What Wetland People Should Know About Soil

MAWS/MAPSS JOINT WINTER CONFERENCE AND ANNUAL MEETING
MARCH 2023

By: Rodney Kelshaw: MAPSS President & Lee Burman: MAWS President

What Wetland People Should Know About Soil

1. USE THE RIGHT KEY
2. SOIL TEXTURES: WHAT IS ORGANIC, WHAT IS SANDY, WHAT IS LOAMY? (MUCKY LOAM, HISTIC EPIPEDON, WHAT?)
3. DEPTH MEASUREMENTS (WHERE DO I START?)
4. NAMED SOILS (ISN'T LAMOINE A PLACE?)
5. REDOXIMORPHIC FEATURES (MY DAD WAS MOTTLING; YOU CAN CALL ME REDOX)

Hydric Soil Defined

THE NATIONAL TECHNICAL COMMITTEE FOR HYDRIC SOILS (NTCHS) DEFINES A HYDRIC SOIL AS A SOIL THAT "*FORMED UNDER CONDITIONS OF SATURATION, FLOODING, OR PONDING LONG ENOUGH DURING THE GROWING SEASON TO DEVELOP ANAEROBIC CONDITIONS IN THE UPPER PART*" (FEDERAL REGISTER, 1994).

https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/hydric-soils#criteria

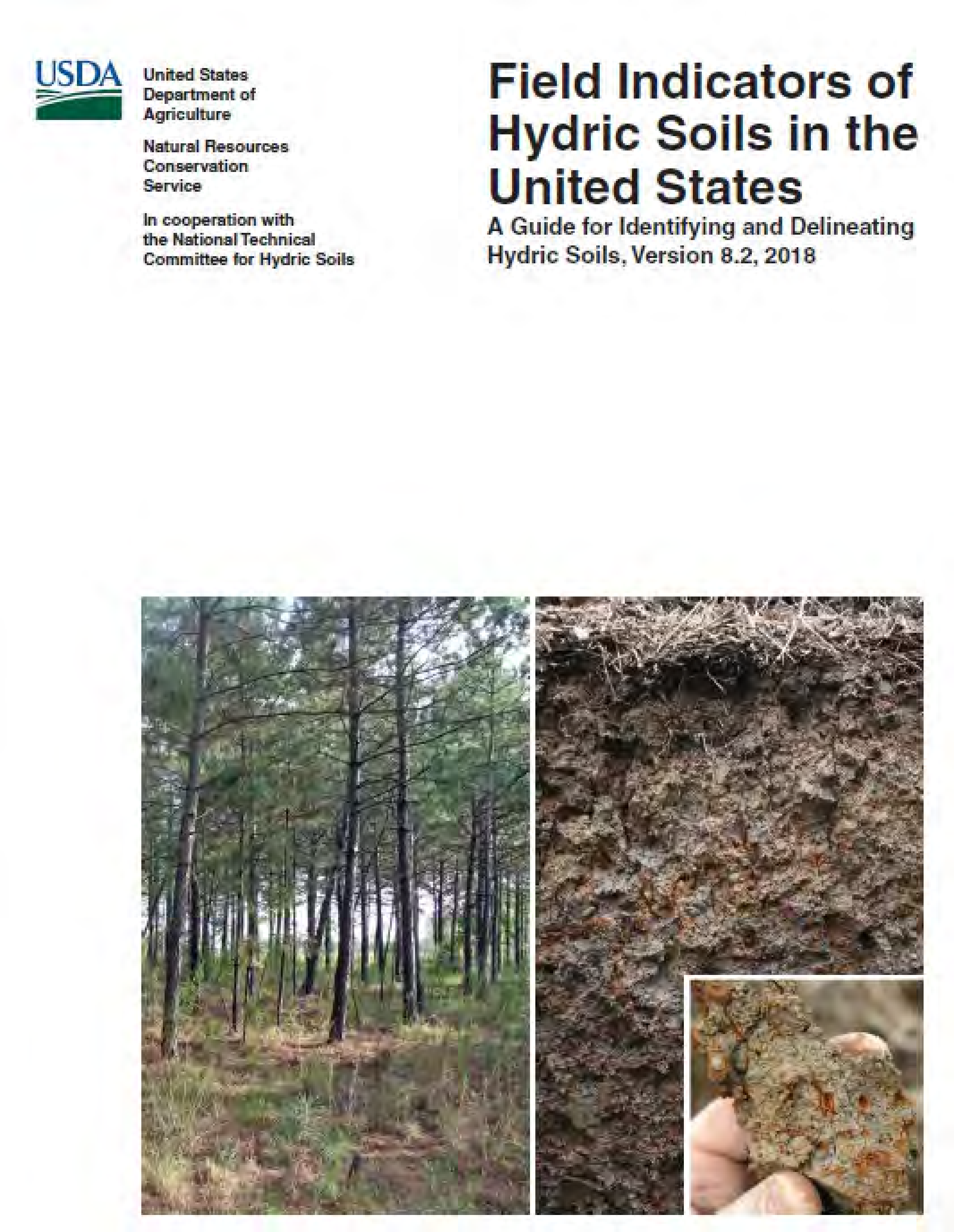
1. USE THE RIGHT KEY

Hydric Soil Identification Resources

Soil References

Many of the hydric soil indicators were developed specifically for purposes of wetland delineation.

During the development of these indicators, soils in the interiors of wetlands were not always examined; therefore, there are wetlands that lack any of the approved hydric soil indicators in the wettest interior portions. Wetland delineators and other users of the hydric soil indicators should concentrate their sampling efforts near the wetland edge and, if these soils are hydric, assume that soils in the wetter, interior portions of the wetland also are hydric, even if they lack an indicator.



Do NOT Use:

A. In the field to make hydric soil determinations.

B. To reference hydric soil determinations in reports/memos.

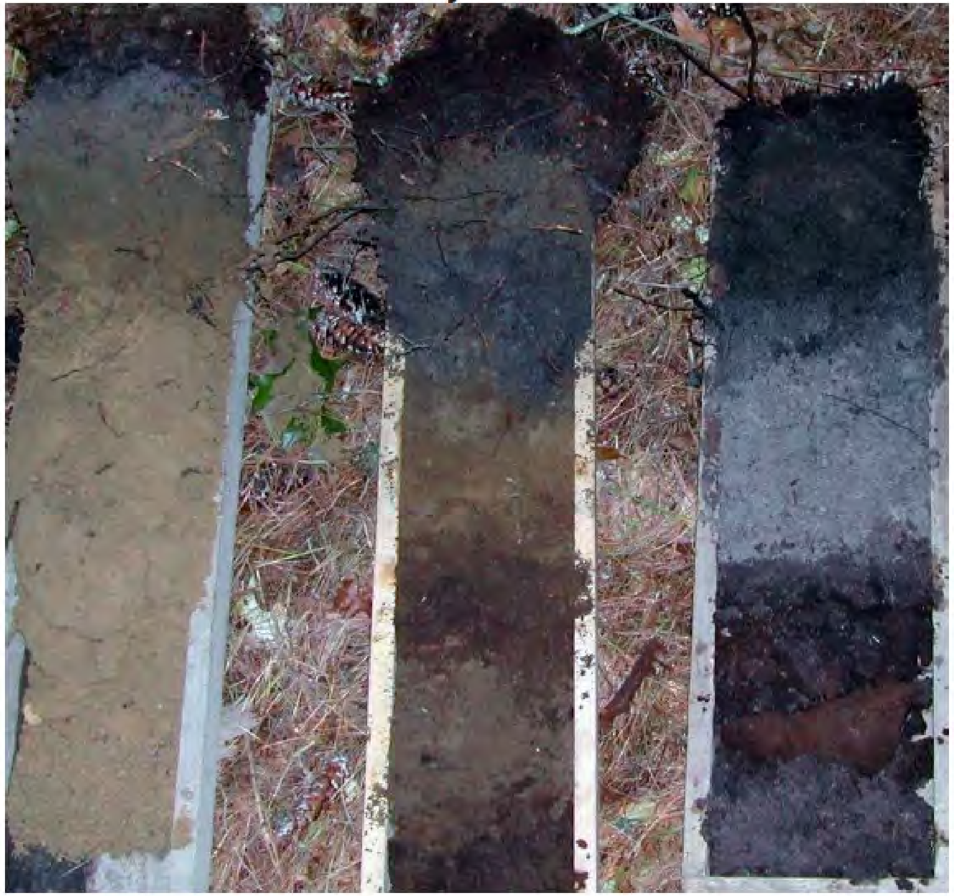
Soil References

Development of Field Indicators for Identifying Hydric Soils in New England Version 4

In response, the NEHSTC began to develop a guide to Field Indicators for Identifying Hydric Soils in New England which merged these three documents. Common complaints from wetland delineators was the confusion of having three guides to hydric soil indicators in New England: 1) Field Indicators of Hydric Soils in the United States; 2) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region; and 3) Field Indicators for Identifying Hydric Soils in New England.

