

Site-Specific Soil Mapping Standards for New Hampshire and Vermont

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 Society seeks to educate itself 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.

Society of Soil Scientists of Northern New England, P.O. Box 986, Durham, NH 03824.

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**Society of Soil Scientists of
Northern New England**

SSSNNE Special Publication No. 3

**SITE-SPECIFIC SOIL MAPPING STANDARDS
FOR NEW HAMPSHIRE AND VERMONT**

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The activities conducted under these standards will be in compliance with the nondiscrimination provisions contained in the titles VI and VII of the Civil Rights Act of 1964, as amended; Civil Rights Restoration Act of 1987 (Public Law 100-259); and other nondiscrimination statutes: namely, section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975. The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791.

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SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT

SSSNNE Special Publication No. 3
Version 2.0, January 1999

INTRODUCTION

The Site-Specific Soil Mapping Standards for New Hampshire and Vermont (SSSMS) described in this document represent an update to Version 1 published in June of 1997. The Standards represent an enhancement of the Order 1 Mapping Standards for New Hampshire published in Society of Soil Scientists of Northern New England (SSSNNE) Special Publication No. 2 while incorporating some of the more specific criteria previously included in the High Intensity Soil (HIS) Mapping Standards for New Hampshire (SSSNNE Special Publication No. 1). Some of the more noticeable improvements include: standards for defining and using symbols for special features; drainage class interpretive limits defined in accordance with the Field Indicators for Identifying Hydric Soils in New England; and specialized format that will facilitate region-wide adoption of these standards by the New England States.

Site-specific soils mapping is synonymous with Order 1 soils mapping performed by the USDA/NRCS National Cooperative Soil Survey (NCSS). The primary distinction is that the new standards include criteria appropriate for subdivision and site plan review or biosolids management in New Hampshire and allow for more stringent requirements designed to be applicable to New Hampshire, Vermont and other states. The basic criteria are augmented by a supplement specific to each state.

The term "Order 1" is used by the National Cooperative Soil Survey to describe the most detailed level of soils mapping performed under this Federal program. The Order 1 Soil Mapping Standards for New Hampshire (SSSNNE Special Publication No.2) were originally established based on the National Cooperative Soil Survey Order 1 Standards. The "site-specific" term used for this document is based on NCSS Order 1 mapping standards, with enhancements in specific 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.

These Standards represent the official recognition of site-specific soil mapping standards in Vermont. This document has been developed as a guide for professional soil scientists when making site-specific soil maps in New Hampshire and Vermont. These site-specific maps are at various scales depending on the intended use and need for precision. These Standards update and supersede SSSNNE Special Publication No. 3, Version 1, dated July, 1997. In June of 2002, these Standards will supersede SSSNNE Special Publication No. 1 High Intensity Soil Maps for New Hampshire, dated January 1994.

The 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.

The SSSMS is backed by the most advanced soil research program in the world. 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.

HOW TO USE THIS DOCUMENT

The various criteria required to meet site-specific mapping standards are described on the following pages and are designed to be applicable throughout New England. Some additional criteria unique to individual states include use of soil legends and map labeling. State supplements are appended to describe the state specific requirements. The user of this document must also follow the standards detailed in the supplement for the state 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 by the Society of Soil Scientists of Northern New England in cooperation with 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 Society seeks to educate itself 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 purchased through the Society of Soil Scientists of Northern New England, P.O. Box 986, Durham, NH 03824. An order form is attached as Appendix F.

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 986
Durham, NH 03824

State Soil Scientist
USDA Natural Resources Conservation Service
Federal Building, 2 Madbury Road
Durham, NH 03824

Soil Liaison
USDA Natural Resources Conservation Service
69 Union Street
Winooski, VT 05404

SITE-SPECIFIC SOIL MAPPING STANDARDS¹

1. MAP SCALE

- A. Site-Specific mapping 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. Site-Specific base map scale shall be 1: 12,000 (1" =1000') or larger. (SSM 2.6-2.9)

2. MAPPING BASE

The soil scientist will insure that site-specific 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. Site specific 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 unpredictable, 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.

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

- 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.

