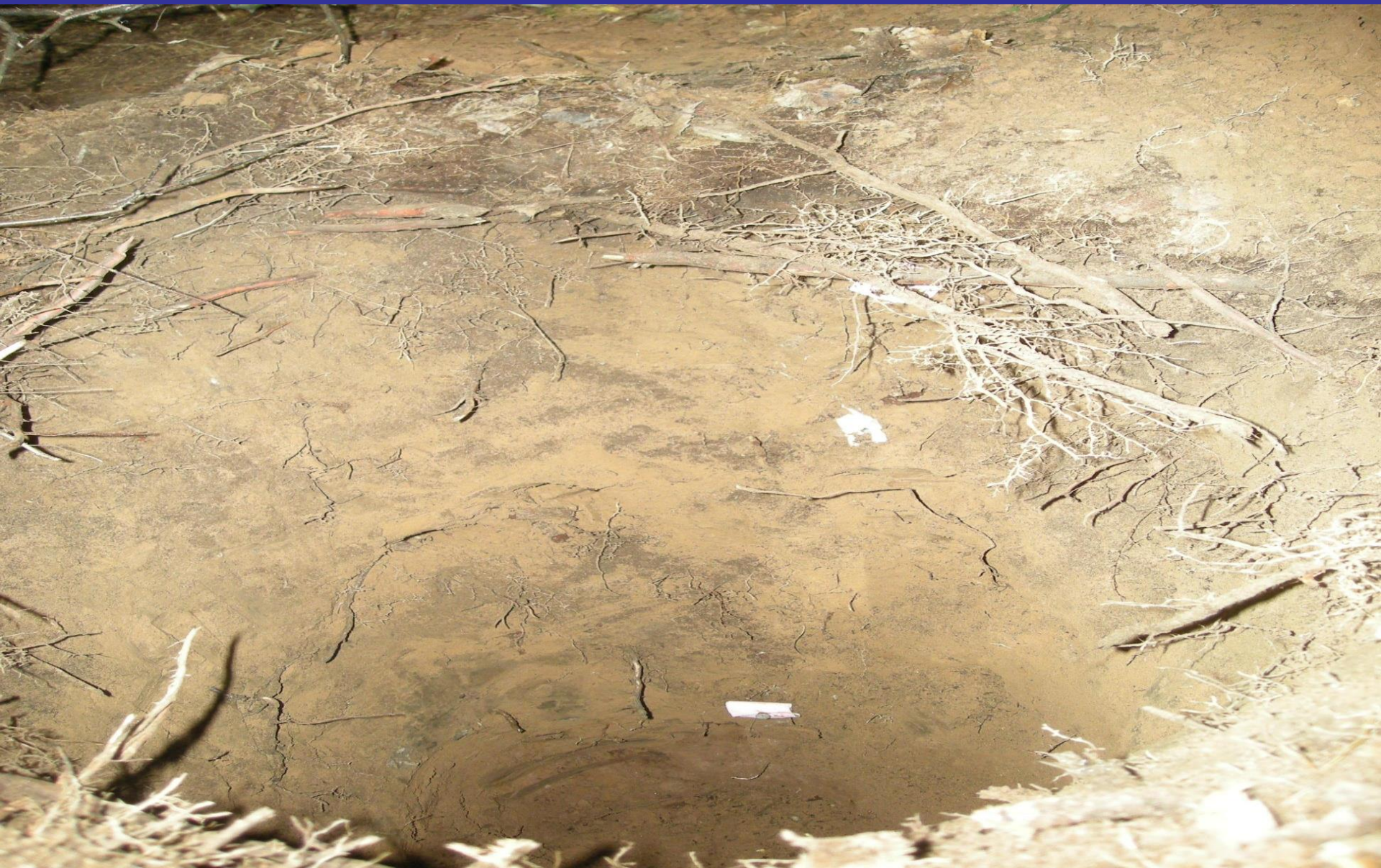
ALLUVIAL SOILS

THICK DARK “A” HORIZONS

IRREGULAR DECREASE IN ORGANIC MATTER CONTENT

TYPICAL ALLUVIAL SOIL (FLOOD PLAIN) SITE

WELL DRAINED ALLUVIAL SOIL



IRREGULAR DECREASE IN ORGANIC MATTER CONTENT

POORLY DRAINED ALLUVIAL SOIL

DARK PARENT MATERIAL

NONE IN MAINE

DARK PARENT MATERIAL VERMONT

RED PARENT MATERIAL

NO HYDRIC SOILS WITH RED PARENT MATERIAL RECOGNIZED IN MAINE

SOILS LOWER IN THE LANDSCAPE CAN BE AFFECTED BY THEM

RED PARENT MATERIAL

DISTURBED SOILS

OXYAQUIC SOILS

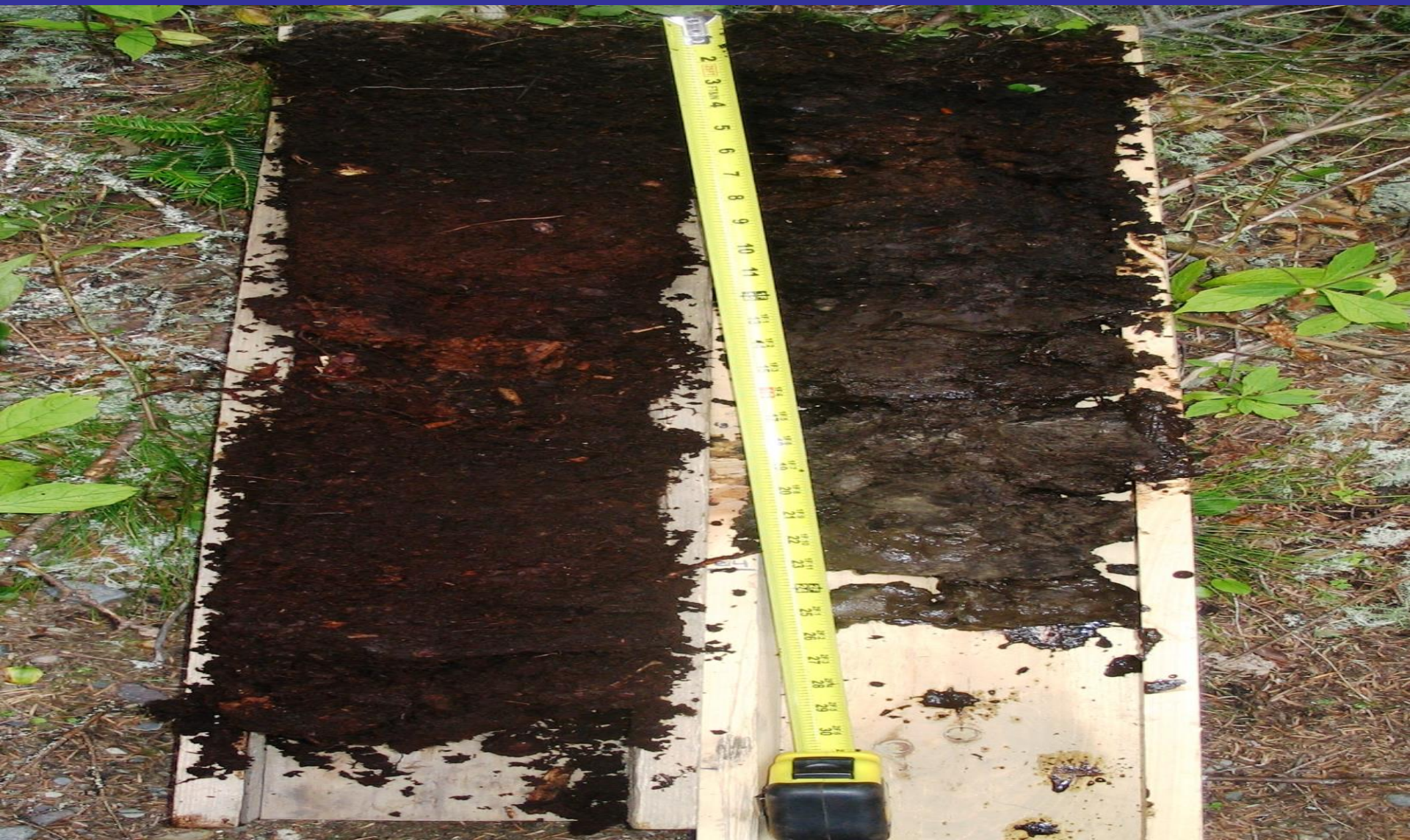
SOILS WITH OXYEGNATED GROUNDWATER

THEY ARE WET BUT MAY NOT DEVELOP REDUCING CONDITIOND OR REDUCED SOIL COLORS

BROWNER THAN TYPICAL WET SOIL (NOTE OM ACCUM)

WELL DRAINED VS OXYGEN RICH WET SOIL PROFILE

FOLIST V HISTOSOL



TYPICAL DOWNEAST FOLIST

CRYIC SOILS - THIXOTHROPHY

NICE ROAD FRONT PROPERTY

A SOIL SCIENTIST WOULD HAVE KNOWN BETTER

SOIL PIT

SAFETY TIPS
FOR
EXCAVATING A DEEP SOIL PIT

DAVID P. ROCQUE

STATE SOIL SCIENTIST
MAINE DEPARTMENT OF AGRICULTURE
STATE HOUSE STATION #28
AUGUSTA, MAINE 04333
PHONE: (207) 287-2666
E-MAIL: DAVID.ROCQUE@MAINE .GOV