Field Indicators for Identifying Hydric Soils in New England Version 4

May 2017



New England Hydric Soil Technical Committee

Errata for Companion Guide to Field Indicators for Identifying Hydric Soils in New England: TA-6 to A-17

November, 2018

The TA-6 Mesic Spodic indicator was recently moved from a test indicator to a fully approved indicator (A-17) by the National Technical Committee for Hydric Soils. This errata provides minor editorial changes that were made along with the approval.

A17.—Mesic Spodic. *For use in MLRA 144A and 145 of LRR R and in MLRA 149B of LRR S.* A layer that is ≥5 cm (2 inches) thick, that starts at a depth ≤15 cm (6 inches) from the mineral soil surface, that has value of 3 or less and chroma of 2 or less, and that is directly underlain by either:

a. One or more layers of spodic materials that have a combined thickness of ≥8 cm (3 inches), that start at a depth ≤30 cm (12 inches) from the mineral soil surface, and that have a value and chroma of 3 or less; or,

b. One or more layers that have a combined thickness of ≥5 cm (2 inches), that start at a depth ≤30 cm (12 inches) from the mineral soil surface, that have a value of 4 or more and chroma of 2 or less, and that are directly underlain by one or more layers that have a combined thickness of ≥8 cm (3 inches), that are spodic materials, and that have a value and chroma of 3 or less."

User Notes: This indicator is used to identify wet soils that have spodic materials or that meet the definition of Spodosols. The layer or layers described above that have value of 4 or more and chroma of 2 or less are typically described as E or Eg horizons. The layer or layers that are 8 cm (3 inches) or more, that have value and chroma 3 or less, and that meet the definition of spodic materials (i.e., have an illuvial accumulation of amorphous materials consisting of organic carbon and aluminum with or without Fe) are typically described as Bh, Bhs, or Bhsm horizons. These Bh, Bhs, or Bhsm horizons typically have several color patterns, cementation, or both."

Soil References

Development of Field Indicators for Identifying Hydric Soils in New England Version 4

Version 4 of Field Indicators for Identifying Hydric Soils in New England reflects conditions specific to New England by taking all of the applicable national indicators and adding indicators found in the region that are not addressed in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region Version 2.0 (2012) or Field Indicators of Hydric Soils in the United States Version 8.0 (2016). In NE Soil Version 4 additional hydric soil indicators, specific to New England are in the Problem Soil section. Also included are additional guides, charts, diagrams and detailed user notes to better interpret and understand the indicators. This edition serves as a one-stop guide for identifying hydric soils in New England.

Soil References

Army Corps of Engineers Memorandum Supporting the use of the New England Hydric Soil Technical Committee's:

Field Indicators for Identifying Hydric Soils in New England: Version 4

Downloadable on the New England Hydric Soil Technical Committee website

https://sites.google.com/view/nehstc/home

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO
ATTENTION OF

CENAE-RDP July 6, 2017

MEMORANDUM FOR THE RECORD

SUBJECT: *Field Indicators for Identifying Hydric Soils in New England (Version 4).* New England Hydric Soil Technical Committee (NEHSTC), May 2017

1. The above-referenced guide is an update of the previous version released in 2004. It clarifies and refines the 2004 version based on extensive field testing. This guide is currently the best available reference of its kind in New England and is specifically developed for New England soils.

2. This version of the guide is widely used by state and Federal agency staff and the consulting community. It is a standard reference for regulatory programs throughout much of New England.

3. This field guide provides an important resource to use in problem and disturbed situations where Chapter 5 "Difficult Wetland Situations in the Northcentral and Northeast Region" of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* is applicable. When properly used, this field guide provides results that help make determinations in these difficult to delineate areas. This field guide and subsequent updates are appropriate and recommended for use with whatever version of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* is in effect at the time of the wetland delineation.

4. The Environmental Resource Section staff of the Policy and Technical Support Branch in the Regulatory Division use this field guide and continue to encourage its use by Corps staff and other wetland practitioners for Chapter 5 circumstances.

Digitally signed by LADD.RUTH.M.1228556242
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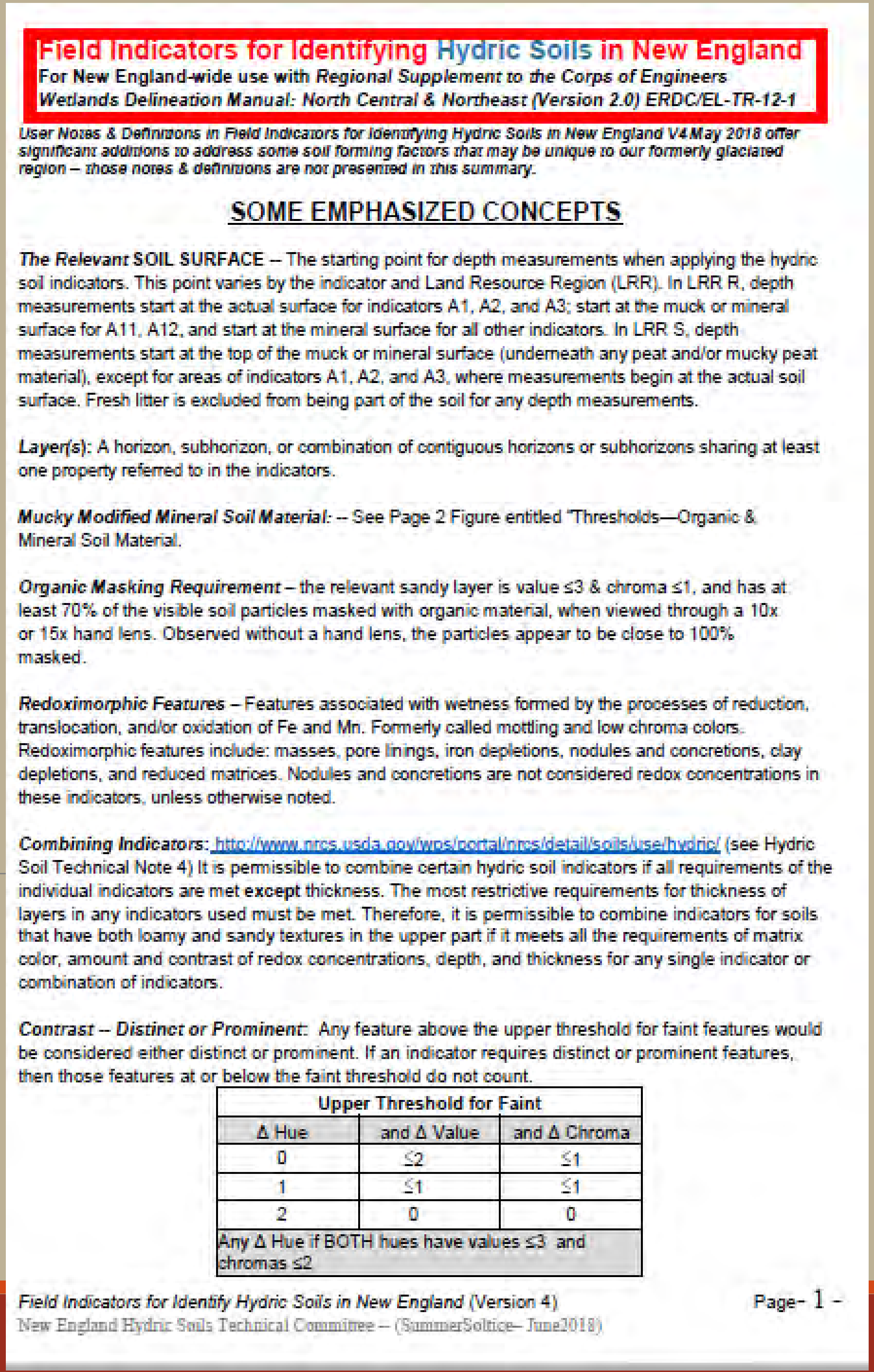
RUTH M. LADD
Chief, Policy and Technical Support Branch

Soil References

8 Page Cheat Sheet

Downloadable on the New England Hydric Soil Technical Committee website



Field Indicators for Identifying Hydric Soils in New England

For New England-wide use with *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: North Central & Northeast (Version 2.0) ERDC/EL-TR-12-1*

User Notes & Definitions in Field Indicators for Identifying Hydric Soils in New England V4 May 2018 offer significant additions to address some soil forming factors that may be unique to our formerly glaciated region – those notes & definitions are not presented in this summary.