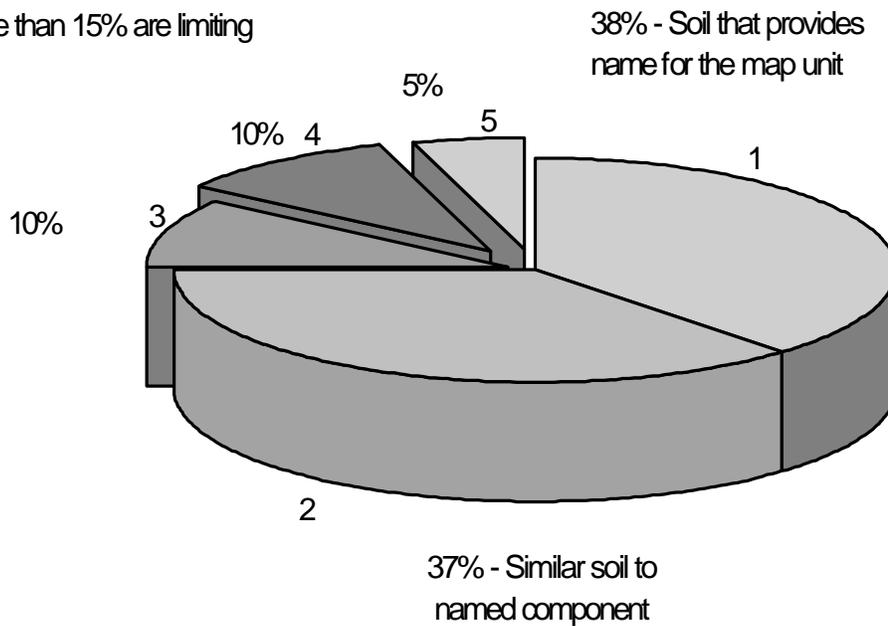
A. Consociations

(Numbers refer to the diagram 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 unit can be made at the discretion of the soil scientist.)

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



COMPONENTS OF A CONSOCIATION

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 refinements in classification or definition of an 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

<u>Alpha Slope Symbol</u>	<u>Standard Range</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
A	0-3%	0%	1-3%
B	3-8%	1-3%	5-8%
C	8-15%	4-8%	8-16%
D	15-25%	10-16%	18-30%
E	25-50%	20-30%	30-60%
F	50%+	45-65%	none

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 Phases

<u>Stony Class</u>	<u>Phase</u>	<u>Percent Surface Cover</u>	<u>Distance Between Stones</u>
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. Disturbed Map Units and Miscellaneous Land Types

Disturbed 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 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

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 published by the New England Interstate Water Pollution Control Commission (NEIWPC). This NEIWPC 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 basically 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.

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 scientist is certified, then the certification stamp is also required;

8. Other distinguishing 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. SOIL DRAINAGE CLASS INTERPRETIVE LIMITS

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

The interpretive limits for the very poorly drained and poorly drained drainage class are based on the Field Indicators for Identifying Hydric Soils In New England, Version 2, dated July 1998, and any supplements or subsequent versions to this document. For a full explanation on the use and interpretation of the field indicator, refer to the Field Indicators for Identifying Hydric Soils In New England.

The Field Indicators for Identifying Hydric Soils in New England 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 are updated, these Standards should also be updated. Should, at any time, these Standards not agree with the Field Indicators for Identifying Hydric Soils for New England, the Field Indicators will take precedence over these Standards.

It needs to be emphasized that the 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 contain aquic conditions sufficient to classify in the Aquic Suborder may allow for non-hydric soil properties within the range in characteristics.

Soil series that are identified on the National List of Hydric soils are currently being delineated and mapped based on the field indicators that qualify that series as being hydric. The dryer end of the series range is typically handled as a separate map unit as identified in state legends or catina keys, or is handled as a similar inclusion within the mapping concept of the next better drained soil in the catina (see page 39).

These changes to the very poorly, poorly and somewhat excessively drained classes represent a departure from the original HIS standards. These adopted standards represent the very latest thinking in the field of soil science for the identification of hydric soils and for other land use interpretations.

VERY POORLY DRAINED SOILS*

- II. Soils that are flooded daily by tides
- III. Soils that have aquic conditions within the upper part **and**
 - A. Have an organic surface layer greater than 16 “ thick, **or**
 - B. Have an organic surface layer 8 to 16” thick **and**
is directly underlain by a depleted or gleyed matrix.
 - C. Have an organic surface layer 4 to 8” thick, **or**
a mucky A or Ap horizon **and**
is directly underlain by a depleted or gleyed matrix
 - G. Do not have a spodic horizon; dominant texture in upper 20” is loamy fine sand or coarser **and**
 - 1. have an organic surface layer 4 to 8 thick, or mucky A or Ap directly underlain with 5% or more redox features.

