Site Specific Soil Mapping Standards For New Hampshire and Vermont

SPECIAL PUBLICATION NO. 3- VERSION 5.0

SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT

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I. INTRODUCTION

This document represents a cooperative effort between the Society of Soil Scientists of Northern New England (SSSNNE) and the USDA/NRCS National Cooperative Soil Survey. This document is not copyrighted and is provided by SSSNNE. The Site-Specific Soil Mapping Standards for New Hampshire and Vermont (SSSMS) described in this document represents an update to the Society of Soil Scientists of Northern New England, Special Publication No.3, Version 3.0 published in February, 2011. These standards have been in effect in New Hampshire and Vermont for over seven years. This version represents an enhancement of previous versions as a result of the experience of direct application of these standards in the field along with updates of supporting documents.

Site-specific soil mapping is conducted for very intensive land uses requiring very detailed information about soils, generally in small areas. Some site specific activities do not produce a survey per se (such as transect logs). Site-specific soil mapping is synonymous with Order 1 soil surveys completed by the National Cooperative Soil Survey. The information can be used in planning individual building sites, experimental agricultural plots, and other uses requiring detailed and precise knowledge of the soils and their variability. Field procedures permit observation of soil boundaries throughout their length. The soils within each delineation are identified by transecting or traversing. Map units are mostly consociations (with some complexes) and are phases of soil series or are miscellaneous areas. Base map scale is generally 1:12,000 (1”=1000’) or larger and more typically 1:1,200 (1”=100’).

II. NRCS ORDER 1 AND SITE-SPECIFIC SOIL MAPPING STANDARDS

The term "Order 1" is used by the USDA/NRCS National Cooperative Soil Survey (NCSS) to describe the most detailed level of soils mapping performed under this Federal Program (See Appendix E). Site-specific soil mapping is synonymous with Order 1 soil mapping. The primary distinction is that site specific standards include enhancements in specific soil mapping requirements to reflect local environmental conditions, soils and landscapes, as well as to recognize specific state regulatory policies and compliance requirements for the land-use permitting process. The soil mapping criteria identified in these standards are appropriate for subdivision and site plan review, biosolids management and other specific land uses that are regulated in New Hampshire and Vermont. These standards are designed to augment the basic criteria with a supplement specific to each state (see NH Supplement, p.37 or Vermont Supplement, p.46).

III. NRCS POLICY ON USE OF COUNTY SOIL SURVEY MAPS

The NRCS National Cooperative Soil Survey Program provides soil resource information and land use interpretations on the behavioral characteristics of soils based on soils mapping completed at a scale ranging from 1:15,840 to 1:24,000. Soils mapping at these scales have interpretive value for general land use planning purposes only and are not satisfactory for making site-specific land use decisions without a site visit and verification of soils. In most situations they are not suitable for subdivision or site plan review. Due to the cartographic limitations of the map scale, the smallest soil delineation shown on county soil maps range from 3 to 5 acres in size. Small areas of contrasting soils, less than 3 to 5 acres may not be shown on the soils map which can result in costly mistakes (both monetarily and environmentally) when site-specific land use decisions are made without first conducting an on-site evaluation or completing a site-specific soil survey.

The NRCS does not condone the enlarging of county soil survey maps to overlay site plans at a smaller scale. This procedure gives the misconception that the soil map was completed with a much higher degree of precision than what was actually allowed at the original mapping scale. The NRCS will not take responsibility for the misinterpretation of soils information resulting from enlarging the county soil maps.

These mapping standards conform to the standards of the National Cooperative Soil Survey and will provide the necessary soil interpretations needed to make site-specific land use decisions. The NRCS Soil Survey Program will provide Soil Scientists to complete site-specific soils mapping only when the request for such mapping is necessary to support NRCS mandated programs. All other site-specific soil mapping must be conducted by a private consulting Soil Scientist.

IV. SUPPORTING PRINCIPLES BEHIND THE SITE-SPECIFIC STANDARDS

The Site Specific Soil Mapping Standards (SSSMS) described in this document are based on a universally recognized taxonomic system of soil classification and are supported by national soil mapping standards established by the USDA National Cooperative Soil Survey. They allow for the development of multi-purpose soil map products which are carefully controlled and monitored through a state, regional and national quality assessment program.

To the extent SSSMS are based on the soil mapping standards of the National Cooperative Soil Survey, they are supported by University Agricultural Experiment Stations, Cooperative Extension Service, as well as the US Forest Service, USEPA, the US Army Corps of Engineers, US Fish and Wildlife Service and many other state and federal agencies.

Although SSSMS are based on national standards which are consistent across state lines, there are some application procedures that are unique for each state. The supplements that have been designed to be applied in each state are based on the requirements of individual state regulatory programs. The individual state criteria are made part of this document (See pages 37 and 46).

The original Federal authority for the National Cooperative Soil Survey is contained in the record of the 53rd Congress, chapter 169, Agricultural Appropriations Act of 1896. The authority was elaborated in public Law 74-46, the Soil Conservation Act of April 27, 1936, and again in Public Law 89-560, Soil Surveys for Resource Planning and Development, September 7, 1966. Title 7 Code of Federal Regulations Chapter VI, Subchapter B – Conservation Operations, Part 610 – Technical Assistance authorizes the National Cooperative Soil Survey to assist land owners and others who are responsible for making decisions and setting policies that influence land use, conservation treatment, and resource management. Authorized activities include evaluation of soil, water, vegetation and other resource data needed for making land use, environmental and conservation treatment decisions.
The standards of the National Cooperative Soil Survey meet all of the requirements of the soil science profession and are accepted as the standard.

There are three principal publications that provide reference documentation on the standards of the National Cooperative Soil Survey and subsequently to the Site-Specific Soil Mapping Standards for New Hampshire and Vermont. They are as follows:

1. Soil Survey Manual, 2017, NRCS- Soil Science Division Staff. C. Ditzler, K. Scheffe and H.C. Monger (eds), USDA Handbook 18, Government Printing Office, Washington, D.C.

The purpose of the Soil Survey Manual is to provide the major principles and concepts for making and using soil surveys and the standards and conventions for describing soils.
See Appendix D for Web Address

2. National Soil Survey Handbook – 430-VI, 1996, USDA, NRCS, and all amendments to this handbook.

The National Soil Survey Handbook provides guidelines, definitions, policy, responsibilities, and procedures for conducting soil surveys, planning soil surveys, collecting and maintaining soil survey documentation and distributing the information to users.
See Appendix D for Web Address

3. Agricultural Handbook 436, Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys, 1999, USDA, NRCS, and all amendments.

Soil Taxonomy provides the common base for the organization of knowledge about soils and a universal means to communicate this knowledge.
See Appendix D for Web Address

The soil data collection process is carried out using scientific methods and processes that provide reproducible results. Soil survey investigational procedures are based on universally accepted scientific design and sampling strategy (American Society for Testing and Materials, Soil Science Society of America, etc.) and are documented sufficiently to allow others to apply these methods consistently (USDA/NRCS/NSSC Soil Investigations Report No. 42. 1996).

V. HOW TO USE THIS DOCUMENT

The various criteria required to meet site-specific soil mapping standards are described on the following pages and are designed to be applicable throughout the Northeastern United States. Some additional criteria unique to individual states include use of soil legends and map labeling. New Hampshire and Vermont supplements are appended in this document to describe the state specific requirements. The user of this document must also follow the state standards detailed in the supplement for where work is being performed.

It is emphasized that these Standards are the minimum to which the Soil Scientist must comply. They are abridged from source documents which explain site-specific soil mapping standards in greater detail. For further clarification on any criteria discussed in these Standards, the Soil Scientist should refer to the appropriate originating document. There is a list of reference documents in the bibliography including those that specifically contain the criteria for site-specific soil mapping. Internet addresses for sources of additional clarification on the standards of the National Cooperative Soil Survey are found in Appendix D. Soil Scientists should work with the end user of the soil map product to determine the level of detail appropriate for the proposed use.

The site specific soil mapping standards have been developed through a cooperative effort between the Society of Soil Scientists of Northern New England and the USDA Natural Resources Conservation Service in response to a need to provide regulatory agencies, local officials, and land use planners with consistent high quality, large scale, soil resource information. The Society of Soil Scientists of Northern New England is a non-profit, professional organization of Soil Scientists, dedicated to the advancement of soil science. The members of the Society seek to educate themselves and the public in the wise use of soil resources and natural resource information, thus contributing to the general human welfare and quality of life.

Copies of these standards can be obtained through:

Society of Soil Scientists of Northern New England, P.O. Box 76, Durham, NH 03824. http://www.sssnne.org/ to download a pdf.