SOME EMPHASIZED CONCEPTS

***The Relevant* SOIL SURFACE** – The starting point for depth measurements when applying the hydric soil indicators. This point varies by the indicator and Land Resource Region (LRR). In LRR R, depth measurements start at the actual surface for indicators A1, A2, and A3; start at the muck or mineral surface for A11, A12, and start at the mineral surface for all other indicators. In LRR S, depth measurements start at the top of the muck or mineral surface (underneath any peat and/or mucky peat material), except for areas of indicators A1, A2, and A3, where measurements begin at the actual soil surface. Fresh litter is excluded from being part of the soil for any depth measurements.

Layer(s): A horizon, subhorizon, or combination of contiguous horizons or subhorizons sharing at least one property referred to in the indicators.

Mucky Modified Mineral Soil Material: – See Page 2 Figure entitled "Thresholds—Organic & Mineral Soil Material.

Organic Masking Requirement – the relevant sandy layer is value ≤3 & chroma ≤1, and has at least 70% of the visible soil particles masked with organic material, when viewed through a 10x or 15x hand lens. Observed without a hand lens, the particles appear to be close to 100% masked.

Redoximorphic Features – Features associated with wetness formed by the processes of reduction, translocation, and/or oxidation of Fe and Mn. Formerly called mottling and low chroma colors. Redoximorphic features include: masses, pore linings, iron depletions, nodules and concretions, clay depletions, and reduced matrices. Nodules and concretions are not considered redox concentrations in these indicators, unless otherwise noted.

Combining Indicators: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/hydric/ (see Hydric Soil Technical Note 4) It is permissible to combine certain hydric soil indicators if all requirements of the individual indicators are met **except** thickness. The most restrictive requirements for thickness of layers in any indicators used must be met. Therefore, it is permissible to combine indicators for soils that have both loamy and sandy textures in the upper part if it meets all the requirements of matrix color, amount and contrast of redox concentrations, depth, and thickness for any single indicator or combination of indicators.

Contrast – Distinct or Prominent: Any feature above the upper threshold for faint features would be considered either distinct or prominent. If an indicator requires distinct or prominent features, then those features at or below the faint threshold do not count.

Upper Threshold for Faint		
Δ Hue	and Δ Value	and Δ Chroma
0	≤2	≤1
1	≤1	≤1
2	0	0
Any Δ Hue if BOTH hues have values ≤3 and chromas ≤2		

Soil References

<u>The keys do not address all hydric soil conditions found in New England.</u> There are cases (see Problem Soils discussion and indicators) where hydric soils exist that do not meet any of the currently listed indicators. For many hydric soils, saturation and reduction in the upper part of the soil are seasonal and not continuous throughout the growing season. Users are cautioned when working in areas where the hydrology has been altered. In such a case, the presence or absence of hydric soil indicators may not reflect the current hydrologic conditions. If a soil meets the technical standard** it is a hydric soil regardless of the lack of an indicator.

**Technical Note 11 at: https://acsess.onlinelibrary.wiley.com/doi/full/10.1002/saj2.20202#:~:text=The%20Hydric%20Soil%20Technical%20Standard%20(HSTS)%20was%20developed%20to%20provide,anaerobic%20conditions%2C%20and%20precipitation%20normality.

Soil References

Development and application of the Hydric Soil Technical Standard

Hydric soils form as a result of prolonged soil saturation and microbial activity that induce anaerobic conditions. The Hydric Soil Technical Standard (HSTS) was developed to provide a quantitative procedure for evaluating the hydric status of a soil based upon direct measurements of saturation, anaerobic conditions, and precipitation normality. thus demonstrating that the definition of a hydric soil has been met.

3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

All Soils (LRR R)

A1.—Histosol
A2.—Histic Epipedon
A3.—Black Histic
A4.—Hydrogen Sulfide
A5.—Stratified Layers
A6.—Organic Bodies
A7.—5 cm Mucky Mineral
A8.—Muck Presence
A9.—1 cm Muck
A10.—2 cm Muck
A11.—Depleted Below Dark Surface
A12.—Thick Dark Surface
A13.—Alaska Gleyed
A14.—Alaska Redox
A15.—Alaska Gleyed Pores
A16.—Coast Prairie Redox
A17.—Mesic Spodic

Sandy Soils (LRR R)

S1.—Sandy Mucky Mineral
S2.—2.5 cm Mucky Peat or Peat
S3.—5 cm Mucky Peat or Peat
S4.—Sandy Gleyed Matrix
S5.—Sandy Redox
S6.—Stripped Matrix
S7.—Dark Surface
S8.—Polyvalue Below Surface
S9.—Thin Dark Surface
S11.—High Chroma Sands
S12.—Barrier Islands 1 cm Much

Loamy and Clayey Soils (LRR R)

F1.—Loamy Mucky Mineral
F2.—Loamy Gleyed Matrix
F3.—Depleted Matrix
F6.—Redox Dark Surface
F7.—Depleted Dark Surface
F8.—Redox Depressions
F10.—Marl
F11.—Depleted Ochric
F12.—Iron-Manganese Masses
F13.—Umbric Surface
F16.—High Plains Depressions
F17.—Delta Ochric
F18.—Reduced Vertic
F19.—Piedmont Flood Plain Soils
F20.—Anomalous Bright Loamy Soils
F21.—Red Parent Material
F22.—Very Shallow Dark Surface

3. SOIL TEXTURES

What is Organic, What is Sandy, What is Loamy?

All Soils (LRR R)

A1.—Histosol
A2.—Histic Epipedon
A3.—Black Histic
A4.—Hydrogen Sulfide
A5.—Stratified Layers
A11.—Depleted Below Dark Surface
A12.—Thick Dark Surface

Sandy Soils (LRR R)