* Table outline based on the Field Indicators for Identifying Hydric Soils in New England, Version 2, July 1998

POORLY DRAINED SOILS*

Soils that have aquic conditions in the upper part and one or more of the following:

III. Soils that have aquic conditions within the upper part and one or more of the following:

- D. Within 10" **and** directly underlying an A or Ap, is a depleted or gleyed matrix.
- E. Within 20" and directly underlying a thick or very thick dark A or Ap, a depleted or gleyed matrix 4" or more thick.
- F. Have a spodic horizon **and**
 - 1. within 6" an E horizon with 5% or more redox features **and** directly underlain by a spodic horizon **with**
 - a) redox features, **or**
 - b) redox features directly underlying a dark Bh or Bhs
 - 2. within 10" and directly underlying a dark A **or** shallow E horizon, a dark Bh or Bhs, greater than 2", directly underlain with 5% or more redox features.
 - 3. within 10" and directly underlying a dark Ap horizon is
 - a) an E horizon with 5% or more redox features directly underlain by a horizon with redox features, **or**
 - b) a dark Bh or Bhs directly underlain by 5% or more redox features, **or**
 - c) a Bs horizon with 5% or more redox features.
- G. Do not have a spodic horizon; dominant texture in upper 20" is loamy fine sand or coarser **and**
 - 2. within 10" and directly underlying a dark A or Ap, a horizon with matrix color chroma 3 or less, value 4 or more with 5% or more redox features.
 - 3. within 15" and directly underlying a thick, very dark Ap, a horizon with matrix color chroma 3 or less, value 4 or more with 5% redox features.
- H. Do not have a spodic horizon; dominant texture in upper 20" is finer than loamy fine sand **and**
 - 1. within 10" and directly underlying a dark A or Ap, a horizon with 10% or more redox depletions **and** within 20", a horizon with a depleted or gleyed matrix
 - 2. within 15" and directly underlying a thick, very dark Ap
 - a) a horizon with 20% or more redox depletions **and** within 20" a horizon with a depleted or gleyed matrix
 - b) 10% or more redox depletions **and** within 20" a horizon with a depleted or gleyed matrix **and** within 6" there is 5% or more redox features
- I. Any soil with a very dark A or Ap less than 10" thick **and** directly underlain by horizon with color matrix chroma 3 or less with 10% or more redox features **and** within 24" has redox features, **and**
 - 1. within 6" has 5% or more redox features, **or**
 - 2. within 6" has 2% or more Fe/Mn nodules and/or concretions.

* Table outline based on the Field Indicators for Identifying Hydric Soils in New England, Version 2, July 1998

With the exception of the somewhat excessively drained drainage class, the interpretive limits for somewhat poorly drained through excessively drained were developed by the Society of Soil Scientists of Northern New England, 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.

SOMEWHAT POORLY DRAINED SOILS

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

MODERATELY WELL DRAINED SOILS

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

Soils that have textures in any horizon within the particle size control section of loamy very fine sand or finer, and have moderate permeability

SOMEWHAT EXCESSIVELY DRAINED SOILS

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

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

10. 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.

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 - 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 than 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 - map unit which is employed when two or more kinds of soil (taxa) occur in a regularly repeating pattern so intricate that the components cannot be delineated separately at the scale of mapping.

CONSOCIATION - soil 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 1/2 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.

FOLI 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 surface, with a high volume of organic soil materials and 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, Seventh Edition, 1996. <http://www.statlab.iastate.edu/soils/keytax/>

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 MOTTLES - often reddish brown features which are remains of an earlier water table situation. Commonly, relict mottles 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 mottles 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 need 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.

SITE-SPECIFIC SOIL MAPPING - 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 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 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 a larger map scale.

SOIL MAP UNIT - 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, or a complex of two soil types, with a defined set of soil properties.

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 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 principals 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.

<http://www.nhq.nrcs.usda.gov/BCS/soil/smanual.html>

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

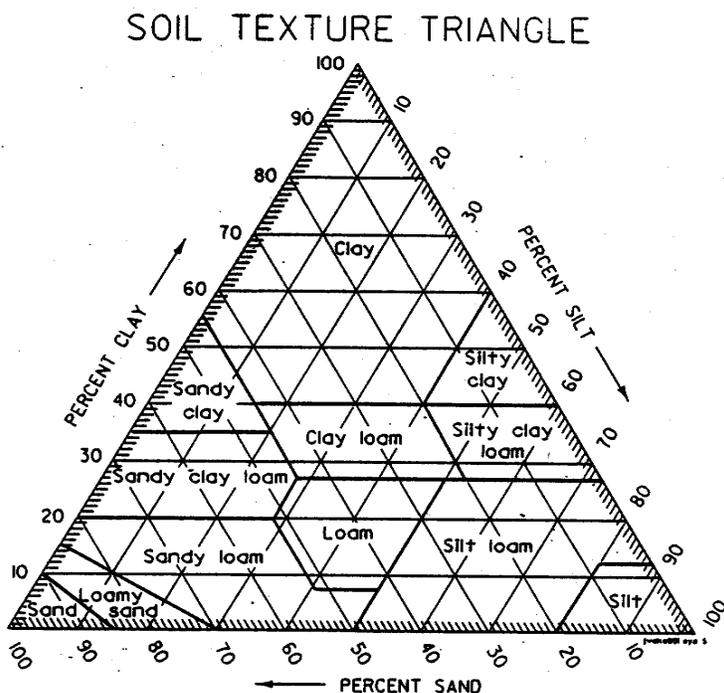


Chart showing the percentages of sand, silt and clay in the basic textural classes.