Comments regarding these standards are always welcome. Comments can be sent to any one of the following addresses:

Chairman
New Hampshire State Board of Natural Scientists
57 Regional Drive
Concord, NH 03301

President
Society of Soil Scientists of Northern New England
P.O. Box 76
Durham, NH 03824

State Soil Scientist
USDA Natural Resources Conservation Service
273 Locust St, Suite 2D
Dover, NH 03820
Phone: (603) 868-7581
Fax: (855) 428-0332

State Soil Scientist
USDA Natural Resources Conservation Service
356 Mountain View Drive, Suite 105
Colchester, VT 05446

SITE-SPECIFIC SOIL MAPPING STANDARDS[1]

1. MAP SCALE

A. Map scale must be large enough to permit refined distinctions among small homogeneous areas of soils. The Soil Scientist and the map user must choose a scale which meets their needs.

B. Base map scale shall be 1: 12,000 (1" =1000') or larger. (???)

2. MAPPING BASE

[1] Site-specific soils mapping conducted by the National Cooperative Soil Survey is described and recognized as "Order 1" mapping.

The Soil Scientist will insure that base maps are of suitable quality to meet the mapping standards defined in this document. Types of suitable base maps include, but are not limited to:

1. Aerial photos
2. Topographic maps
3. Orthophotos
4. Digital Orthophoto Quads (DOQs)

3. FIELD PROCEDURES

A. In areas where soils retain a relatively high degree of predictability, delineations are identified by traversing the landscape making sufficient soil observations to enable accurate soil boundary placement and to ensure appropriate soil map unit composition. Soil boundaries are observed throughout their length, and their placement corresponds to changes in soil properties or land form. Remotely sensed data may be used as an aid in boundary delineation.

B. In areas where soils are complex and less predictable, delineations are identified by transecting the landscape and making soil observations at appropriate intervals to justify the map unit selection. Sufficient transecting is completed to ensure accurate soil line placement and to ensure appropriate soil map unit composition. Soil boundaries are observed throughout their length within the subject property boundaries, and their placement corresponds to changes in soil properties or land form. Remotely sensed data may be used as an aid in boundary delineation.

C. Soil map units are appropriately separated for the purpose of carrying out land use applications.

D. Ground control is required and shall be at the density specified by the Soil Scientist. States may require specific ground control depending on the purpose of the soil map product being produced. See individual state supplements.

4. MAP UNIT PURITY

Different kinds of soil map units are used to accommodate different complexities of soil patterns on the landscape to best meet the purpose of the survey. Two kinds of map units are appropriate for site-specific soil survey mapping.

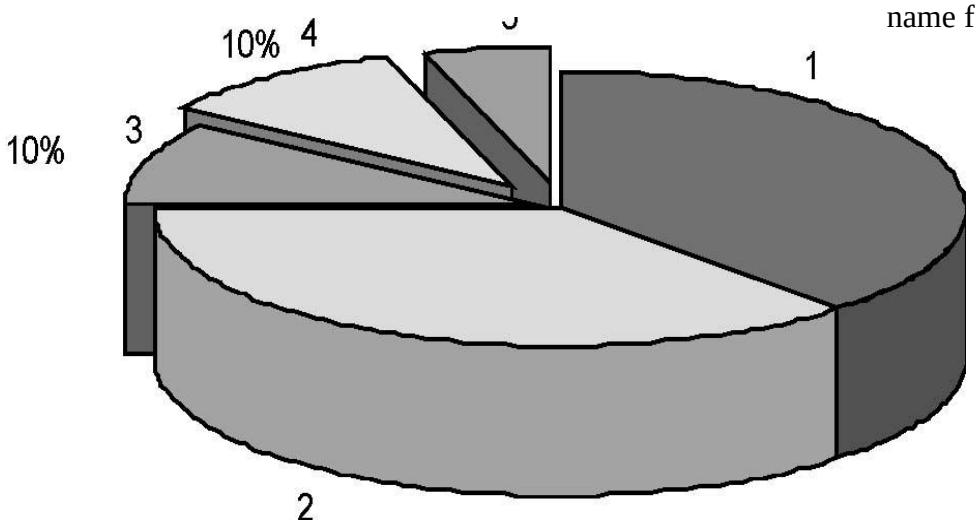
A. Consociations (Numbers refer to Figure 1 on the following page.)

1&2	Map units will contain 75 percent or more of pedons that fit within the range of the taxon that provides the name for the map unit,or are in a similar taxa.
2	No one similar soil is greater than the named reference taxa.
3, 4, &5	The total amount of dissimilar inclusions will not exceed 25 percent.
3& 4	No single dissimilar soil will make up more than 10 percent of the map unit.
4&5	Limiting inclusions do not exceed 15 percent of the map unit.
	(More intensive separation of dissimilar inclusions within a map unity can be made at the discretion of the Soil Scientist.)

FIGURE 1: COMPONENTS OF A CONSOCIATION

Up to 25% dissimilar inclusions of which no more than 15% are limiting

38% -Soil that provides name for the map unit



37% -Similar soil to named component

B. Complexes

1. Map units consist of areas of two or more kinds of soils that are in a regularly repeating pattern so intricate that the two components cannot be delineated separately at the scale of mapping.
2. The major components that provide the name for the map unit are sufficiently different in morphology or behavior that the unit cannot be named as a consociation.
3. No single dissimilar soil will make up more than 10 percent of the map unit.
4. Limiting inclusions do not exceed 15 percent of the map unit.
5. The total amount of dissimilar inclusions will not exceed 25 percent.

C. At the discretion of the Soil Scientist, areas of dissimilar inclusions, too small to be delineated, will be shown with special features symbols. Allowable special features, and definitions, are located in Appendix C.

5. IDENTIFICATION OF MAP UNITS

The identification of soil map units utilizes taxonomic class names at the series level and accompanying phase terms. The primary identification of the map unit is described in terms of ranges of soil properties within the limits of defined NRCS/NCSS Official Series Descriptions and ranges of inclusions. Some map units may require naming at a categorical level above the series. The identification of soil series and phases of soil series do not allow for adjacent map units to be identified with the same map symbol.

A. Soil Series Names

Consociations, or complexes composed of major components that fall within the range and characteristics of existing official series, will use the series name to identify the map unit.

B. Phases of Soil Series

Soil phases are used to identify distinctions within official soil series. They subdivide taxonomic classes at the series level and recognize soil properties that may be used as differentiating criteria. Phase selection is governed by the property which has the greatest impact on use and management of the soils in a survey area. Phases, beyond those identified in official NRCS soils legends, are used only when adequate documentation demonstrates the need to separate map units at the series level on the basis of soil behavior, use and management.

1. Slope phases

If symbols are used to identify slope range, they are either alpha or numeric (see state supplements) and will occur as the last digit in a map symbol. Some map units that are level or nearly level may not have a slope designation in the symbol. The symbol identifying slope has a standard range, but on occasion, when landscape patterns dictate, the symbol will represent a narrower or broader slope range from the standard. There are, however, specific slope limits that are allowed for any particular symbol as identified below.

Slope Phases

Alpha Slope Symbol	Range
A	0-3%
B	3-8%
C	8-15%
D	15-25%
E	25-50%
F	50%+

2. Stony and bouldery phases

   Stony and bouldery phases may be recognized where the stones or boulders cover more than 0.01 percent of the soil surfaces.

Stony and Bouldery Phases

Stony Class	Phase	Percent Surface Cover	Distance Between Stones
1	Nonstony	<.01%	>100’ apart
2	Stony	.01-1.0%	50-100’ apart
3	Very Stony	1.0-3.0%	10-50’ apart
4	Extremely Stony	3.0-15.0%	1.5-10’ apart

3. Depth phases

   This phase refers to the total vertical distance from the surface of a soil to any feature for which vertical location is described. The depth terms, when used without specifying the feature to which depth is measured, refer to depth to bedrock. Otherwise, the feature to which depth is measured is specified.

4. Substratum phases

   The soil material that lies below the control section is undifferentiated for the series name. In some situations, this material may be important to recognize for some uses for which a soil survey is interpreted. If the underlying material contrasts sharply with that which is normal for the taxa, it may be identified as a phase, specifying the contrast in material of the substratum in the name.

5. Physiographic phases

   Land form or physiographic position may be used as a phase criterion to distinguish among map units of a single taxon. The physiographic differentiae must be significant to soil behavior or use and management.