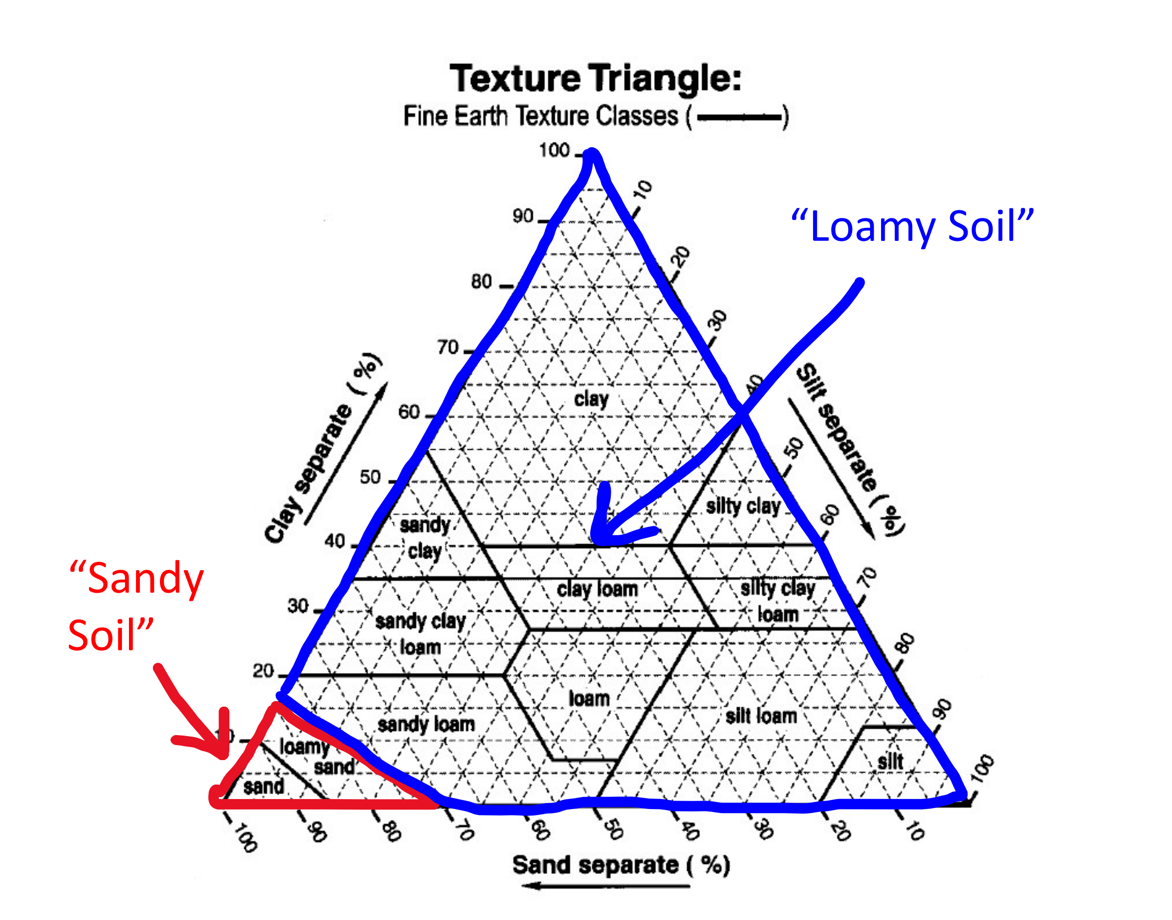
S1.—Sandy Mucky Mineral
S4.—Sandy Gleyed Matrix
S5.—Sandy Redox
S6.—Stripped Matrix
S7.—Dark Surface
S8.—Polyvalue Below Surface
S9.—Thin Dark Surface

Loamy and Clayey Soils (LRR R)

F1.—Loamy Mucky Mineral
F2.—Loamy Gleyed Matrix
F3.—Depleted Matrix
F6.—Redox Dark Surface
F7.—Depleted Dark Surface
F8.—Redox Depressions

Note: Organic soils and soils with thick organic surface layers are generally further inside a wetland.

3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

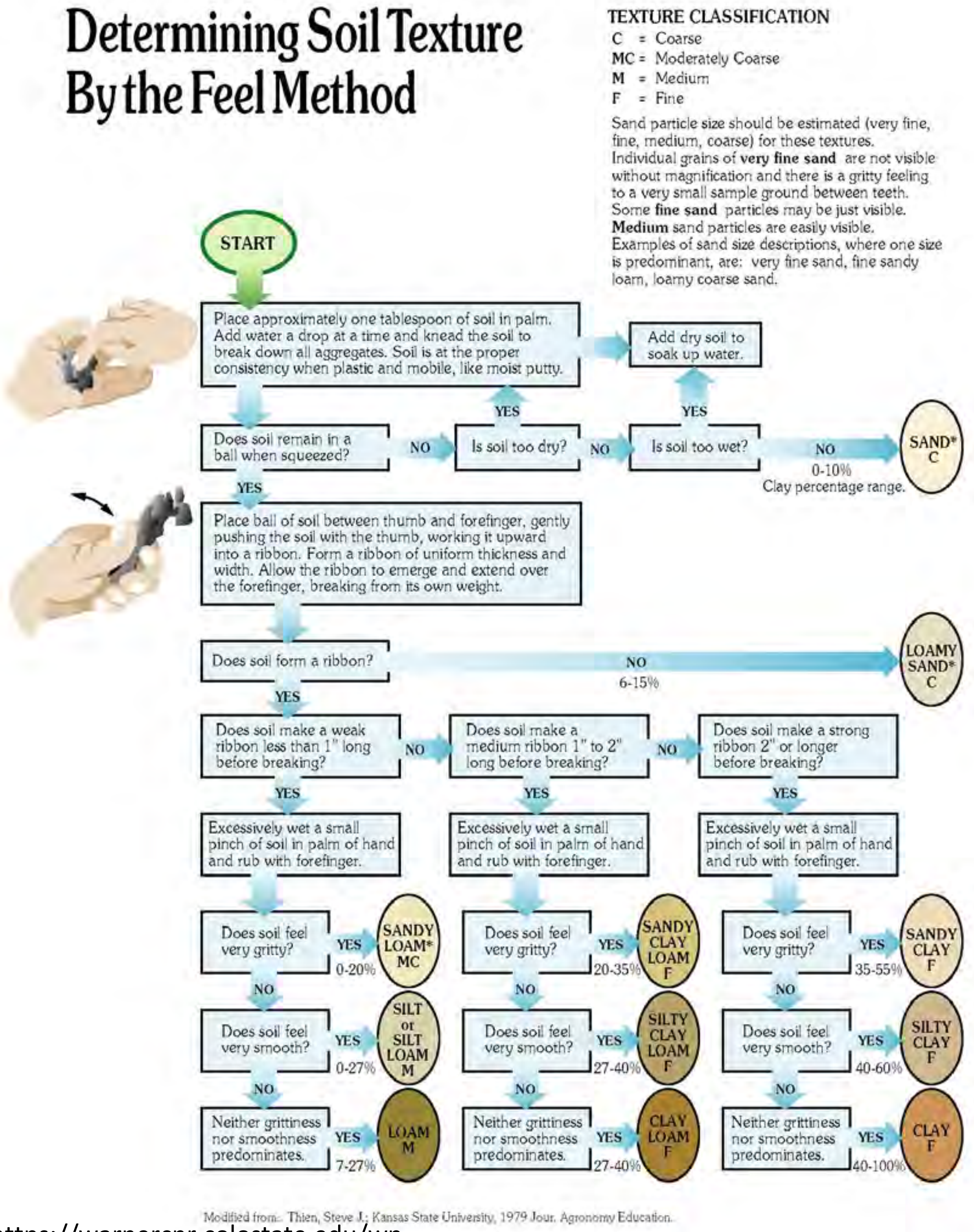


The Soil Textural Triangle categorizes mineral soil textures for Soil Science (NRCS Classifications).

In the USDA Hydric Soil Keys:

"Sandy soils" have a USDA texture of loamy fine sand & coarser.

"Loamy soils" have USDA textures of loamy very fine sand & finer.



https://warnercnr.colostate.edu/wp-content/uploads/sites/2/2017/09/2012MOR2_CSU_HandTexture_Soil_Eng.pdf