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

SPODIC HORIZON- 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 *Keys to Soil Taxonomy*)

SPOT SYMBOLS - see Special Features

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.

11. 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.

The initial meeting of the Subcommittee was held on January 8, 1997, in Concord, New Hampshire. At this meeting, Ray Lobdell volunteered to serve as Chair.

The following individuals are currently serving on this subcommittee.

Ray Lobdell, Soil Scientist, Chair
Lobdell Associates, Inc.
88 Gale Chandler Road
Landaff, NH 03585

Mary Gospodarek, Soil Scientist
Bredberg & Associates
Paul Hill Road, P.O. Box 7
Eaton Center, NH 03832

Francesca Latawiec, Principal Planner
NH Office of State Planning
2 1/2 Beacon Street
Concord, NH 03301

Sid Pilgrim, Adjunct Professor
University of New Hampshire
Durham, NH 03824

Peter Schauer, Soil Scientist
Schauer Environmental Consultants
75 Woodhill - Hooksett Road
Bow, NH 03304

Cindy Balcius, Soil Scientist
Gove Environmental Services
P.O. Box 118
Long Block Building
Exeter, NH 03833

Steve Hundley, State Soil Scientist
Natural Resources Conservation Service
Federal Building
Durham, NH 03824

On March 7, 1997, at a meeting of NRCS soil scientists in White River Junction, Vermont, there was unanimous support to adopt site-specific soil mapping standards for Vermont. A Vermont representative was selected to serve on the site-specific mapping subcommittee.

Thom Villars, Soil Scientist
Natural Resources Conservation Service
Gilman Office Center
White River Jct. VT 05001

12. BIBLIOGRAPHY

Publications and documents identified with an asterisk (*) are currently on file at the New Hampshire Department of Agriculture Library, State House Annex 1, Concord, NH. These documents are maintained by the NRCS according to the Memorandum of Understanding with the NH Board of Certification of Natural Scientists.

Publications and documents identified with a pound sign (#) indicate source documents containing the soil mapping standards and guidelines established by the USDA/NRCS National Cooperative Soil Survey.

- *# United States Department of Agriculture Handbook No. 18, 1993. Soil Survey Manual, and amendments, USDA Natural Resources Conservation Service.
<http://www.nhq.nrcs.usda.gov/BCS/soil/smanual.html>

- # United States Department of Agriculture, 1975. Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys, Soil Conservation Service, US Department of Agriculture Handbook 436, 754pp illus.

- *# United States Department of Agriculture, November 1996. National Soil Survey Handbook, USDA Natural Resources Conservation Service.

- *# United States Department of Agriculture, Natural Resources Conservation, 1998. Keys to Soil Taxonomy, Eighth Edition, US Government printing Office, Washington, DC.
<http://www.statlab.iastate.edu/soils/keytax>

- *# United States Department of Agriculture, Natural Resources Conservation Service, Official Series Descriptions for New Hampshire.
<http://www.statlab.iastate.edu:80/soils/osd>

- * United States Department of Agriculture, December 1998, New Hampshire State-Wide Numerical Soils Legend, Issue #4 and amendments. Natural Resources Conservation Service.
<http://www.nh.nrcs.usda.gov>

- United States Department of Agriculture, 1990. Soil Series of the United States, Including Puerto Rico and the US Virgin Islands, US Department of Agriculture Miscellaneous Publication No. 1483, 459 pp.

- * United States Department of Agriculture. 1991. Hydric Soils of the United States, US Department of Agriculture Miscellaneous Publication No. 1491, unnumbered.
<http://www.statlab.iastate.edu:80/soils/hydric>

- * New England Interstate Water Pollution Control Commission, 1995. Field Indicators for Identifying Hydric Soils in New England. Version 2, July 1998, 64pp.

- New Hampshire Revised Statutes Annotated, 1989, Certification of Natural Scientists, HB 639-FN, 281:1 310-A:75 to 310-A:97; 281:6.

- Constitution of the New Hampshire Association of Consulting Soil Scientists and Code of Ethics, 1989, 6 pp.

