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INTRODUCTION

The *SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND* is a non-profit professional organization of soil scientists, both in the private and public sectors, that is dedicated to the advancement of soil science. The Society fosters the profession of soil classification, mapping and interpretation, and encourages the dissemination of information concerning soil science. With the intent of contributing to the general human welfare, the Society seeks to educate the public on the wise use of soils and the associated natural resources.

These standards for making high intensity soil maps have been developed for use in New Hampshire. The Society is available to assist in developing standards for use in Maine and Vermont. Some demonstrated uses of these standards in New Hampshire include: lot size by soil type ordinances, use in local subdivision regulations that incorporate septic tank leach field (4K receiving area) set-back distances from sensitive soil conditions and in wetland delineation activities (hydric soils). Soil drainage classes used in these standards have been updated to more closely align with the concepts used by New Hampshire Department of Environmental Services. It should be noted that the accuracy of soil line placement serving as delineation for any jurisdictional wetlands or hydric soil boundary may be more restrictive than outlined in these standards.

**Comments or inquiries on these standards may be directed to the Board of
Directors at the following address:**

**SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND
P.O. Box 76
Durham, NH 03824**

Standards For A High Intensity Soil Map New Hampshire

Criteria for High Intensity Soil Map:

1. Use of a Base Map.
2. Use of a Connotative Soil Legend (see attachment - Key to Soil Types).
3. Required Map Unit Purity.
4. Minimum Size Delineation.
5. Required accuracy of soil boundary line placement.
6. Map prepared by a Certified Soil Scientist or by an apprentice working under direct supervision of said certified soil scientist.

Base Map:

1. A current perimeter survey by a Licensed Land Surveyor.
2. Map scale of 1" = 100' or larger, i.e. 1" = 50, 1" = 20', etc.
3. Topography with 2-foot contour intervals or less, i.e. 1-foot contour intervals.
4. Ground control is required and shall be at the density specified by the Soil Scientists.

The following guidelines are recommended:

1. Four identified points or features per acre.
2. Uniformly distributed throughout the parcel.
3. Points or features will be shown on base map.

Connotative Soil Legend:

(See attachment - Key to Soil Types)

Areas mapped with parent material symbol 6 will be identified within the map unit or map unit legend as to its origin, i.e. Human Transported Material, Excavated or Regraded. All map unit symbols used will be derived from the Connotative Soil Legend with only one soil type per map unit delineation.

High Intensity Map Unity Purity:

The soil within an area enclosed by a soil boundary line (a map unit delineation) will have a minimum of 75 percent of the soil properties inferred by the soil map symbol derived from the Key To Soil Types and placed within that map unit delineation. Limiting soil type or types can make up a maximum of 15 percent of the map unit delineation. The control section for determining soil properties is from the mineral soil surface to a depth of 40 inches except for

Histosols and Soils with a histic epipedon or a mineral histic.

User Note:

This item warrants additional discussion. However, for this issue the user is encouraged to refer to the publication, "Site-Specific Soil Mapping Standards for New Hampshire-Vermont" dated December 2017.

Minimum Size Delineation:

The minimum size delineation will refer only to map units of poorly drained, very poorly drained, rock outcrop or slopes of greater than 25 percent. The minimum size delineation will be 2,000 square feet. Smaller areas may be shown at the discretion of the Soil Scientist.

Soil Boundary Line Placement:

Soil boundary line placement should be accurate within 20 feet.

If any soil boundary is to be used for setback requirements or other permitting requirements, it will be flagged in the field, located and shown on the Soil/Plan map. Streams and small water bodies shown at the discretion of the Soil Scientist.

Certified Soil Scientist:

A person qualified in soil classification and mapping, who is certified by the State of New Hampshire under RSA 310. All high intensity soil maps will be identified with the name and number of the Certified Soil Scientist.

It should be noted that:

THESE ARE MINIMUM STANDARDS FOR HIGH INTENSITY SOIL MAPS.

KEY TO SOIL TYPES

This key is used in determining soil types that are utilized in high intensity soil surveys. The soil types are defined as soils having the same soil characteristics of drainage class, parent material, restrictive features, and slope; and are designated by a five-part symbol, the parts being A, B, C, D and E.