Ribboning Method

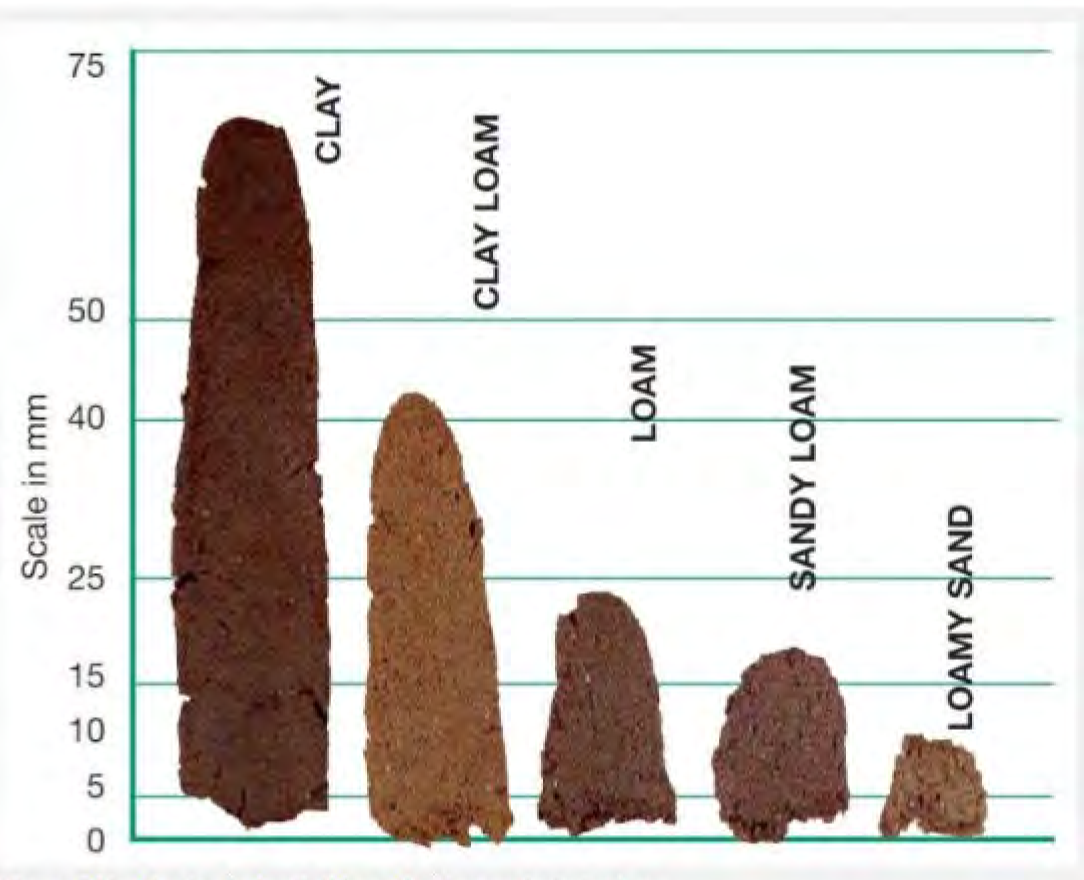
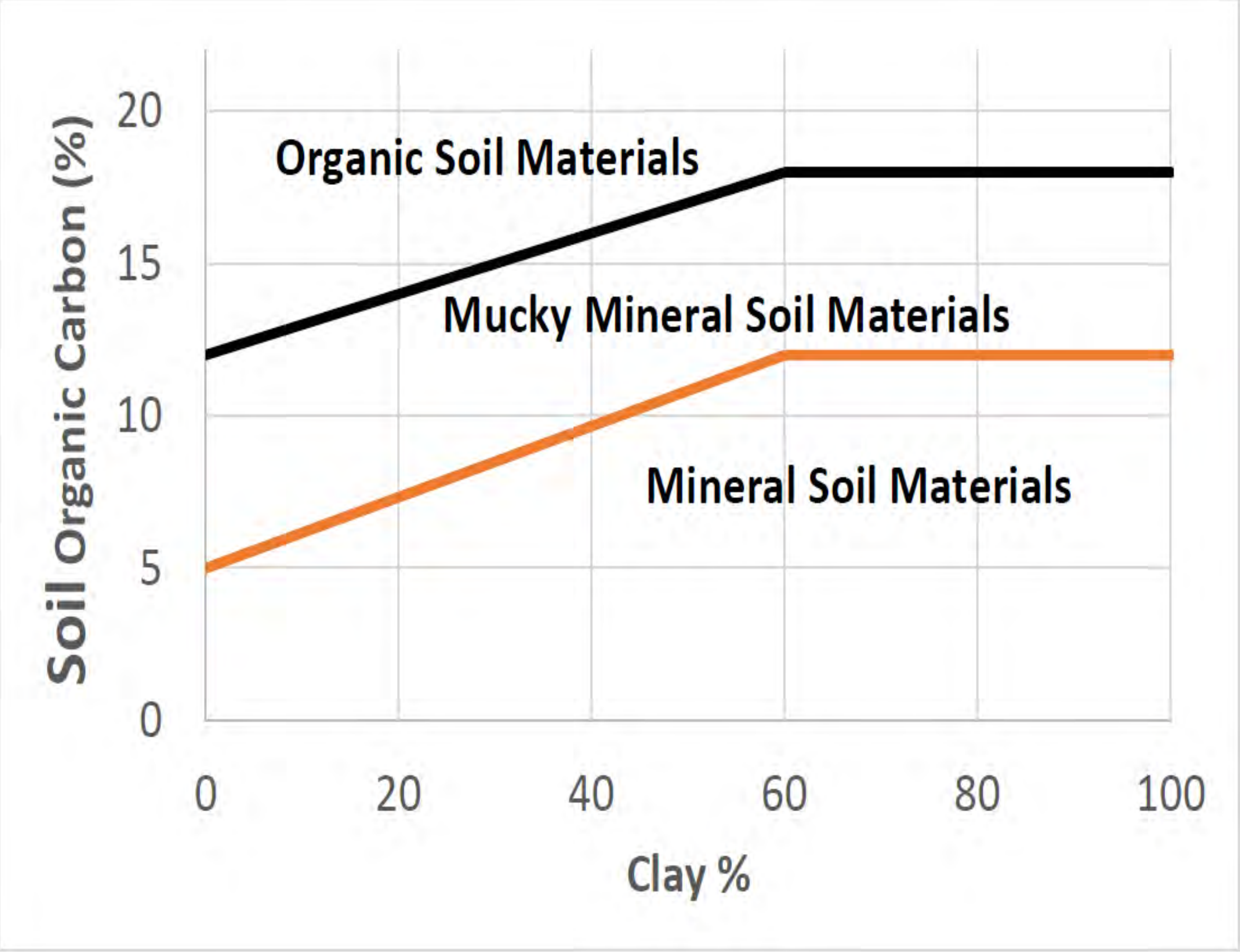


Figure 3 Hand extruded soil ribbons to demonstrate texture

https://www.agric.wa.gov.au/soil-constraints/soil-texture-estimating-hand

3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

USDA NRCS Version 4 Definition of Organic soil material.
“Soil material that is saturated with water for long periods or artificially drained and, excluding live roots, has 18 percent or more organic carbon with 60 percent or more clay or 12 percent or more organic carbon with 0 percent clay. Soils with an intermediate amount of clay have an intermediate amount of organic carbon. If the soil is never saturated for more than a few days, it contains 20 percent or more organic carbon. Organic soil material includes muck, mucky peat, and peat (fig. 53).”



3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

A. **Sand** can always be felt as individual grains, but silt and clay generally cannot.

B. Dry **silt** feels floury, and wet **silt** is slippery or soapy but not sticky.

C. Dry **clay** forms hard lumps, is very sticky when wet, and plastic (like plasticene) when moist.

D. Well-decomposed **organic matter** (humus) imparts silt-like properties to the soil. It feels floury when dry and slippery when moist, but not sticky and not plastic. However, when subjected to the taste test, it feels non-gritty. It is generally very dark when moist or wet, and stains the hands brown or black.

https://www.for.gov.bc.ca/isb/forms/lib/fs238.pdf

3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

Determining the texture of soil materials high in organic carbon.

1. Gently rub the wet soil material between forefinger and thumb.
2. If upon the first or second rub the material feels gritty, it is mineral soil material.
3. If after the second rub the material feels greasy, it is either mucky mineral or organic soil material.
4. Gently rub the material two or three more times. If after these additional rubs it feels gritty or plastic, it is mucky mineral soil material; if it still feels greasy, it is organic soil material.

Corps Wetland Delineation Manual, Northeast Regional Supplement

3. SOIL TEXTURES
What is Organic, What is Sandy, What is Loamy?

HISTIC SOILS ARE NOT THE SAME AS FOLISTS

Folic Horizon

General description. The folic horizon (from L. folium, leaf) is a surface horizon, or a subsurface horizon occurring at shallow depth, which consists of well-aerated organic soil material.

Diagnostic criteria. A folic horizon must have:

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1. more than 20 percent (by weight) organic carbon (35 percent organic matter); and
2. water saturation for less than one month in most years; and
3. thickness of more than 10 cm. If a folic horizon is less than 20 cm thick, the upper 20 cm of the soil after mixing must contain 20 percent or more organic carbon.

https://www.fao.org/3/W8594E/w8594e08.htm#:~:text=Geneal%20description.,well%2Daerated%20organic%20soil%20material.

3. DEPTH MEASUREMENTS (where do I start?)

Where does the depth measurement start for the Hydric Soil Keys?