- Constitution and Bylaws of the Society of Soil Scientists of Northern New England, 1991.

- *# United States Department of Agriculture, 1992, National Soil Taxonomy Handbook, Issue No. 15, Natural Resources Conservation Service.

- * US Dept. Of Agriculture, Natural Resources Conservation Service, Wetlands Science Institute and Soils Division, 1996, Field Indicators of Hydric Soils in the United States, Version 3.2, July 1996, pp27.

- * National Research Council, 1993, Soil and Water Quality, An Agenda for Agriculture, National Academy Press, 516pp.

- *# Field Book for Describing and Sampling Soils , Version 1.1, National Soil Survey Center, Natural Resources Conservation Service, March 11, 1998

13. RECORD SHEET FOR AMENDMENTS TO SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT

Date	Amendments
October 17, 1992	Adoption of the Order 1 Soil Mapping Standards for New Hampshire at the SSSNNE annual meeting, Webster, New Hampshire. The adopted document carried a date of April 29, 1992.
January 15, 1993	Editorial changes to the Order 1 Standards made by the Board of Directors as authorized by membership at the October 17, 1992 annual meeting held at Grist Mill Restaurant, Bow, NH.
June 26, 1997	New SSSNNE Special Publication No. 3 adopted by vote of the full membership of the Society of Soil Scientists of Northern New England on June 26, 1997. Full membership of SSSNNE adopted Site-Specific Soil Mapping Standards to replace SSSNNE Special Publication No.2: <u>Order 1 Soil Mapping Standards for New Hampshire</u> . Standards expanded to include New Hampshire and Vermont. The standards for High Intensity Soil (HIS) Maps for New Hampshire were included in the Site-Specific Soil Mapping Standards to meet the standards of the USDA National Cooperative Soil Survey. It was agreed these site-specific standards will supersede the <u>High Intensity Soil Maps for New Hampshire (HIS)</u> , SSSNNE Special Publication No.1, dated January 1994, in June, 2002. During the five year period the SSSMS and HIS standards will be allowed to co-exist.
November 19, 1998	Site-Specific Soil Mapping Standards for New Hampshire and Vermont, Version 2.0, edits and revisions approved at the full membership of SSSNNE, Bethal, Maine.

STATE SUPPLEMENTS

New Hampshire Supplement

I. 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 updated in September of 1997 and is part of these Standards, contained in Appendix B.

In 1997, the Society of Soil Scientists of Northern New England initiated the phasing out of the High Intensity Soil (HIS) Mapping Standards over a five year period. After June 2002, HIS standards will no longer be recognized or maintained by the society of Soil Scientists of Northern New England. During the full membership meeting of SSSNNE in Bethel, Maine, on December 5, 1997, it was voted on and passed to update the HIS standards on drainage class to agree with the Site-Specific Soil Mapping Standards. This action allows the HIS standards to be useable during this phase out period.

During the spring and summer of 1998, the Office of State 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. As of this printing, the Office of State Planning is preparing a guidance document for planning boards.

The New Hampshire Office of State 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 and UNH Cooperative Extension are also cooperators.

II. NEW HAMPSHIRE HIGH INTENSITY SOIL (HIS) MAPPING STANDARDS

The New Hampshire HIS mapping standards were developed in the mid 1980's in response to local planning board concerns about inadequate or inconsistent soil information upon which they were making important land use decisions. Of particular concern was sizing lots to accommodate onsite wastewater treatment systems and protect surface and ground water quality. In response to this need, the Soil Science Society for Northern New England developed HIS standards to clarify site-specific soils information for soil maps. These HIS standards were developed for a single purpose: soil-based lot sizing.

For over ten years, HIS soil mapping standards provided a consistent and reliable, but limited, source of site-specific soils information. Many municipalities require that a HIS map be part of an application for local approvals and for local planning boards to use in implementing zoning ordinances and subdivision and site plan review regulations.

As the population of New Hampshire increases, concerns for the protection of natural resources also increases. Local officials need technical information concerning soil quality, behavior and suitability which go beyond the level of detail provided by a HIS map. The HIS maps provided information on only four principal soil properties (drainage class, parent material, restrictive feature and slope). It has become apparent that site-specific soils information must be more comprehensive than that which is provided by HIS mapping alone, so municipalities can make fully informed land-use decisions based on the most up-to-date soil resource information available.