C. Anthropogenic Soil Map Units and Miscellaneous Land Types

Anthropogenic soils and miscellaneous areas have little or no identifiable soil as defined in Soil Taxonomy. Most situations are a result of human activity that has altered the parent material in an area. Map units are named in terms of characteristics of the parent material in the local area. Typically map units are identified at the Great Group level (See Disturbed Soil Map Unit Supplement)

D. Drainage Class Interpretive Limits

The soil drainage class interpretive limits used to carry out site-specific soil mapping will be those adopted and approved by the Society of Soil Scientists of Northern New England, effective with the adoption of these Standards. The drainage class interpretive limits are used to determine soil wetness properties and are not to be construed as a substitute for taxonomic placement. The interpretive limits for very poorly drained and poorly drained soils are based on the Field Indicators for Identifying Hydric Soils in New England", Version 4, May 2017. This document is a dynamic document and is subject to revision and enhancement as the soil science community expands its knowledge base on the morphology and behavior of wet soils. As the Field Indicators for Identifying Hydric Soils in New England is updated, these Standards should also be updated. Should, at any time, these Standards not agree with the Field Indicators for Identifying Hydric Soils in New England, the Field Indicators will take precedence over these standards. Soil Drainage Class Interpretive Limits are attached hereto, and made part of these Standards.

6. SOILS LEGEND

There are three types of soils legends used in site-specific soil mapping: a total numeric legend, an alpha-numeric legend or a total alpha legend. The National Cooperative Soil Survey Program in each state has established its own method of maintaining a soils legend and protocols for establishing new legend symbols. The individual state soils legends are described and explained in each of the state supplements. The Soils Legend and a full report must accompany the map. The Soils Legend and a brief summary of map unit descriptions should be printed on the finished Site specific Soil Map.

7. MAP LABELING

A. Site specific soil surveys shall be completed by a qualified Soil Scientist and shall be signed by the Soil Scientist completing the work.

B. With the exception of 7.B.1 below, the following statement will be included on all map products produced by consulting Soil Scientists working in the private sector:

"This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, intended for [intended purpose of the site specific soil survey]. It was produced by a professional Soil Scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a report that accompanies this map."

1. Should a client impose constraints on the consulting Soil Scientist that precludes him or her from producing a product that meets the standards of the National Cooperative Soil Survey, a statement will be added to the map label indicating: “This map product is not within the technical standards of the National Cooperative Soil Survey because….**"**

8. REPORT TO ACCOMPANY SOIL MAP

A. A narrative report will accompany all map products. Minimum requirements to be included in the report are as follows:

1. Reference to these mapping standards;
2. Date soil map was produced;
3. Geographic location and size of site;
4. Soil identification legend for the site-specific soil map symbols;
5. Purpose of the soil survey (intended use of the parcel).
6. Soil map unit descriptions;
   a) Map unit symbol and map unit name
   b) Landscape setting and surface features
   c) Drainage class and parent material
   d) If a complex, estimated percent of components, and pattern
   e) Nature of dissimilar inclusions and estimated percent
7. Signature of the Soil Scientist who is responsible for the soil map. If the Soil Scientists is certified, then the certification stamp is also required;
8. Other distinguished features of the site and soils determined to be significant by the Soil Scientist;
9. Maximum size of limiting inclusions;
10. If special features symbols are used, the size of the area represented by each symbol is included as part of the definition of the symbol; and
11. Soil profile descriptions may be included, if appropriate, at the discretion of the Soil Scientist.

9. NATURAL SOIL DRAINAGE CLASSES

Natural soil drainage class refers to the frequency and duration of wet periods under conditions similar to those under which the soil developed. Alteration of the water regime by man, either through drainage or irrigation, is not a consideration unless the alterations have significantly changed the morphology of the soil.

Drainage class, by definition, is an agricultural interpretation adopted by the USDA Natural Resources Conservation Service. As such, drainage class interpretations cannot be specifically and consistently identified in the field for regulatory purposes. For this reason, interpretive limits were established to allow the Soil Scientist to identify precise soil drainage boundaries in the field.

The definition of the natural drainage classes is provided along with the drainage class Interpretive limits.

10. SOIL DRAINAGE CLASS INTERPRETIVE LIMITS

Interpretive limits identify a specific range of allowable, observable, and measurable features in the soil profile that specifically identify the drainage class of the map unit.

The interpretive limits for the very poorly drained and poorly drained drainage classes are based on the Field Indicators for Identifying Hydric Soils In New England, Version 4, dated May, 2017 (hereinafter referred to as the NE Field Indicators) and any supplements or subsequent versions to this document. For a full explanation on the use and interpretation of the NE Field Indicator, refer to the Field Indicators for Identifying Hydric Soils In New England. This report maybe a separate document or may be a note on the soil mapping plan.

With the exception of the somewhat excessively drained drainage class, the interpretive limits for somewhat poorly drained through excessively drained were developed by SSSNNE, and adopted with the original publication of the HIS mapping standards. The somewhat excessively drained drainage class was adopted with these Standards to more effectively recognize an uninterrupted range in drainage class as recognized by the National Cooperative Soil Survey. The interpretive limits for well drained soils was revised in November, 2001 and officially adopted by the Society of Soil Scientists of Northern New England on December 6, 1996.

The NE Field Indicators is a dynamic document and is subject to revision and enhancement as the soil science community expands its knowledge base on the morphology and behavior of wet soils. As the NE Field Indicators are updated, these Standards should also be updated. Should, at any time, these Standards not agree with the NE Field Indicators, the NE Field Indicators will take precedence over these Standards.

It needs to be emphasized that the soil drainage class interpretive limits cannot be used for taxonomic placement and potential ambiguities may exist if one attempts to correlate drainage class interpretive limits (which determine hydric conditions) with the range in soil characteristics and the classification of Official Series Descriptions. Some soil series that have aquic conditions sufficient to classify in the Aquic suborder in Soil Taxonomy may allow for non-hydric soil properties within the range in characteristics.

VERY POORLY DRAINED SOILS

Definition:

Water is removed from the soil so slowly that free water remains at or near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or in depressions. Some are frequently ponded.

Interpretive Limits: See Appendix E and F

POORLY DRAINED SOILS

Definition:

Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present.

Interpretive Limits: (See Appendix E and F)

SOMEWHAT POORLY DRAINED SOILS

Definition:

Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydrologic conductivity, a high water table or additional water from seepage.

Interpretive limits:

Soils that have common distinct or prominent redoximorphic features, which are not relict features, at a depth less than 15 inches below the soil surface

MODERATELY WELL DRAINED SOILS

Definition:

Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytes are affected. They commonly have a moderately low or lower saturated hydrologic conductivity in a layer within the upper 1 meter, periodically receive high rainfall, or both.

Interpretive limits:

Soils that have distinct or prominent redoximorphic features, that are not relict features, between a depth of 15 inches and 40 inches below the soil surface.

WELL DRAINED SOILS

Definition:

Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season. Wetness does not inhibit growth of roots for significant periods during most growing seasons. The soils are mainly deep to redoximorphic features that are related to wetness.

Interpretive limits:

Soils that have textures in any horizon within the particle size control section of loamy very fine sand or finer, and have moderate permeability. Few, fine, distinct redox concentrations confined to ped faces, in a 2-inch zone immediately above the contact with firm or very firm dense basal till, (if occurring within 40 inches) is allowed within the intrepretive limits of well drained.*

* Upland soils in the Northeast that perch a thin layer (typically less than 2 inches thick) of free water on top of the contact with firm or very form dense basal till for a very brief period of time, during spring snowmelt and after periods of heavy rainfall, do not increase the adversity of land use interpretations beyond the interpretations resulting from the dense basal till, itself.

SOMEWHAT EXCESSIVELY DRAINED SOILS

Definition:

Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep. The soils are commonly coarse textured and have high saturated hydrologic conductivity or are very shallow.

Interpretive limits:
Soils that have textures in any horizon within the particle size control section of loamy very fine sand or finer; and have moderately rapid to rapid permeability in some portion of the control section or are shallow to bedrock

EXCESSIVELY DRAINED SOILS

Definition:
Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse textured and have very high hydrologic conductivity or are very shallow.

Interpretive limits:
Soils with textures of very fine sand or coarser in all horizons within the control section

11. 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.

ANTHROPOGENIC SOILS – areas where the soil material has been altered, primarily by human activity, to the extent that little or no identifiable soil remains, as defined in Soil Taxonomy.

AQUIC CONDITIONS - that portion of the soil profile that currently experiences continuous or periodic saturation and reduction. Three elements determine the presence of aquic conditions:

Saturation - characterized by zero or positive pressure in the soil and generally can be determined by observing free water in an unlined auger hole.

Reduction - can be characterized by the direct measurement of redox potential.