A. Measurement starts at the actual surface
A1. Histosol.
A2. Histic Epipedon.
A3. Black Histic.
A4. Hydrogen Sulfide.

Measurement starts at the muck or mineral surface
A11. Depleted Below Dark Surface.
A12. Thick Dark Surface.

Measurement starts at the mineral surface for all other indicators.
Fresh litter is excluded from being part of the soil for any depth measurements.

4. NAMED SOILS - Isn’t Lamoine a Place?

USDA NRCS Web Soil Survey

https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

4. NAMED SOILS

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BuB2	Lamoine silt loam, 3 to 8 percent slopes	19.4	3.6%
CF	Cut and fill land	8.4	1.6%
DeB	Deerfield loamy fine sand, 0 to 8 percent slopes	7.8	1.5%
HfC	Hartland very fine sandy loam, 8 to 15 percent slopes	73.4	13.7%
HfD	Hartland very fine sandy loam, 15 to 25 percent slopes	142.4	26.6%
HkB	Hinckley gravelly sandy loam, 3 to 8 percent slopes	54.2	10.1%
HkD	Hinckley gravelly sandy loam, 15 to 30 percent slopes	35.3	6.6%
ScA	Scantic silt loam, 0 to 3 percent slopes	33.3	6.2%
Sd	Scarboro mucky peat	4.2	0.8%
SkB	Scio very fine sandy loam, 3 to 8 percent slopes	39.8	7.4%
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded	10.3	1.9%
SuD2	Suffield silt loam, 15 to 25 percent slopes, eroded	16.1	3.0%
WmB	Windsor loamy sand, 3 to 8 percent slopes	17.6	3.3%
WmC	Windsor loamy sand, 8 to 15 percent slopes	73.1	13.7%
Totals for Area of Interest		**535.5**	**100.0%**

4. NAMED SOILS

STATE OF MAINE CATENA KEY

STATE OF MAINE CATENA KEY

The soil catena concept is a useful guide to understand the complex nature of soils that blanket the landscape. A soil catena is a sequence of soil series that extend across relief positions and are developed from similar parent material. Relief influences soil formation primarily through its effect on drainage, runoff, and erosion. The key that follows uses the catena concept by matching parent material and drainage, for each series. This is helpful in identifying the relationship of one series to others. It is intended to be used only as a guide; the Official Series Description should be used to identify the soil being evaluated.

(Series listed in (*ITALICS*) have a mesic soil temperature regime and are no longer used in Maine.)

(Series listed as underlined are from outside MLRA Region R.- These series may have different soil properties from what was described when these soils were first identified in Maine.)

PARENT MATERIAL Of the soils catena and selected characteristics of the deepest, best drained member	SOIL DRAINAGE CLASS						
	Excessively Drained	Somewhat Excessively Drained	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Poorly Drained	Very Poorly Drained
A. Soils formed in Glacial Till							
1. Dark gray fine-grained quartzite, slate, phyllite, and some calcareous sandstone							
a. Coarse-loamy soils			Bangor Penquis[3]	Dixmont	→		
b. Loamy-skeletal soils		Thorndike[2]	Danforth Winnecook[3]	Shirley	→		
c. Coarse-loamy soils with dense basal till		Monson[2]	Elliottsville[3]	Chesuncook	Telos	Monarda	Burnham
2. Calcareous dark gray shale, silt-stone, phyllite, and limestone							
a. Fine-loamy soils			Caribou Mapleton[3]	Conant	→	Easton	Washburn*
b. Fine-loamy soils with dense basal till				Perham	Daigle	Aurelie	
3. Dark gray limestone and calcareous shale							
a. Coarse-loamy soils	←	(*BIDDSON*[2])	Linneus[3]				
4. Red sandstone and conglomerate							
a. Loamy soils		Creasey[2]					

5. Fine-grained quartzite, slate, and some granite							
a. Coarse-loamy soils with dense basal till			Plaisted	Howland		Monarda	Burnham
6. Mica schist and phyllite with some granite and gneiss							
a. Coarse-loamy soils with a spodic horizon	Abram[1]	Lyman[2] (*HOLLIS*[2])	Berkshire (*CHARLTON*) Tunbridge[3] →	Sunapee (*SUTTON*)		Lyme (*LEICESTER*)	
b. Coarse-loamy soils with a spodic horizon & dense basal till			Marlow (*PAXTON*)	Dixfield Peru (*WOODBRIDGE*)	Colonel (*RIDGEBURY*)	Brayton ← Pillsbury →	Peacham (*WHITMAN*)
c. Coarse-loamy soils with a spodic horizon having > 6% organic carbon			Hogback[2] Rawsonville[3]				
7. High elevation soils with a cryic temperature regime (generally at elevations greater than 2500 feet)							
a. Coarse-loamy soils with a spodic horizon			Sisk Saddleback[3]	Surplus	→	Bemis	
b. Loamy-skeletal soils with a spodic horizon			Enchanted[4]				
8. Granite, gneiss and some schist							
a. Sandy-skeletal soils with a spodic horizon	Schoodic[1]	Hermon Canaan[3]		Waumbek	←	Naskeag[3]	
b. Coarse-loamy soils with a spodic horizon & dense sandy basal till			Becket	Skerry	Westbury		
c. Coarse-loamy over sandy or sandy-skeletal soils			Monadnock				
B. Soils formed in Glaciofluvial Material Mainly on deltas, terraces, eskers, kames and beaches							
1. Granite, gneiss, some sandstone and lesser amounts of slate, shale and phyllite							
a. Sandy-skeletal soils with a spodic horizon	Colton (*HINCKLEY*)			Duane			
b. Sandy soils with a spodic horizon	(*WINDSOR*)	Adams		Croghan (*DEERFIELD*)	Au Gres	← Moosilauke ← Naumburg Kinsman (*WALPOLE*)	Searsport (*SCARBORO*)
c. Sandy soils with a cemented spodic horizon					Finch (*SAUGATUCK*)		
d. Sandy soils		(*MERRIMAC*)					

2. Slate, shale, phyllite and lesser amounts of granite, gneiss and limestone							
a. Sandy-skeletal soils		Masardis ←	Stetson	Sheepscot			
b. Coarse-loamy over sandy or sandy-skeletal soils			Allagash (*AGAWAM*)	Madawaska (*NINIGRET*) Machias	→ (*RED HOOK*)	← (*FREDON*) (*ATHERTON*)	(*HALSEY*) →
c. Sandy soils				Skowhegan	→		
C. Soils formed in Marine and Glaciolacustrine Deposits (including some loess caps)							
1. Silt and clay deposits							
a. Fine soils			(*SUFFIELD*)	Buxton	Lamoine	Scantic	Biddeford
b. Fine-silty soils				Boothbay	→	Swanville (*CANANDAIGUA*)	→
2. Very fine sand and silt deposits							
a. Coarse-silty soils with a spodic horizon			Salmon (*HARTLAND*)	Nicholville (*BELGRADE*) (*SCIO*)	←	Roundabout (*RAYNHAM*)	
3. Loamy material over silt and clay deposits							
a. Coarse-loamy over clayey soils			Melrose	Elmwood	Swanton	→	Whately
4. Sandy material over loamy deposits							
a. Sandy over loamy soils				(*ELDRIDGE*)			
5. Fine-silty soils in tidal areas							Gouldsboro Sulfaquents
D. Soils formed in Alluvial Deposits							
1. Slate, phyllite and schist							
a. Coarse-silty soils			Fryeburg (*HADLEY*)	Lovewell (*WINOOSKI*)	Cornish	Charles (*LIMERICK*)	Medomak (*SACO*)
b. Coarse-silty soils without a cambic horizon			Lille				
2. Granite, gneiss and schist							
a. Coarse-loamy soils			Ondawa	Podunk		Rumney	
b. Sandy soils	Sunday						
E. Organic Soils (pH given in 0.01M $CaCl_2$)							
1. Folists							
a. Very shallow & shallow to bedrock soils, pH < 4.5	←		Ricker				

b. Deep & very deep to bedrock soils, pH <4.5		Mahoosuc					
2. Fibrists							
a. pH < 4.5							Vassalboro
b. Terric soils, pH ≥ 4.5							Togus
c. Soils formed from mainly sphagnum, pH < 4.5							Waskish
3. Hemists							
a. pH < 4.5							Sebago
b. pH ≥ 4.5							Rifle
c. Terric soils, pH < 4.5							Chocorua
d. Tidal area soils							Sulfihemists
4. Saprists							
a. pH ≥ 4.5							Bucksport
b. Terric soils, pH ≥ 4.5							Wonsqueak Pondicherry Markey
c. Undifferentiated soils							Borosaprists

All these organic soils are very deep (>60 inches) to bedrock unless otherwise noted.
These Terric organic soils range from 16 to 51 inches in thickness over mineral soil.