SYMBOL: A Drainage Class

- 1- Excessively drained
- 2- Well drained
- 3- Moderately well drained
- 4- Somewhat poorly drained
- 5- Poorly drained
- 6- Very poorly drained
- 7- Not determinable (to be used only with Symbol B-6)

SYMBOL: B Parent Material

- 1- Glaciofluvial Deposits (outwash/terraces of sand or sand and gravel).
- 2- Glacial Till Material (active ice)
Marine or Glaciolacustrine Deposits (3, 4 or 5)
- 3- Very fine sand and silt deposits (glacial lakes)
- 4- Loamy/sandy over silt/clay deposits
- 5- Silt and clay deposits (ocean waters)
- 6- Excavated, Regraded or Human Transported Material (see Connotative Soil Legend)
- 7- Alluvial Deposits (flood plains)
- 8- Organic Materials - Fresh Water Wetlands
- 9- Organic Materials - Tidal Wetlands

SYMBOL: C Restrictive Features (if more than one applies, list the most restrictive)

- 1- None
- 2- Bouldery, with more than 15% of the surface covered with boulders (larger than 24 inches in diameter).
- 3- Mineral restrictive layer(s) are present in the soil profile less than 40 inches below the soil surface - such as "hard pan", densic material, platy structure or clayey texture with consistence of at least firm, i.e. more than 20 newtons. For other examples of soil characteristics that qualify for restrictive layer, see Soil Manual for Site Evaluations in New Hampshire, 2nd Ed., page 3-17, figure 3-14.
(continued)
- 4- Bedrock present in the soil profile 0-20 inches below the mineral soil

surface (Bedrock is either a lithic or paralithic contact - See *User Note: Soil Taxonomy*. Paralithic references bedrock that can be removed by an excavator, backhoe or by hand shovel with difficulty. Bedrock fractures are spaced more than 4 inches.

- 5- Subject to flooding.
- 6- Does not meet fill standards (see addendum - Standards for Human Transported Material) (only to be used with Symbol B-6).
- 7- Bedrock present in the soil profile 20 to 40 inches below the mineral soil surface. (Bedrock is either lithic or paralithic contact; see *Soil Taxonomy*).
- 8- Areas where depth to bedrock is so variable that a single soil type cannot be applied, will be mapped as a complex of soil types and will have a symbol C of 8.

SYMBOL: D Slope Class

- B- 0% to 8%
- C- 8% to 15%
- D- 15% to 25%
- E- 25% to 35%
- F- 35%+

SYMBOL: E -High Intensity Soil Map Identifier - H. (see addendum)

Addendum to KEY TO SOIL TYPES

1. Standards for Human Transported Material:

- Fill material consisting of organic materials or non-soil materials such as tree stumps, sawdust, wood chips and bark, bricks, asphalt, concrete, metal, wallboard, etc., even with a soil matrix, should not be used.
- The in-place fill should have less than 15% organic matter and non-soil materials by volume.
- The in-place fill should not contain more than 25% by volume of cobbles (6 to 10-inch diameter) and stones (larger than 10 inches in diameter).
- The in-place fill should not have more than 27% by weight of clay size (0.002 mm and smaller) particles.
- The fill should be essentially homogeneous. If bedding planes and other discontinuities are present, detailed analysis is necessary.

2. Examples of soils classified using the KEY TO SOIL TYPES:

- a. An excessively drained sand and gravel soil with no restrictive features on a 9% slope would be identified as: **111CH**
- b. A moderately well drained glacial till soil with a restrictive layer, on a 4% slope, would be identified as: **323BH**
- c. A somewhat poorly drained clayey soil with firm consistency and high clay content in the substratum, on a 1% slope, would be identified as: **453BH**
- d. A very poorly drained organic soil located on the tidal marsh would be identified as: **691BH**
- e. An area of well drained glacial till where bedrock is present, and the shallow soils are so intermixed with deep soils that they cannot be separated, on a 16% slope, would be identified as: **228DH**
- f. An area that was filled with stumps and concrete blocks such that the fill material would not meet the Standards for Human Transported Material, on a 2% slope, and the depth to a seasonal high water table could not be determined, would be identified as: **766BH**

3. High Intensity Soil Map Identifier

The H is placed at the end of the soil type to identify the area mapped as meeting the standards for high intensity soil maps. If, as a preliminary planning tool, a soil map is made that does not meet the standards, but the soil scientist still prefers to use the connotative legend to identify the soils, a P (signifying a preliminary map) will be used in place of the H, i.e. **111CP**. Maps made with soil types ending with P do not meet the standards for high intensity soil maps and are not intended to be used for wetland ordinances, lot size by soil type regulations, etc.