Redoximorphic features - associated with wetness resulting from the reduction and oxidation of iron and manganese compounds in the soil after saturation with water and desaturation, respectively.

CERTIFIED SOIL SCIENTIST (New Hampshire) - an individual certified by the Joint Board of Natural Scientists pursuant to New Hampshire RSA 310-A.

COLOR CONTRAST - the degree of visual distinction evident between associated colors. Contrast may be described as faint, distinct, or prominent.

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

Prominent: Contrasts strongly with the color to which they are compared. Prominent colors are commonly the most obvious color feature of the section described. Prominent colors with 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). Hue, value, and chroma are described in the Munsell Soil Color Charts, as printed by Munsell Color, 2441 North Culvert Street, Baltimore, Maryland 21218.

COMPLEX – a soil map unit with two or more series (taxa) occurring in a regularly repeating pattern so intricate that the individual soil series cannot be delineated separately at the scale of mapping.

CONSOCIATION – a **s**oil map unit in which 75 percent or more of the polypedons fit within the range of the taxon or kind of miscellaneous area that provides the name for the map unit or fit in a similar taxa or miscellaneous areas.

DENSIC CONTACT -contact between soil and densic material that has no cracks, or the spacing of cracks in which roots can enter is 10cm or more.

DENSIC MATERIAL -unaltered soil material that has a bulk density such that roots cannot enter except in cracks. In New Hampshire, densic material is confined to firm and very firm compact basal till, with a bulk density typically of 1.7 or higher.

DIGITAL ORTHOPHOTO QUADS (DOQs) - computer generated orthophotos that have been digitized for electronic transfer and manipulation. The level of precision must meet the Federal Geographic Data Committee's National Map Accuracy Standards. The orthophotos are digitized at a scale of 1:24,000 with their center corresponding to the center of USGS topographic 7 ½ minute quadrangle maps. Digital orthophoto quarter quads have been digitized at a scale of 1:12,000 and have quarter-quad centers.

DISSIMILAR INCLUSION - soils that either do not share limits of some important diagnostic properties of the named taxon, or, in the professional judgment of the Soil Scientist, have different use or management requirements.

EVIDENCE OF WETLAND HYDROLOGY - refers to evidence, other than soil morphology, that indicates permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil. This evidence would include, but not be limited to, predominance of hydrophytic vegetation, oxidized rhizospheres, water marks, drift lines, water borne sediment deposits, water-stained leaves, surface scoured areas, wetland drainage patterns, and morphological plant adaptations.

FOLISTIC EPIPEDON -surface layer consisting of organic material, that otherwise meets the criteria for Histic Epipedon except that it is never saturated except for a brief period after heavy rain or snow melt.

GROUND CONTROL - features which are evident or marked on the ground and located accurately on the base map. Ground control is essential for the accurate delineation of soil boundaries.

HIGH INTENSITY SOIL (HIS) MAP - a soil map product originally produced for the sole purpose of soil-based lot sizing in New Hampshire. The HIS soils mapping developed under the standards described in this document now meet the standards of the National Cooperative Soil Survey and are considered a multi-purpose product. HIS map products conform to a specific set of standards as identified in this document and carries, in addition to the site specific map symbols, map unit symbols representing the connotative HIS soils legend as identified in SSSNNE Special Publication No.1 dated January 1994.

HISTIC EPIPEDON - a layer**,** normally at the soil surface, with a high volume of organic soil materials that is saturated for some time in most years.

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

KEYS TO SOIL TAXONOMY - abridged taxonomic key to soil classification for making and interpreting soil surveys. USDA Natural Resources Conservation Service, Eleventh Edition, 2009.

LIMITING SOIL - a soil that differs appreciably in one or more soil properties from the named soil in a map unit. The difference in soil properties is more restrictive and may affect use and management.

MINERAL SOIL MATERIALS - soil horizons or layers comprised mostly of mineral material with relatively low content of organic matter (less than 12 to 18 percent, by weight of organic carbon depending upon clay content).

MOTTLES - refers to features of contrasting colors in a horizon not associated with wetness.

NATIONAL SOIL SURVEY HANDBOOK (NSSH) - standards and guidelines for conducting soil survey operations under the standards of the USDA/NRCS National Cooperative Soil Survey. Latest update: November 1996.

ORDER 1 SOIL SURVEY - the most intensive level of mapping detail provided by the USDA National Cooperative Soil Survey. The least intensive level of mapping is Order 5 which is used to show soil patterns over entire countries or continents. Order 1 soil surveys are synonymous with Site-Specific Soil Surveys and are made for very intensive land uses requiring very detailed information about soils, generally in small

areas. The information can be used in planning individual building sites, experimental agricultural plots, and other uses that require a detailed and very precise knowledge of the soils and their variability. Field procedures permit observation of soil boundaries throughout their length. The soils in each delineation are identified by transacting or traversing. Map units are mostly consociations with some complexes and are phases of soil series or are miscellaneous areas. Base map scale is generally 1:12,000 (1"=1000') or a larger map scale. Mapping orders are further described in Appendix E.

ORGANIC SOIL MATERIALS - soil layers or horizons that typically contain 12 to 18 percent or more organic carbon by weight, depending on the percent clay in the soil.

ORTHOPHOTO - aerial photograph that has been processed to remove distortion and displacement to enable the measurement of true distances, angles and areas on the Earth surface.

REDOXIMORPHIC FEATURES - soil features associated with wetness resulting from the reduction and oxidation of iron and manganese compounds in the soil after saturation with water and desaturation, respectively.

RELICT FEATURES - often reddish brown colors which are remains of an earlier water table situation. Commonly, relict 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 "iron layers" may be related to a water table situation entirely different than exists today. The water table was perhaps considerably higher than the present water table. Relict features are not considered redoximorphic features.

RESTRICTIVE FEATURES - characteristics of the soil which may have a negative effect on land use, such as bedrock, hardpan, densic material, or soil horizons with a high clay content within the control section.

SERIES CONTROL SECTION - includes soil materials starting at the soil surface and also considers the first 25 cm (10 inches) below a densic or paralithic contact if its upper boundary is less than 125 cm (50 inches) below the mineral soil surface. In some soils, the series control section can extend to 200 cm (80 inches).

The control section for the differentiation of soil series is not the same as the control section for particle-size class, mineralogy, and other soil properties identified at the family level. The Keys to Soil Taxonomy needs to be consulted for additional information on control sections.

The key to series control section for soils recognized in New Hampshire and Vermont is as follows:

I. In a mineral soil, the series control section starts at the soil surface to the shallowest of the following:

A. A lithic contact; or

B. A depth of either 25 cm (10 inches) below a densic or paralithic contact, or 150 cm (60 inches) if there is no densic or paralithic contact; or

C. The lower boundary of the deepest diagnostic horizon or a depth of 200 cm,

(80 inches) whichever is shallower.

II. In an organic soil (Histosol), the series control section starts at the soil surface to the shallowest of the following:
A. A lithic contact; or
B. A depth of 25 cm (10 inches) below a densic or paralithic contact, or 100 cm (40 inches) if there is no densic or paralithic contact; or
C. The base of the bottom tier (refer to Keys to Soil Taxonomy).

SIMILAR INCLUSION - soils that either share limits of most of the important diagnostic properties of the named taxon, or, in the professional judgment of the Soil Scientist, have similar use and management requirements.

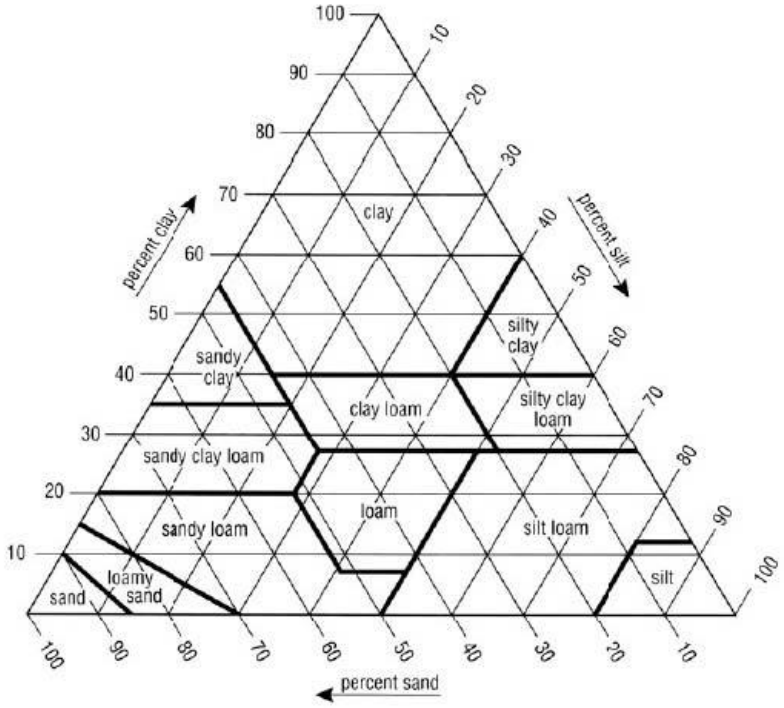
SOIL MAP UNIT - an area defined and named in terms of its soil properties. Each individual area shown on the map is a delineation of a soil map unit. Each map unit contains a map symbol which indicates the soil type, or soil types if the map unit is a complex.