Footnotes are for mineral soils:

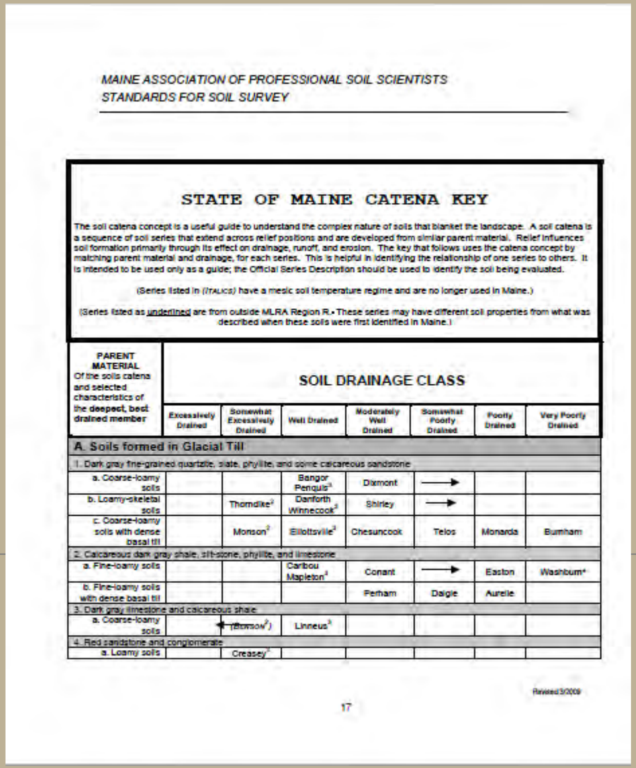
1 Very shallow (<10 inches of mineral soil above bedrock)
2 Shallow (10 to <20 inches of mineral soil above bedrock)
3 Moderately deep (20 to <40 inches of mineral soil above bedrock)
4 Deep (40 to ≤60 inches of mineral soil above bedrock)
All others are Very deep (>60 inches of mineral soil above bedrock)

*Washburn is an inactive series & no current description is available

Last updated February 2000; **subject to change**

4. NAMED SOILS

STATE OF MAINE CATENA KEY



MAINE ASSOCIATION OF PROFESSIONAL SOIL SCIENTISTS
STANDARDS FOR SOIL SURVEY

STATE OF MAINE CATENA KEY

The soil catena concept is a useful guide to understand the complex nature of soils that blanket the landscape. A soil catena is a sequence of soil series that extend across relief positions and are developed from similar parent material. Relief influences soil formation primarily through its effect on drainage, runoff, and erosion. The key that follows uses the catena concept by matching parent material and drainage, for each series. This is helpful in identifying the relationship of one series to others. It is intended to be used only as a guide; the Official Series Description should be used to identify the soil being evaluated.

(Series listed in *(ITALICS)* have a mesic soil temperature regime and are no longer used in Maine.)

(Series listed as underlined are from outside MLRA Region R.• These series may have different soil properties from what was described when these soils were first identified in Maine.)

PARENT MATERIAL Of the soils catena and selected characteristics of the deepest, best drained member	SOIL DRAINAGE CLASS						
	Excessively Drained	Somewhat Excessively Drained	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Poorly Drained	Very Poorly Drained
A. Soils formed in Glacial Till							
1. Dark gray fine-grained quartzite, slate, phyllite, and some calcareous sandstone							
a. Coarse-loamy soils			Bangor Penquis[3]	Dixmont	→		
b. Loamy-skeletal soils		Thorndike[2]	Danforth Winnecook[3]	Shirley	→		
c. Coarse-loamy soils with dense basal till		Monson[2]	Elliottsville[3]	Chesuncook	Telos	Monarda	Burnham
2. Calcareous dark gray shale, silt-stone, phyllite, and limestone							
a. Fine-loamy soils			Caribou Mapleton[3]	Conant	→	Easton	Washburn*
b. Fine-loamy soils with dense basal till				Perham	Daigle	Aurelie	
3. Dark gray limestone and calcareous shale							
a. Coarse-loamy soils	←	*(Bomson[2])*	Linneus[3]				
4. Red sandstone and conglomerate							
a. Loamy soils		Creasey[2]					

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<u>Organized by Parent Material</u>

A. Soils Formed in Glacial Till
B. Soils Formed in Glaciofluvial Material
C. Soils Formed in Marine and Glaciolacustrine Deposits
D. Soils formed in Alluvial Deposits
E. Organic Soils

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5. Fine-grained quartzite, slate, and some granite							
a. Coarse-loamy soils with dense basal till			Plaisted	Howland		Monarda	Burnham
6. Mica schist and phyllite with some granite and gneiss							
a. Coarse-loamy soils with a spodic horizon	Abram[1]	Lyman[2] (HOLLIS[2])	Berkshire (CHARLTON) Tunbridge[3] →	Sunapee (SUTTON)		Lyme (LEICESTER)	
b. Coarse-loamy soils with a spodic horizon & dense basal till			Marlow (PAXTON)	Dixfield Peru (WOODBRIDGE)	Colonel (RIDGEBURY)	Brayton ← Pillsbury →	Peacham (WHITMAN)
c. Coarse-loamy soils with a spodic horizon having > 6% organic carbon			Hogback[3] Rawsonville[3]				
7. High elevation soils with a cryic temperature regime (generally at elevations greater than 2500 feet)							
a. Coarse-loamy soils with a spodic horizon			Sisk Saddleback[3]	Surplus	→	Bemis	
b. Loamy-skeletal soils with a spodic horizon			Enchanted[4]				
8. Granite, gneiss and some schist							
a. Sandy-skeletal soils with a spodic horizon	Schoodic[1]	Hermon Canaan[2]		Waumbek	←	Naskeag[3]	
b. Coarse-loamy soils with a spodic horizon & dense sandy basal till			Becket	Skerry	Westbury		
c. Coarse-loamy over sandy or sandy-skeletal soils			Monadnock				
B. Soils formed in Glaciofluvial Material — Mainly on deltas, terraces, eskers, kames and beaches							
1. Granite, gneiss, some sandstone and lesser amounts of slate, shale and phyllite							
a. Sandy-skeletal soils with a spodic horizon	Colton (HINCKLEY)			Duane			
b. Sandy soils with a spodic horizon	(WINDSOR)	Adams		Croghan (DEERFIELD)	← ← Au Gres	Moosilauke Naumburg Kinsman (WALPOLE)	Searsport (SCARBORO)
c. Sandy soils with a cemented spodic horizon					Finch (SAUGATUCK)		
d. Sandy soils		(MERRIMAC)					