III. THE MERGING OF NEW HAMPSHIRE "HIS" AND ORDER 1 STANDARDS

Both HIS mapping standards and Order 1 mapping standards have been in concurrent use in New Hampshire for over two years. The soil identification legends for the two standards are not compatible and soil types identified on HIS maps cannot be satisfactorily converted to soil types recognized by the New Hampshire Order 1 soils legend. The HIS mapping standards are satisfactory for soil based lot sizing. However, when local approvals require on-site soil resource information for other land uses, such as land application of biosolids, the identification of prime farmland or run-off calculations to determine erosion characteristics, an Order 1 or site-specific soil survey is necessary. Some components of the HIS mapping standards are very useful in subdivision and site plan reviews. Requirements for the type of base map, map scale and requirements for ground control are more tightly controlled under the HIS standards. The Site Specific Soil Mapping Standards incorporate the better features of the HIS standards into the Order 1 standards. The resulting product allows for a wider variety of mapping scales and base maps depending on the intended use of the end product.

The Site Specific Soil Mapping Standards in this document present high intensity mapping standards that are an improvement over both the previous HIS and Order 1 standards. With the

adoption of Site Specific Soil Mapping Standards in New Hampshire, mapping will conform to the standards of the National Cooperative Soil Survey. This is important because most local ordinances and regulations make reference to the NCSS standards. Municipalities in New Hampshire which require soil maps as part of a completed application for subdivision or site plan review are encouraged to amend their regulations to cite SSSNNE Publication No. 3. This will ensure that soil maps provided by applicants will be multi-purpose products suitable for use as a tool in making most land use decisions, including soil based lot sizing.

There is a transition period to allow municipalities to update their local ordinances and regulations to include SSSNNE Special Publication No. 3. During the transition, it is recommended that both the site-specific map symbol and the HIS map symbol be required to be shown in each soil unit on a soil map product produced under these standards. The connotative HIS soils legend will be used only temporarily to allow time for an adjustment to the new standards. The old HIS legend is part of this document for reference purposes only. It does not conform to NCSS mapping standards. The HIS mapping symbols will be used for a limited period of four years to enable the phasing in of the site-specific soil mapping standards. It is the intent of the Society of Soil Scientists of Northern New England to eliminate the requirement of recording HIS map symbols by June of 2002.

During this four year period, these Site Specific Soil Mapping Standards will provide for the continued use of HIS mapping within the technical standards of the USDA National Cooperative Soil Survey. The Society of Soil Scientists of Northern New England is also allowing for soil scientists to make soil maps using HIS standards that do not meet National Cooperative Soil Survey Standards, if a municipality or client so chooses.

NEW HAMPSHIRE SITE-SPECIFIC SOIL MAPPING STANDARDS

1. MAP 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. MAPPING BASE

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 5.

4. **MAP UNIT PURITY:** See Page 6.

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 with the State-wide numerical map symbol as well as the HIS connotative legend symbol. The HIS map unit identification is carried out after proper series and phase placement, the numbers, of which, best represent the three soil properties (drainage, parent material and restrictive feature) used when developing a HIS soil map. It may be possible to have two or more adjacent map units with similar HIS map symbols. The identification of soil series and phases of soil series, however, do not allow for adjacent map units to be identified with the same map symbol.

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 State Soil Dataset Manager 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 State Soil Dataset Manager, 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 State Soil Dataset Manager should be contacted. These individuals can be contacted in a number of different ways:

Steven J. Hundley
State Soil Scientist
(603) 868-7581: Office

Katherine L. Swain
Soil Dataset Manager
(603) 223-6025: Office

(603) 868-5301: FAX
(800) 384-8732: Voicemail
then 868-7645
Email: shundley@nh.nrcs.usda.gov

(603) 223-6030: FAX
(800) 384-8732: Voicemail
then 868-7745
Email: kswain@nh.nrcs.usda.gov

- E. In some New Hampshire municipalities, site-specific mapping standards for subdivision or site plan review may require, in addition to the Order 1 map symbol, a HIS map symbol based on the HIS connotative legend as defined in SSSNNE Special Publication No.1, dated January 1994. 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.
- a. This connotative legend number will be placed in parentheses directly below or adjacent to the site-specific soil map unit symbol.
 - b. The connotative HIS map unit symbol will be required for a period of five years from the date of this publication, June 2002, at which time the use of HIS map symbols will no longer be endorsed by these standards.