KEY TO SOIL DRAINAGE CLASSES

Where first part of map symbol is 6 - VERY POORLY DRAINED

A. Soils that have one of the following field indicators:
A1, A2, A3, A4, S4, and A11, A12, S3, S8 or F3 when they have a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material. (See Table 1)
By reference using the publication; "Field Indicators for Identifying Hydric Soils in New England", Version 4, May 2017.

Where first part of map symbol is 5 - POORLY DRAINED

B. Soils that have one of the following field indicators:
All of the remaining Field Indicators that are not listed above (See Table 1).
By reference using the publication; "Field Indicators for Identifying Hydric Soils in New England", Version 4, May 2017.
User Note: These indicators are for natural soil conditions. For human disturbed soils (fill, etc.), poorly drained soils may be found that do not key out using B.

Where first part of map symbol is 4 - SOMEWHAT POORLY DRAINED

C. Soils that have 5 percent or more distinct or prominent redoximorphic features that are not relic, at a depth less than 15 inches below the mineral soil surface; are SOMEWHAT POORLY DRAINED.

Where first part of map symbol is 3 – MODERATELY WELL DRAINED

D. Soils that have 5 percent or more distinct or prominent redoximorphic features that are not relic, between a depth of 15 inches and 40 inches below the mineral soil surface; are MODERATELY WELL DRAINED

Where first part of map symbol is 2 - WELL DRAINED

E. Soils that have textures in any horizons between 10 to 40 inches of very fine sand or finer; are WELL DRAINED.

F. **All other soils are - EXCESSIVELY DRAINED and are noted where first part of map symbol is 1.**

Table 1. Correlation of New England Hydric Soil Indicators, V-4.0 to NH Soil Drainage Classes

NE Hydric Soil Indicator	NH Drainage Class
A1: Histosol	VPD
A2: Histic Epipedon	VPD
A3: Black Histic	VPD
A4: Hydrogen Sulfide	VPD
A5: Stratified Layers	PD
A11: Depleted Below Dark Surface	PD
A11: Depleted Below Dark Surface (With a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material.)	VPD
A12: Thick Dark Surface	PD
A12: Thick Dark Surface (With a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material.)	VPD
S1: Sandy Mucky Mineral	PD
S4: Sandy Gleyed Matrix	VPD
S5: Sandy Redox	PD
S6: Stripped Matrix	PD
S7: Dark Surface	PD
S8: Polyvalue Below Surface	PD
S8: Polyvalue Below Surface (With a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material.)	VPD
S9: Thin Dark Surface	PD
F2: Loamy Gleyed Matrix	VPD
F3: Depleted Matrix	PD
F3: Depleted Matrix (With a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material.)	VPD
F6: Redox Dark Surface	PD
F7: Depleted Dark Surface	PD
F8: Redox Depressions	PD
Problem Hydric Soils	
TA6: Mesic Spodic	PD
NE-A1: Frigid Spodic	PD
A10: 2 cm Muck	PD
A16: Coast Prairie Redox	PD
NE-S1: Three Chroma Sands	PD
S3: 5 cm Mucky Peat or Peat	PD
S3: 5 cm Mucky Peat or Peat (With a surface layer that has four inches or more of fibric, hemic or sapric material, or eight inches or more of mucky mineral material.)	VPD
NE-F1: Glaciated Northeast Red Parent Material	PD
F12: Iron-Manganese Masses	PD
F19: Piedmont Floodplain Soils	PD
F21: Red Parent Material	PD
F22: Glaciated Northeast Red Parent Material	PD
F22: Very Shallow Dark Surface	PD

Note: VPD = Very Poorly Drained, PD = Poorly Drained

GLOSSARY

ALBIC HORIZON - one from which clay and free oxides have been removed or in which oxides have been segregated to the extent that the color of the horizon is determined by the color of the primary sand and silt particles rather than by coatings on these particles. See *User Note: Soil Taxonomy*.