SOIL SURFACE - the point at which measurement begins for the description, characterization and taxonomic placement of a particular soil. This is typically the top of the first organic layer, either an Oi, Oe, or Oa. For soils lacking organic surface horizons, the surface is considered the top of the A or Ap. Some officially recognized documents refer to different reference points for the start of measuring soil profile descriptions and depth to diagnostic features. The definition of soil surface may vary slightly depending on the reference being used.

SOIL SURVEY MANUAL (SSM) - USDA document published by the Soil Survey Division Staff providing major principles and practices needed for making and using soil surveys and for assembling and using data related to them. Latest addition: United States Department of Agriculture Handbook No.18 - Soil Survey Manual, October 1993.

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

Soil Texture Triangle showing the percentages of sand, silt and clay in the basic



USDA soil textural classes.

SPECIAL FEATURES SYMBOLS- symbols used on site-specific soils maps to indicate small areas of contrasting soil that are too small to delineate at the scale of mapping. See Appendix B.

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 *Soil Taxonomy*)

SPOT SYMBOLS - see Special Features Symbols

TRANSECT - to proceed across an area or region, in a linear direction, transversely or at random, recording observations taken at regular intervals.

TRAVERSE - to proceed across an area or region, in an irregular pattern specified by the Soil Scientist, from one side to the other, making observations at irregular intervals.

UMBRIC 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.

12. COMMITTEE MEMBERSHIP

During the annual business meeting of the Society of Soil Scientists of Northern New England, held in Gorham, New Hampshire on December 6, 1996, the membership voted favorably to establish an Order 1-High Intensity Soil Mapping Standards Review Subcommittee to address issues surrounding the updating of the New Hampshire Order 1 Mapping Standards and the New Hampshire High Intensity (HIS) Mapping Standards. A committee of seven individuals was established, made up of SSSNNE members who volunteered to serve in this capacity.

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STATE SUPPLEMENTS

New Hampshire Supplement

INTRODUCTION

The Site-Specific Soil Mapping Standards for New Hampshire evolved from the Order 1 Mapping Standards that were developed by members of the Society of Soil Scientists of Northern New England in cooperation with the USDA Natural Resources Conservation Service, and adopted for use in 1993. In New Hampshire, a Soil Scientist who is not employed by the state or federal government must be certified by the Board of Natural Scientists. In March of 1995, the USDA Natural Resources Conservation Service in New Hampshire, and the New Hampshire Board of Natural Scientists, entered into a Memorandum of Understanding which provides the vehicle by which quality control and quality assurance will be carried out on site-specific (Order 1) soil map products produced in New Hampshire by private consultants. The Memorandum of Understanding was was dissolved by the Joint Board, October 4, 2010.

During the spring and summer of 1998, the Office of State Planning (OSP) (now known as the Office of Energy and Planning) and the Department of Environmental Services invited representatives from a number of professional organizations and governmental agencies to come together to develop uniform land use planning and regulatory guidelines for municipalities which would have a broad base of support. The committee met every two weeks with the objective of presenting its findings at the OSP Planning Conference on November 14, 1998. A number of findings were adopted by the committee, which recommends the Site-Specific Soil Mapping Standards for New Hampshire and Vermont as one of the best available guides for site-specific resource characterization and mapping, consistent with State statutes and administrative rules. In May, 1999, the New Hampshire Office of State Planning published Data Requirements for Site Review, Guidance for Planning Boards. This document provides detailed information on the interpretive value of NRCS county soil surveys for subdivision and site plan reviews and the conditions under which a site-specific soil survey is warranted. The NRCS supports the use of this document when evaluating the level of soils information required for making site-specific land use decisions.

The New Hampshire Office of Energy and Planning is an official cooperator of the National Cooperative Soil Survey in New Hampshire, and the New Hampshire Department of Environmental Services requires the submission of soils information based on the National Cooperative Soil Survey standards for the permitting of subsurface wastewater treatment under NH Code of Administrative Rules Env-Ws 1000. The U.S. Forest Service in New Hampshire, UNH Cooperative Extension, UNH Agricultural Experiment Station, and Plymouth State University are also cooperators.

NEW HAMPSHIRE SITE-SPECIFIC SOIL MAPPING STANDARDS

1. MAPPING SCALE

New Hampshire site-specific mapping standards for subdivision review require a map scale of 1”=100’ or larger i.e., 1”=50’, 1”=20’, etc.

2. BASE MAPS

New Hampshire site-specific mapping standards for subdivision or site plan review require the following:

1. A current survey by a Licensed Land Surveyor
2. Topography with contour intervals as required by municipalities on site plans, but at a minimum, contours must be 5 foot or less, (e.g., 2 foot contour interval)
3. Ground control shall be at a density specified by the Soil Scientist. The following guidelines are recommended:
    a. Four identified points or features per acre;
    b. Uniformly distributed throughout the parcel; and
    c. Points or features will be shown on the base map.

3. FIELD PROCEDURES: See Page 10.

4. MAP UNIT PURITY: See Page 10.

5. IDENTIFICATION OF MAP UNITS

When New Hampshire site-specific maps are being produced for subdivision or site plan review, the map unit is identified according to the New Hampshire State-Wide Numerical Soils Legend, a companion document to these Site-Specific Standards.

6. SOILS LEGEND

A. The soils mapping legend will conform to the New Hampshire State-Wide Numerical Soils Legend, and subsequent amendments, published by the USDA Natural Resources Conservation Service, as an official document of the National Cooperative Soil Survey. The State Soils legend is also available on the Internet at: www.nh.nrcs.usda.gov .

B. Map symbols will be composed of 1, 2, 3, or 4 digits followed by a capital letter designating slope. A map symbol denominator of rk, vpd or pd is available to recognize map units that are shallow to bedrock (<20”), very poorly drained, or poorly drained, or have named components that meet this criteria, respectively, if requested by the client.

C. Other than the exception stated in 6.B, above, the map symbols, themselves, will not have any significance or reference to soil properties, landscape position or behavioral characteristics.

D. Soil series, phases of soil series, or soil complexes currently not recognized by the state-wide numerical legend will be assigned a map unit number by the State Soil Scientist or the NRCS MLRA Project Leader contingent upon satisfactory documentation. Satisfactory documentation is defined by meeting all of the follows:

a. The individual making the request for State legend numbers must be on the list of Certified Soil Scientists recognized by the New Hampshire Board of Certification of Natural Scientists.

b. Verbal confirmation, at the time of the request, stating that the soils mapping is being carried out on official business of the company, agency or firm, is being made for a client, and that satisfactory map unit descriptions will be part of the final product presented to the client.

c. Verbal indication, at the time of the request, of the completion deadline for the project, and assurance that a copy of the map unit descriptions will be submitted to the State Soil Scientist within a reasonable time after the completion deadline.

d. Satisfactory map unit descriptions are received by the State Soil Scientist. (See Appendix A for example.) Minimum requirements for map unit descriptions are as follows:

1. Map unit symbol and map unit name;
2. Landscape setting - and surface features that characterize the map unit;
3. Drainage class and parent material;
4. If a complex, the estimated percent of the named components that make up the complex. If significant, describe the pattern of the components;
5. Brief profile description, including, but not limited to, horizon thickness, color, texture, redoximorphic features, structure, and consistence;
6. Nature of dissimilar inclusions, and estimated percent within the map unit; and
7. Copy of all field notes and field documentation used to justify the map unit.

e. If a particular map unit is not approved by the State Soil Scientist or MLRA Project Leader, and a state legend number not provided, and satisfactory resolution cannot be achieved, the consulting Soil Scientist will employ the use of an alpha map symbol and a statement added to the final product indicating this map product is not within the technical standards of the National Cooperative Soil Survey because....

f. Every effort will be made by the State Soil Scientist and State Soil Dataset Manager to fulfill requests for state legend numbers as quickly as possible. The State Soil Scientist should be contacted first. If he/she is not available, and cannot be reached within a reasonable length of time, the NH Dataset Manager should be contacted. These individuals can be contacted in a number of different ways: State Soil Scientist (603) 868-9931 x 128
donald.keirstead@nh.usda.gov

NH Dataset Manager
(603) 223-6023: office
peter.whitcomb@nh.usda.gov

E. In some New Hampshire municipalities, site-specific mapping standards for subdivision or site plan review may require, a HIS map symbol based on the HIS connotative legend as defined in SSSNNE Special Publication No.1, (dated 2008 update). This connotative legend has been made part of the New Hampshire Supplement as a convenience to the person using these Standards. The HIS connotative legend does not meet the site-specific standards defined in this document.