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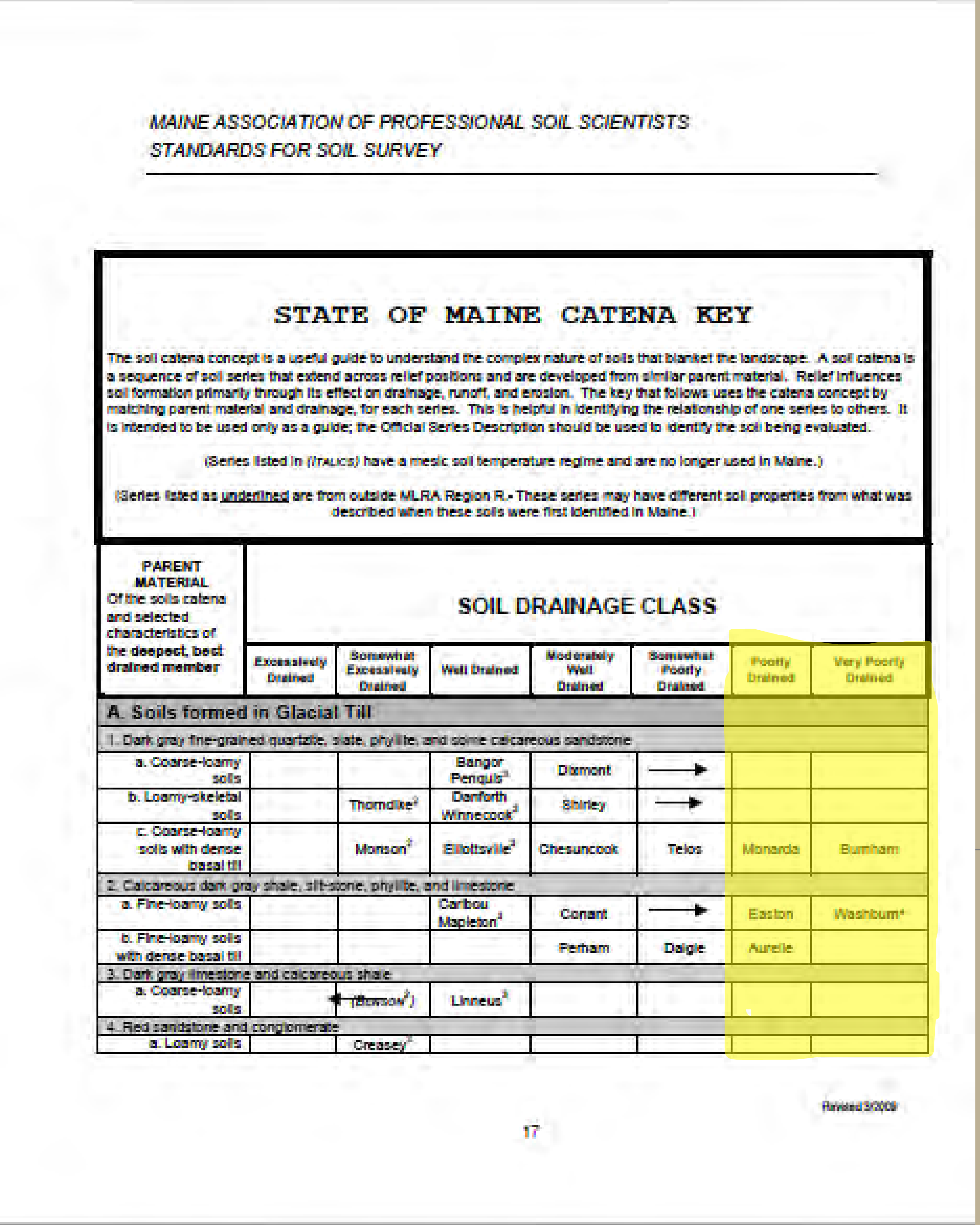
4. NAMED SOILS

Hinckley soil:

1. Excessively Drained
2. Formed in Glaciofluvial Material
3. Sandy-Skeletal texture



MAINE ASSOCIATION OF PROFESSIONAL SOIL SCIENTISTS
STANDARDS FOR SOIL SURVEY

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c. Coarse-loamy soils with dense basal till		Monson[2]	Elliottsville[2]	Chesuncook	Telos	Monarda	Burnham
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b. Fine-loamy soils with dense basal till				Perham	Daigle	Aurelie	
3. Dark gray limestone and calcareous shale							
a. Coarse-loamy soils	←	(*Bowson*[2])	Linneus[3]				
4. Red sandstone and conglomerate							
a. Loamy soils		Creasey[2]					

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4. NAMED SOILS

Named soil map units that are classified as “hydric” are in two columns to right:

1. **Poorly Drained**
2. **Very Poorly Drained**

4. NAMED SOILS

"Hydric" in Soil Science IS NOT THE SAME as Hydric as per the USDA NRCA Version 4 Hydric Soil Keys???

Use the NRCS Soil Survey for non-site-specific information.

2/28/90 3/17/99 Rev.
4/01/92 Rev. 3/01/00 Rev.
4/01/93 Rev. 3/05/02 Rev.
4/04/94 Rev. 1/22/13 Rev.
3/21/96 Rev.

Maine Association of Professional Soil Scientists

KEY FOR THE IDENTIFICATION OF SOIL DRAINAGE CLASS

Use this key starting at the first drainage class (Very Poorly Drained). If the soil being evaluated does not exhibit the soil morphological features for that drainage class, go to the next drainage class. Continue through each drainage class until the soil being evaluated meets the soil morphological features for a particular drainage class.

DRAINAGE CLASS	SOIL MORPHOLOGICAL FEATURES KEY
VERY POORLY DRAINED (VPD)	1) Has organic soil material that extends from the ground surface[1] to a depth of 40 cm (16 inches) or more. Refer to Histosols in *Keys to Soil Taxonomy, 11th Edition, 2010*[2]; ***or*** 2) Has organic soil material that extends from the ground surface to a depth of 20 to 40 cm (8 to 16 inches) (Histic Epipedon)[3] ***and*** is directly underlain by a horizon that has a depleted or gleyed matrix; ***or*** 3) Has organic soil material that extends from the surface to a depth of 10 to 20 cm (4 to 8 inches) ***and*** is directly underlain by a horizon that has a depleted or gleyed matrix; ***or*** 4) Mineral soils with sulfidic materials within 50 cm (20 inches) of the mineral soil surface; alluvial soils with an umbric epipedon; ***or***
POORLY DRAINED (PD)	1) Has dominant textures in the upper 50 cm (20 inches) (below the A-horizon if present) of loamy fine sand or coarser ***and*** has redoximorphic features within 18 cm (7 inches) of the mineral soil surface; ***or*** Has dominant textures in the upper 50 cm (20 inches) (below the A-horizon if present) of loamy fine sand or coarser ***and*** has a Bh- or Bhs-horizon with value/chroma of 3/3 or less that begins within 18 cm (7 inches) of the mineral soil surface ***and*** is directly underlain by a horizon that has redoximorphic features; ***or*** 2) Has an A-horizon that is 18 cm (7 inches) thick or greater with value/chroma of 3/2 or less ***and*** a textures in all sub-horizons within 50 cm (20 inches) of the mineral soil surface of loamy fine sand or coarser ***and*** has redoximorphic features directly below the A-horizon; ***or*** 3) Has a depleted or gleyed matrix within 50 cm (20 inches) of the mineral soil surface ***and*** redox depletions with value of 4 or more and chroma of 2 or less in ped interiors that are less than 18 cm (7 inches) below the mineral soil surface; ***or*** 4) Has an A-horizon that is 18 cm (7 inches) thick or greater with value/chroma of 3/2 or less ***and*** has a depleted or gleyed matrix within 50 cm (20 inches) of the mineral soils surface ***and*** has redox depletions with value of 4 or more and chroma of 2 or less in ped interiors ***or*** a depleted or gleyed matrix directly beneath the A-horizon; ***or***

[1] Surface excludes loose leaves, needles, and twigs.
[2] Organic soil excludes FOLISTS in this key.
[3] Refer to *Keys to Soil Taxonomy, 11th Edition, 2010*, "Histic Epipedon, Required Characteristics".

5. REDOXIMORPHIC FEATURES (MY DAD WAS MOTTLING; YOU CAN CALL ME REDOX)

Redoximorphic features are critical morphologic indices of saturation and reduction in the soil and need careful consideration.

1. **Depletions** are zones of low chroma colors where iron (Fe) and/or manganese (Mn) coatings have been removed and the grayish color observed is the base color of the primary particles. Depleted, reduced, or gleyed matrices are also included as depletions.
2. **Concentrations** include nodules, concretions, masses, and pore linings. Nodules and concretions are hardened forms of Fe and/or Mn concentrations which may not be indicative of current soil hydrologic conditions unless they have a diffuse (halo-like) boundary. Thus, nodules and concretions have a limited value in identifying hydric soils, and the use of masses (soft) and pore linings are emphasized in the indicators.

5. REDOXIMORPHIC FEATURES (MY DAD WAS MOTTLING; YOU CAN CALL ME REDOX)

Discussion about high chroma redox as evidence of reduction ?

Lee and Rod coming up with a powerpoint presentation!

Photo by Rod Kelshaw