AQUIC CONDITIONS - implies a reducing regime that is virtually free of dissolved oxygen because the soil is saturated by ground water or by water of the capillary fringe. The concept includes reduction of iron and the presence of redoximorphic features. See *User Note: Soil Taxonomy*.

EXCAVATED - areas where soil material has been removed. Surface and subsoil layers, or horizons, are absent, or occur as remnants lacking horizon continuity from which a naturally developed soil profile can be identified.

HIGH INTENSITY SOIL MAP UNIT - is an area defined and named in terms of its soil properties. Each individual area enclosed on the map is a delineation. Each map unit contains a map symbol and that symbol represents one soil type with a defined set of soil properties.

HISTIC EPIPEDON - is an 8 to 16-inch layer, normally at the surface of very poorly drained soils, that has organic soil materials. See *User Note: Soil Taxonomy*.

HISTOLS – as used in this publication, are very poorly drained soils with more than 16 inches of organic soil materials.

HUMAN TRANSPORTED MATERIAL - (HTM) is soil parent material (organic or mineral) that has been moved horizontally onto a pedon from a source area outside of that pedon by purposeful human activity. Formerly called “fill” – this parent material is 12 inches or more in thickness on greater than 50% of the area.

HYDRIC SOIL - a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

LIMITING SOIL - is a soil that differs appreciably in one or more soil properties than the named soil type. The difference in soil properties is more restrictive than the named soil type. The limiting soil type is 2 or more drainage classes different from the named soil type, or has 1 or more restrictive features or has slopes greater than 15% if the named soil type is B slope or C slope

MINERAL HISTIC – is a 4 to 8-inch layer, normally at the surface of very poorly drained soils, consisting of organic soil materials. Included are mineral soils (A) with 8.5 to 20 percent organic matter on weight basis and described with a mucky modifier, i.e. “mucky loamy sand”.

MINERAL SOIL MATERIALS - See *User Note: Soil Taxonomy*.

MOTTLES - refers to spots of contrasting colors in a horizon, with either or both high chroma and low chroma represented in the variegated colors. May or may not be related to wetness.

NON-LIMITING SOIL - is a soil type that has most soil properties common to the named soil type. The non-limiting soil is 1 drainage class different, or, has a different parent material, or is any slope class lower than the named soil type, and has no additional restrictive features.

ORGANIC SOIL MATERIALS: See *User Note: Soil Taxonomy*. The threshold for soils with O clay is more than 20% organic matter on weight basis.

REDOXIMORPHIC FEATURES (or “redox features”)- See *User Note: Soil Taxonomy*.

REDOXIMORPHIC FEATURE CONTRAST - refers to the degree of visual distinction that is evident between associated colors. Contrast may be described as faint, distinct, or prominent and the colors are related to wetness.

Faint: Evident only on close examination. Faint redox features commonly have the same hue as the color to which they are compared and differ by no more than 1 unit of chroma or 2 units of value. Some faint redox features of similar but low chroma and value differ by 2.5 units (one page) of hue.

Distinct: Readily seen but contrasts only moderately with the color to which they are compared. Distinct redox features commonly have the same hue as the color to which they are compared but differ by 2 to 4 units of chroma or 3 to 4 units of value; or differ from the color to which they are compared by 2.5 units (one page) of hue but no more than 1 unit of chroma or 2 units of value.

Prominent: Contrast strongly with the color to which they are compared. Prominent redox features are commonly the most obvious color feature of the section described. Prominent redox features that have medium chroma and value commonly differ from the color to which they are compared by at least 5 units (two pages) of hue if the chroma and value are the same; at least 4 units of value or chroma if the hue is the same; or at least 1 unit of chroma or 2 units of value if hue differs by 2.5 (one page).