This connotative legend number will be placed in parentheses directly below or adjacent to the site-specific soil map unit symbol.

7. MAP LABELING

A. Site-specific soil surveys prepared by a Certified Soil Scientist, working in the private sector, shall be stamped and signed by the Certified Soil Scientist indicating certification by the State of New Hampshire under RSA 310-A.

B. With the exception of 7b. below, the following statement will be included on all map products produced by Certified Soil Scientists working in the private sector:

"This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, intended for use in [state purpose of the soil map]. It was produced by a certified Soil Scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map."

a. This statement will not be used in situations as explained in paragraph 6.A.4.e of these standards.

b. Should a client impose constraints on the certified Soil Scientist that precludes him or her from producing a product that meets the standards of the National Cooperative Soil Survey, a statement will be added to the map labeling indicating: "This map product is not within the technical standards of the National Cooperative Soil Survey, because..."

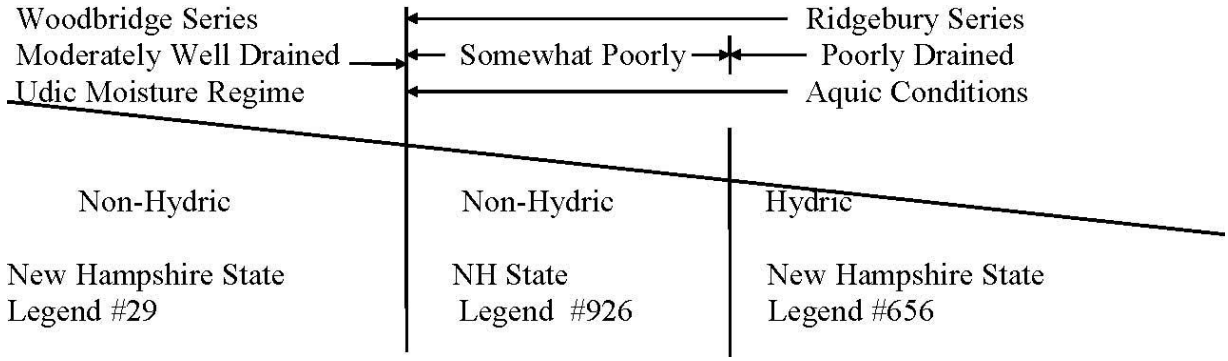
8. REPORT TO ACCOMPANY SOIL MAP

In New Hampshire, the Soil Scientist completing the soil map and accompanying report must be certified with the New Hampshire State Board of Natural Scientists, or have reciprocal rights.

9. SOIL DRAINAGE CLASS INTERPRETIVE LIMITS

Soil series in New Hampshire that are identified on the National List of Hydric soils are currently being delineated and mapped based on the field indicators which qualify that series for being hydric. For some soil series, the drier end of the range-in-characteristics is handled as a separate map unit as identified in the New Hampshire State-Wide Numerical Soils Legend and catena key. See Appendix F and G

Toposequence of two soils whose range in characteristics do not coincide with the



break in hydric soil properties. The moderately well drained Woodbridge series is classified as a coarse-loamy, mixed, mesic, Aquic Dystrochrepts. The somewhat poorly and poorly drained Ridgebury series is classified as a coarse-loamy, mixed, nonacid, mesic, Aeric Epiaquepts. In New Hampshire, this situation has been addressed by separating the Ridgebury Series into a hydric and non-hydric component.

Disturbed Soil Mapping Unit Supplement for New Hampshire DES AoT Site Specific Soil Maps

Introduction

The NRCS NH State-Wide Legend, as amended, contains a number of distinct map units used for identifying areas of soils altered or disturbed by human influence. However, in preparing the required Site Specific Soils Maps for compliance with NH Department of Environmental Services Alteration of Terrain (AoT) rules, additional information is often needed and desired. This supplement provides a means to supply the user a more detailed soil mapping unit description to meet this need.

Purpose

To provide Soil Scientists with additional soil mapping tools for disturbed sites and miscellaneous areas to enhance site specific soil maps and interpretations to reflect new requirements under the revised NH Alteration of Terrain regulations. This supplement is intended to allow the creation of soil maps with mapping units that can be expanded beyond those of the NRCS NH State-Wide Numerical Legend and the standards of the National Cooperative Soil Survey for disturbed units in order to provide specific information useful in preparation of site specific soils maps and reports to comply with NHDES Env-Wq 1500-Alteration of Terrain.

Note that the disturbed soil supplement has been created by SSSNNE and is not a product of the NRCS or the National Cooperative Soil Survey. Additionally, the supplemental legend can only be used in conjunction with the Site Specific Soil Mapping standards and cannot be used to create a stand-alone soils map.

For the purposes of this supplement, the definition of disturbed land, including excavate and fill, is as defined by RSA 485-A: 6, VIII; RSA 485-A: 17, and NHDES Env-Wq 1500.

Map Notation

Notation on the Site Specific Soil Map completed to comply with the NH AoT rules should include the following disclaimer:

Site-Specific Soil Map

1. This detailed Site-Specific Soil Map conforms to the standards of SSSNNE Publication No. 3, as amended, “Site-Specific Soil Mapping Standards for NH and VT”.

2. This map has been prepared to comply with soil mapping requirements of RSA 485 A: 17and NHDES Env-Wq 1500, Alteration of Terrain.

3. See accompanying narrative report for methodology, map symbol legend, and interpretations.

Map Symbol Denominators for Disturbed Unit Supplements

The map symbols for Site-Specific Soil Mapping of disturbed soils in New Hampshire is a two part symbol with parts separated by a forward slash (***/***).

The first part consists of the USDA-NRCS Disturbed Map Unit symbol from the NH State-Wide Numerical Soil Legend. The map symbol is composed of 1 to 3 digits followed by a capital letter designating slope.

The second part consists of symbols of the SSSNNE NH Disturbed Soil Supplement to the Site Specific Soil Survey Standards, as detailed below. The disturbed map symbol is composed of 5 lower case letters.

Thus a Site Specific map symbol for a map prepared for an AoT application would be formatted as follows:

400A/aaaaa

These SSSNNE NH Disturbed Soil Supplemental symbols can only be used in conjunction with the USDA-NRCS Disturbed Map Unit symbols for the NH Statewide Numerical Soil Legend.

Supplemental Symbols

Supplemental symbols may be used at the discretion of the Certified Soil Scientist who creates the Site Specific Soil Survey. The five components of the Disturbed Soil Mapping Unit Supplement are as follows:

Symbol 1: Drainage Class

a-Excessively Drained
b-Somewhat Excessively Drained
c-Well Drained
d-Moderately Well Drained
e-Somewhat Poorly Drained
f-Poorly Drained
g-Very Poorly Drained
h-Not Determined

Symbol 2: Parent Material (of naturally formed soil only, if present)

a-No natural soil within 60”
b-Glaciofluvial Deposits (outwash/terraces of sand or sand and gravel)
c-Glacial Till Material (active ice)
d-Glaciolacustrine very fine sand and silt deposits (glacial lakes)
e-Loamy/sandy over Silt/Clay deposits
f-Marine Silt and Clay deposits (ocean waters)
g-Alluvial Deposits (floodplains)

h-Organic Materials-Fresh water wetlands
i- Organic Materials-Tidal wetlands

Symbol 3: Restrictive/Impervious Layers

a-None
b-Bouldery surface with more than 15% of the surface covered with boulders
c-Mineral restrictive layer(s) are present in the soil profile less than 40 inches below the soil surface such as hard pan, 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 layers, see "Soil Manual for Site evaluations in NH" 2nd Ed., (page 3-17, figure 3-14)
d-Bedrock in the soil profile; 0-20 inches
e-Bedrock in the soil profile; 20-60 inches
f-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
g-Subject to Flooding
h–Man-made impervious surface including pavement, concrete, or built-up surfaces (i.e. buildings) with no morphological restrictive layer within control section

Symbol 4: Estimated Ksat* (most limiting layer excluding symbol 3h above).

a- High.
b- Moderate
c- Low
d- Not determined *See "Guidelines for Ksat Class Placement" in Chapter 3 of the Soil Survey Manual, USDA

Symbol 5: Hydrologic Soil Group*

a-Group A
b-Group B
c-Group C
d-Group D
e-Not determined

*excluding man-made surface impervious/restrictive layers

Vermont Supplement

INTRODUCTION

his document represents the official reference for Site-Specific Soil Mapping Standards and Order 1 Soil Mapping Standards in Vermont for use by the private soil consultant and NRCS Soil Scientists. The State of Vermont does not have a certification program for Soil Scientists. Current state legislation citing the NRCS as the source of soil resource information can refer to the site-specific soil standards as the means by which the soil information is obtained if appropriate.