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 7.B.2 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

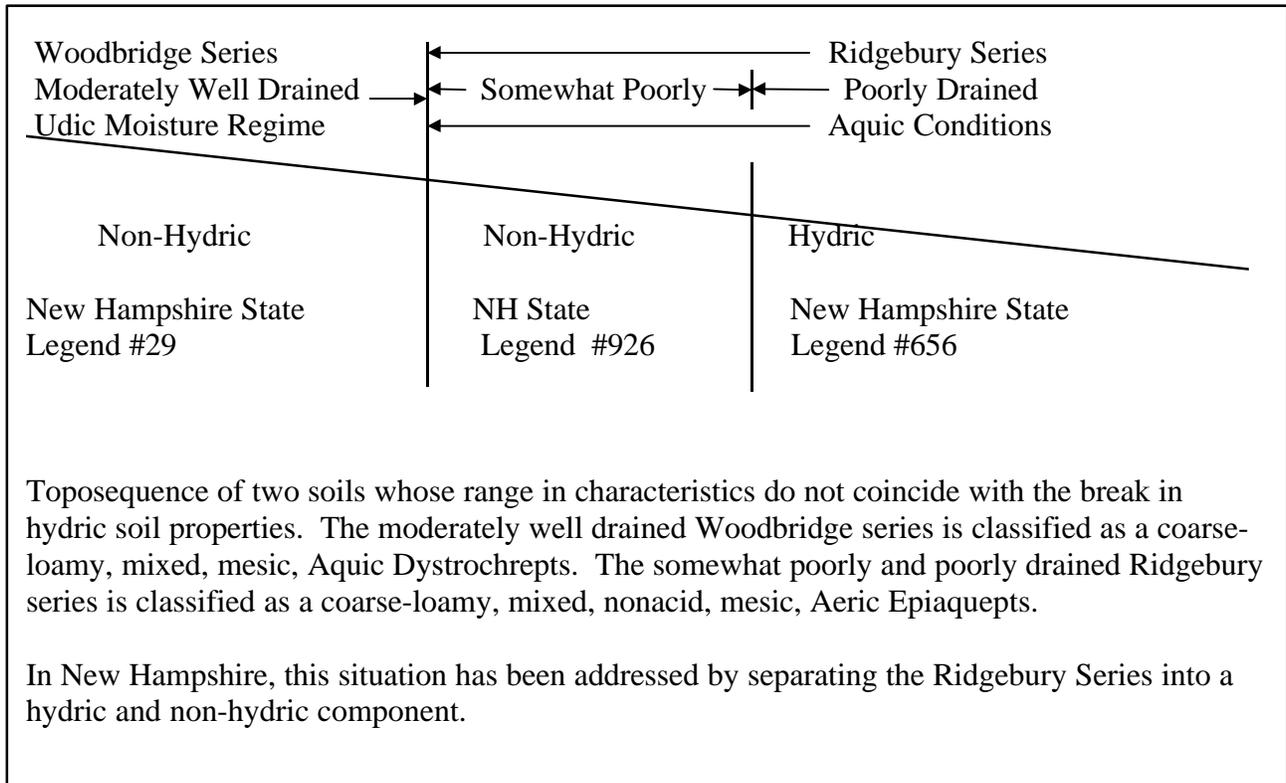
indicating: "This map product is not within the technical standards of the National Cooperative Soil Survey, because..."

8. REPORT TO ACCOMPANY SOIL MAP

- A. 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.
- B. If a New Hampshire site-specific map product for subdivision or site plan review is produced, map unit descriptions supporting the HIS map symbols are required in addition to the descriptions for the site-specific soil map symbols.

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 catina key.



10. HIS CONNOTATIVE SOIL MAP LEGEND

This connotative legend is being provided for the convenience of the soil scientists when completing site-specific soil maps for subdivision review where the New Hampshire community requires the use of HIS map symbols in order to be in compliance with town ordinances. This legend does not conform with the mapping standards of the NRCS National Cooperative Soil Survey and does not meet these site-specific soil mapping standards. This connotative legend will be phased out over a five year period.

This symbols list is abridged from the HIS connotative legend as defined in SSSNNE Special Publication No. 1, dated January 1994. For complete understanding of the use of these symbols, the original document must be referenced.

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)
- 2 - Glacial till Material Marine or Glaciolacustrine Deposits
- 3 - Very fine sand and silt deposits
- 4 - Loamy/sandy over silt/clay deposits
- 5 - Silt and clay deposits
- 6 - Excavated, regraded or filled
- 7 - Alluvial deposits
- 8 - Organic materials; fresh water
- 9 - Organic materials; tidal marsh

Symbol C: Restrictive Feature (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, platy structure, clayey texture.
- 4 - Bedrock present in the soil profile 0 to 20 inches below the surface (bedrock is either a lithic or paralithic contact)
- 5 - Subject to flooding
- 6 - Does not meet fill standards
- X - 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 "X"

Symbol D: Slope Class

- B - 0 to 8 percent slopes
- C - 8 to 15 percent slopes
- D - 15 to 25 percent slopes
- E - 25 percent +

Symbol E: High Intensity Soil Map Identifier - H

Vermont Supplement

I. INTRODUCTION

This document represents the official recognition of Site-Specific Soil Mapping Standards in Vermont for use by the private soil consultant. Municipalities in Vermont are encouraged to adopt these Standards when soil resource information is required as part of the permitting process. The State of Vermont does not have a certification program for soil scientists. However, these standards can be adopted by municipalities for site plan and subdivision reviews. 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.