REGRADED - areas where the natural soil profile has been disturbed or destroyed by mechanical activity. The surface and subsoil horizons are not recognizable to highly mixed.

RELIC FEATURES - Often are reddish brown features that are relics of an earlier water table situation. Commonly, relic features appear as reddish brown horizontal layers below 3 to 4 feet. They are quite common on exposed faces in sand and gravel pits. The origin of these “hor layers” may be related to a historic water table that differs from current conditions.

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SOIL TEXTURES - are classes based on weight of each separate of the fine earth fraction (less 2 mm) of soil, i.e. sand, silt and clay. The amount of each soil separate contained in a soil sample will determine its texture.

SPODIC HORIZON - a subsurface layer of soil characterized by the accumulation of aluminum oxides (with or without iron oxides) and organic matter; a diagnostic horizon for Spodosols. See *User Note: Soil Taxonomy*

UMBERIC EPIPEDON - a mineral surface layer of soil characterized by the accumulation of organic matter to the extent that it has a dark color even when dry. See *User Note: Soil Taxonomy*

USER NOTE: SOIL TAXONOMY

The National Cooperative Soil Survey adopted many significant changes in 1999. Updated concepts on the iron chemistry of wet soils with fluctuating water tables resulted in many new terms. For example, mottles as used in the earlier versions of the HIS standards are replaced with the term redoximorphic features. Users are encouraged to seek other publications for a complete definition of this term and others used by soil scientists in making soils maps. Duplication is beyond the scope of this publication.

A few titles that may be useful:

1. Keys to the Taxonomic Classification of New England Soils. December 2000. Edited by Sidney A.L. Pilgrim and Michael Cuomo with websites. Copies for \$15 from:

N.H. Association of Natural Resources Scientists
P.O. Box 110
Concord, New Hampshire 03302-0110

2. New England Hydric Soils Technical Committee. Field Indicators for Identifying Hydric Soils in New England, Version 4, May 2017. Available on the Society of Soil Scientists of Northern New England website www.sssnne.org

3. Keys to Soil Taxonomy, 12th Printing, 2014. Soil Survey Staff, U.S. USDA-NRCS, Government Printing Office Washington, D.C.

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/taxonomy/?cid=nrcs142p2_053580

4. Soil Taxonomy, Second Edition: A Basic System of Soil Classification for Making and Interpreting Soil Surveys, Agricultural Handbook No. 436, Soil Survey Staff, US Government Printing Office, Washington, DC, 1999

RECORD SHEET FOR AMENDMENTS TO THE STANDARDS

Date: Amendments:

July 11, 1990 Adoption of key to Soil Drainage Classes at SSSNNE meeting held at New England Center, Durham, NH.

October 16, 1993 Adoption of following change at annual meeting, Groton, VT: Key to soil types, page 6, dated 3/1/91. Symbol C, item 4. The change is bedrock present from 40 to 20 inches. 4-bedrock present in the soil profile 0 to 20 inches below the soil surface, etc.

July 16, 2002 Page six, symbol C, add "7-Bedrock present in the soil profile 20 to 40 inches below the soil surface. (Bedrock is either lithic or paralithic contact; See *User Note: Soil Taxonomy*.
Page six, symbol C, delete the letter X for variable bedrock depth and replace it with the number 8. The text remains the same except the "X" is replaced with an "8" at the end of the text.
Delete pages 9 through 11 and replace with drainage classes from Field Indicators.
Below the heading "Key to Soil Drainage Classes" there should be a subheading "From Field Indicators for Identifying Hydric Soils in New England, Version 2, 1998." In the Field Indicators, the very poorly drained soils are II, III.A, III.B, III.C and III.G.1.
In the glossary, on page 12, delete "Hydric Type A Soil" and "Hydric Type B Soil" entirely. Poorly and very poorly drained are now defined in the text drainage class keys.

September 2006 Update to be consistent with Version 3 April 2004, "Field Indicators for Identifying Hydric Soils in New England."

April 2008 Place upper limit on E Slopes – to conform with site specific standards.

December 2017 Update to be consistent with Version 4, May 2017, "Field Indicators for Identifying Hydric Soils in New England."