VERMONT SITE-SPECIFIC/ORDER 1 SOIL MAPPING STANDARDS

1. **MAPPING SCALE:** See page 5

2. **BASE MAPS**

   In addition to the recognized map photobase allowed for site-specific mapping, the Vermont Orthophotos are also suitable for site-specific soils mapping in Vermont. This photobase is used by the Vermont Center for Geographic Information Inc. for digital map products and meets National Map Accuracy Standards.

3. **FIELD PROCEDURES:** See page 10

4. **MAP UNIT PURITY:** See page 10

5. **IDENTIFICATION OF MAP UNITS:** See page 13

6. **SOILS LEGEND**

   A. The soil mapping legend will conform to the Vermont Site-Specific/Order 1 Soils Legend and subsequent amendments, established and maintained by the USDA Natural Resources Conservation Service as an official document of the National Cooperative Soil Survey.

   B. Map symbols will be composed of a four digit number to recognize the taxonomic unit, and some phase criteria, followed by an upper case letter to indicate slope phase.

   C. Soil series, phases of soil series, or soil complexes currently not listed in the Vermont Site-Specific/Order 1 Soils Legend will be reviewed by the Vermont State Soil Scientist for approval into the state-wide legend contingent upon satisfactory documentation. Satisfactory documentation is comprised of all of the following:

   a. Written confirmation that 1)the soils mapping is being carried out on official business of the company, agency or firm, 2) that it is being made for a client, and 3) that satisfactory map unit descriptions will be part of the final product presented to the client.

b. Written indication of the completion deadline for the project and assurance that a copy of the map unit descriptions will be submitted to the Vermont State Soil Scientist within a reasonable time after the completion deadline.

c. Satisfactory map unit descriptions are received by the Vermont State Soil Scientist. Minimum requirements for map unit descriptions include all of the following:

1. Map unit symbol and map unit name;
2. Landscape setting - and surface features that characterize the map unit;
3. Drainage class and parent material;
4. If a complex, the estimated percent of the named components that make up the complex. Describe the pattern of the components if significant;
5. Brief profile description, including, but not limited to: Horizon thickness, color, texture, redoximorphic features, structure, and consistence;
6. Nature of dissimilar inclusions, and estimated percent within the map unit; and
7. Copy of all field notes and field documentation used to justify the map unit.

d. If a particular map unit is not approved by the Vermont State Soil Scientist, the consulting Soil Scientist will employ the use of special notation and a statement added to the final product indicating, “This map product is not within the technical standards of the National Cooperative Soil Survey because....”.

e. The Vermont State Soil Scientist can be contacted as follows:

USDA Natural Resources Conservation Service
451 West Street
Amherst MA 01002-2953
Al.Averill@ma.usda.gov
Phone: (413) 253-4382

7. MAP LABELING

A. Site-specific soil surveys shall be prepared by a qualified Soil Scientist, and shall be signed by the Soil Scientist completing the work.

B. With the exception of 7.B.1 below, the following statement will be included on all map products produced by consulting Soil Scientists working in the private sector. This statement is not required for map products produced by USDA NRCS Soil Scientists.

"This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product produced by a

private soil consultant and is not a product of the USDA Natural Resources Conservation Service. There is a narrative report that accompanies this map."

a. Should a client impose constraints on the consulting Soil Scientist that precludes him or her from producing a product that meets the standards of the National Cooperative Soil Survey, a statement will be added to the map label indicating: "This map product is not within the technical standards of the National Cooperative Soil Survey, because...."

APPENDIX A

SAMPLE MAP UNIT DESCRIPTIONS

CONSOCIATION

142C Monadnock fine sandy loam, 8 to 15 percent slopes

The soil is well drained and formed in a loamy mantle overlying sandy glacial till. It occurs on side slopes and knolls within the mapping area.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is reddish brown to yellowish brown fine sandy loam about 15 inches thick. The substratum, to a depth of 60 inches or more, is olive brown gravelly loamy sand.

Included with this soil in mapping are small areas with a dense, very firm substratum that may perch water for a brief period of time in the spring and during periods of heavy rainfall. Also included are soils that are sandier in the upper part. These inclusions make up as much as 15 percent of the map unit.

COMPLEX

60B Tunbridge-Berkshire Complex, 3 to 8 percent slopes, very stony

This map unit consists of well drained soils formed in glacial till on bedrock controlled hills and ridges. These soils occur in such an intricate pattern that it was not practical to separate them at the scale selected for mapping. The Tunbridge soil is moderately deep to bedrock and occurs on ridges and hilltops above the Berkshire soil and makes up about 50 percent of the map unit. The Berkshire soil is very deep with bedrock occurring below 60 inches and makes up about 40 percent of the map unit. The remaining 10 percent of the map unit is made up of small areas that contain more sand in the subsoil and substratum.

Typically, the Tunbridge soil has a black fine sandy loam surface layer about 4 inches thick. The subsoil, about 22 inches thick, is yellowing red to strong brown gravelly fine sandy loam. Mica schist bedrock occurs at about 26 inches.

Typically, the Berkshire soil has a very dark grayish brown surface layer about three inches thick. The subsoil, about 32 inches thick, is dark brown fine sandy loam. The substratum, to a depth of 60 inches or more, is grayish brown gravelly sandy loam.

MISCELLANEOUS AREAS

Udorthents, refuse substratum

This map unit consists of areas that have been used for refuse disposal. Areas have been constructed of alternating layers, several inches to several feet thick, of refuse and soil material. A surface cover of loamy soil material, about 12 inches thick, occurs over most of the map unit.

Appendix B

Appendix C Access to Web Sites:

Society of Soil Scientists of Northern New England: http://www.sssnne.org

http://soils.usda.gov/sitemap.html

The web address highlighted above provides a direct link to many of the major soil sites on the Internet. The following is a partial listing of direct links.

ef

Soil Survey	**Photo Gallery**
Web Soil Survey	State Soils
Soil Data Mart	Soil Profiles
Listing of Soil Surveys by State	Soil Landscapes
Status Maps	The Twelve Soil Orders
National Soil Characterization Data	NRCS Photo Gallery
Soil Geography	Earth Science
Soil Geochemistry Spatial Database	
Soil Research Results	**Soil Use and Management**
	Hydric Soils
Technical References	Soil Quality
National Soil Survey Handbook	Soil Risks and Hazards
Soil Survey Manual	State of the Land
Technical Notes	Thematic Maps
Soil Classification	Urban Soil Uses
The Twelve Orders of Soil Taxonomy	Urban Soil Primer
Field Book for Describing and Sampling Soils	World Soil Resources
Laboratory Methods Manual	
Soil Classification	**Partnerships**
	National Cooperative Soil Survey
Soil Education	List of Universities
Smithsonian Soils Exhibit	Professional Organizations
Soil Facts	
Soil Science Glossary	
State Soils	
K-12	
Organizations	
Professional Development	

Appendix D
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 of 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

Appendix E
Summary New England Hydric Soil Indicators, V-4.0

S1. - Sandy Mucky Mineral

Technical Description: A layer of mucky modified sandy soil material 5 cm (2 in) or more thick starting at a depth less than or equal to 15 cm (6 in) from the soil surface.

S4. – Sandy Gleyed Matrix

Technical Description: A gleyed matrix that occupies 60 percent or more of a layer starting at a depth less than or equal to 15 cm (6 in) from the soil surface.

S5. – Sandy Redox

Technical Description: A layer starting at a depth less than or equal to 15 cm (6 in) from the soil surface that is at least 10 cm (4 in) thick and has a matrix with 60 percent or more chroma of 2 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings.

S6. – Stripped Matrix

Technical Description: A layer starting at a depth less than or equal to 15 cm (6 in) from the soil surface in which iron/manganese oxides and/or organic matter have been stripped from the matrix and the primary base color of the soil material has been exposed. The stripped areas and translocated oxides and/or organic matter form a faintly contrasting pattern of two or more colors with diffuse boundaries. The stripped zones are 10 percent or more of the volume and are rounded.

S7. – Dark Surface

Technical Description: A layer 10 cm (4 in) thick starting at a depth less than or equal to 15 cm (6 in) from the soil surface with a matrix value of 3 or less and chroma of 1 or less. When viewed with a 10x or 15x hand lens, at least 70 percent of the visible soil particles must be masked with organic material. When viewed without a hand lens, the material appears to be nearly 100 percent masked. The matrix color of the layer immediately below the dark layer must have the same colors as those described above or any color that has a chroma of 2 or less.

S8. - Polyvalue Below Surface

Technical Description: A layer with a value of 3 or less and chroma of 1 or less starting at a depth less than or equal to 15 cm (6 in) from the soil surface. When viewed with a 10x or 15x hand lens, at least 70 percent of the visible soil particles in this layer must be masked with organic material. When viewed without a hand lens, the material appears to be nearly 100 percent masked. Immediately below this layer, 5 percent or more of the soil volume has a value of 3 or less and chroma of 1 or less and the remainder of the

soil volume has a value of 4 or more and chroma of 1 or less to a depth of 30 cm (12 in) or to the spodic horizon, whichever is less.

S9. – Thin Dark Surface

Technical Description: A layer 5 cm (2 in) or more thick, starting at a depth less than or equal to 15 cm (6 in) from the soil surface, with a value of 3 or less and chroma of 1 or less. When viewed with a 10x or 15x hand lens, at least 70 percent of the visible soil particles in this layer must be masked with organic material. When viewed without a hand lens, the material appears to be nearly 100 percent masked. This layer is underlain by a layer(s) with a value of 4 or less and chroma of 1 or less to a depth of 30 cm (12 in) or to the spodic horizon, whichever is less.

F2. – Loamy Gleyed Matrix

Technical Description: A gleyed matrix that occupies 60 percent or more of a layer starting at a depth less than or equal to 30 cm (12 in) from the soil surface.

F3. – Depleted Matrix

Technical Description: A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a) 5 cm (2 in) if the 5 cm (2 in) starts at a depth less than or equal to 10 cm (4 inches) from the soil surface, or
b) 15 cm (6 in) starting at a depth less than or equal to 25 cm (10 in) from the soil surface.

F6. – Redox Dark Surface

Technical Description: A layer that is at least 10 cm (4 in) thick, starting at a depth less than or equal to 20 cm (8 in) from the mineral soil, and has:

a) Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings, or
b) Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

F7. – Depleted Dark Surface

Technical Description: Redox depletions with a value of 5 or more and chroma of 2 or less in a layer that is at least 10 cm (4 in) thick, starting at a depth less than or equal to 20 cm (8 in) from the mineral soil surface, and has:

a) Matrix value of 3 or less and chroma of 1 or less and 10 percent or more redox depletions, or
b) Matrix value of 3 or less and chroma of 2 or less and 20 percent or more redox depletions.

F8. – Redox Depressions

Technical Description: In closed depressions subject to ponding, 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings in a layer that is 5 cm (2 in) or more thick and starts at a depth less than or equal to 10 cm (4 in) from the soil surface.

Indicators for Problem Hydric Soils

To use these indicators, follow the procedure described in the section on Problematic Hydric Soils in Chapter 5 of the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (USACOE, 2011). Assistance from an experienced soil scientist may be required.

TA6. – Mesic Spodic

Technical Description: A layer 5 cm (2 in) or more thick, starting at a depth less than or equal to 15 cm (6 in) from the mineral soil surface that has value of 3 or less and chroma of 2 or less and is underlain by either:

a) One or more layers 8 cm (3 in) or more thick occurring at a depth less than or equal to 30 cm (12 in) from the mineral soil surface, having value and chroma of 3 or less, and showing evidence of spodic development; or
b) One or more layers 5 cm (2 in) or more thick occurring at a depth less than or equal to 30 cm (12 in) from the mineral soil surface, having value of 4 or more and chroma of 2 or less, and directly underlain by a layer(s) 8 cm (3 in) or more thick having value and chroma of 3 or less and showing evidence of spodic development.

A10. – 2 cm Muck

Technical Description: A layer of muck 2 cm (0.75 in) or more thick with a value of 3 or less and chroma of 1 or less, starting at a depth less than or equal to 15 cm (6 in) from the soil surface.

A16. – Coast Prairie Redox

Technical Description: A layer starting at a depth less than or equal to 15 cm (6 in) from the soil surface that is at least 10 cm (4 in) thick and has a matrix chroma of 3 or less with 2 percent or more distinct or prominent redox concentrations occurring as soft masses and/or pore linings.

NE-S1. - Three Chroma Sands

Technical Description: A layer 10 cm (4 in) or more thick with value 3 or less and chroma 1 or less that is directly underlain by a layer that begins starting at a depth less than or equal to 30 cm (12 in) from the soil surface that has a matrix value 4 or more, chroma 3 or less with 2% or more redox features that are prominent or distinct.

S3. – 5 cm Mucky Peat or Peat

Technical Description: A layer of mucky peat or peat 5 cm (2 in) or more thick with a value of 3 or less and chroma of 2 or less, starting at a depth less than or equal to 15 cm (6 in) from the soil surface, and underlain by sandy soil material.

NE-F1. - Glaciated Northeast Red Parent Material

Technical Description: A layer derived from red parent materials that is at least 15 cm (6 in) thick, starting at a depth less than or equal to 25 cm (10 in) from the soil surface with a hue of 7.5YR or redder, with a matrix that has a value and chroma of 2 through 4. The layer must contain 5 percent or more distinct or prominent depletions and/or redox concentrations occurring as soft masses or pore linings.

NE-A1. - Frigid Spodic

Technical Description: A layer starting at a depth less than or equal to 15 cm (6 in) from the soil surface that has value of 4 or more and chroma of 2 or less in which iron, manganese and other oxides have been stripped from the soil matrix and the primary base color of the soil material has been exposed, and there are 2 percent or more redox concentrations occurring as soft masses or pore linings. The stripped areas and translocated oxides and/or organic matter form a faintly contrasting pattern of two or more colors with diffuse boundaries. The layer immediately below the stripped layer must have value 3 or less and chroma 2 or less due to the accumulation of translocated organic matter, iron (and other oxides), and be at least 8 cm (3 in) thick.

F12. – Iron-Manganese Masses

Technical Description: On floodplains, a layer 10 cm (4 in) or more thick with 40 percent or more chroma of 2 or less and 2 percent or more distinct or prominent redox concentrations occurring as soft iron and manganese masses with diffuse boundaries. The layer starts at a depth less than or equal to 20 cm (8 inches) from the soil surface. Iron-manganese masses have value and chroma of 3 or less. Most commonly, they are black. The thickness requirement is waived if the layer is the mineral surface layer.

F19. - Piedmont Floodplain Soils

Technical Description: On floodplains, a mineral layer at least 15 cm (6 in) thick starting at a depth less than or equal to 25 cm (10 in) from the soil surface, with a matrix (60 percent or more of the volume) chroma of less than 4 and 20 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

F21. – Red Parent Material

Technical Description: A layer, derived from red parent materials (see glossary), is at least 10 cm (4 in) thick, starting at a depth less than or equal to 25 cm (10 in) from the soil surface with a hue of 7.5YR or redder. The matrix has a value and chroma greater than 2 and less than or equal to 4. The layer must contain 10 percent or more

depletions and/or distinct or prominent redox concentrations occurring as soft masses or pore linings. Redox depletions should differ in color by having:

a) A minimum difference of one value higher and one chroma lower than the matrix, or
b) Value of 4 or more and chroma of 2 or less.

F22. – Very Shallow Dark Surface

In depressions and flood plains subject to frequent ponding and/or flooding, one of the following must be observed:

a) If bedrock occurs between 15 cm (6 in) and 25 cm (10 in) of the soil surface, a layer at least 15 cm (6 in) thick starting at a depth less than or equal to 10 cm (4 in) from the soil surface with a value of 2.5 or less and chroma of 1 or less, and the remaining soil to bedrock must have the same colors as above or any other color that has a chroma of 2 or less.
b) If bedrock occurs at a depth less than or equal to 15 cm (6 in) from the soil surface, more than half of the soil thickness must have a value of 2.5 or less and chroma of 1 or less, and the remaining soil to bedrock must have the same colors as above or any other color that has a chroma of 2 or less.