The Vermont Center for Geographic Information is an official cooperator of the National Cooperative Soil Survey pertaining to the production and distribution of digital map products. The U.S. Forest Service is also a cooperator.

VERMONT SITE-SPECIFIC SOIL MAPPING STANDARDS

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

2. **MAPPING BASE**

In addition to the recognized mapping base allowed for site-specific mapping, the Vermont Orthophoto Base is also suitable for site-specific mapping in Vermont. This base product 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 5

4. **MAP UNIT PURITY:** See page 6

5. **IDENTIFICATION OF MAP UNITS:** See page 7

6. **SOILS LEGEND**

A. The soils mapping legend will conform to the Vermont 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.

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

- C. Soil series, phases of soil series, or soil complexes currently not recognized in the Vermont State-Wide Numerical Soils Legend will be reviewed by the Vermont Soils Liaison for approval into the state-wide legend contingent upon satisfactory documentation. Satisfactory documentation is comprised of all of the following:
- a. Verbal confirmation, at the time of the request, that the soils mapping is being carried out on official business of the company, agency or firm, that it is being made for a client, and that satisfactory map unit descriptions will be part of the final product presented to the client.
 - b. 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 Vermont Soils Liaison within a reasonable time after the completion deadline.
 - c. Satisfactory map unit descriptions are received by the Vermont Soils Liaison (See Appendix A for example). 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 Soils Liaison, 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 Soils Liaison can be contacted as follows:

Stephen Gourley, Soils Liaison
Natural Resources Conservation Service
69 Union Street
Winooski, VT 05404
Phone: (802) 951-6796 ext. 236
Email: sgourley@vt.nrcs.usda.gov

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 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 sideslopes 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 compact 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 10 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

MEMORANDUM OF UNDERSTANDING BETWEEN THE NEW HAMPSHIRE STATE BOARD OF CERTIFICATION OF NATURAL SCIENTISTS AND THE NATURAL RESOURCES CONSERVATION SERVICE UNITED STATES DEPARTMENT OF AGRICULTURE

Relative to: Site Specific Soil Survey Mapping Standards for New Hampshire

Authority: Public Law 46-74, 16 U.S.C. (590 a-f)
Public Law 89-560, 42 U.S.C. (3271-3274)
New Hampshire RSA HB 639-FN, 281:1 310-A:75 to 310-A:97; 281:1-281:6

This Memorandum of Understanding is made on this 23rd day of September, 1997 by and between the New Hampshire State Board of Certification of Natural Scientists, (hereinafter referred to as the "Board"), and the Natural Resources Conservation Service of the United States Department of Agriculture (hereinafter referred to as "NRCS").

Purpose: It is the mutual desire of the Board and the NRCS to develop and maintain one set of standards for carrying out Site Specific soil mapping activities in the State of New Hampshire. It is the belief of the Board and NRCS, that it is for the public good, and for the good of the communities within this State, to have a single set of soil mapping standards based on the technical standards of the National Cooperative Soil Survey (NCSS) and that these standards be actively enforced to ensure protection of the public interest through maintaining high professional standards and code of ethics.

Therefore: The New Hampshire State Board of Certification of Natural Scientists and the USDA Natural Resources Conservation Service deem it mutually advantageous to cooperate in this undertaking and hereby agree as follows:

1. The NRCS Agrees:

- A. To provide to the Board, copies of the following documents, that will be updated annually, or at unspecified intervals, that will ensure no more than 10 percent of the documentation provided is more than 6 months out of date:
1. Keys to Soil Taxonomy by Soil Survey Staff
 2. National Soil Taxonomy Handbook
 3. Amendments to National Soil Taxonomy Handbook as released by the National Soil Survey Center
 4. National Soil Survey Manual
 5. National Soils Handbook
 6. Official Series descriptions for all soil series actively recognized in New Hampshire
 7. All soils series and phases of soil series actively recognized in New Hampshire that reside in the National Soil Survey Database.
 8. New Hampshire State Numerical Soils Legend
 9. Descriptive legend for all map units actively recognized and mapped in New Hampshire
 10. Hydric Soils of the United States
 11. New Hampshire State Hydric Soils Lists
 12. Field Indicators for Identifying Hydric Soils in the United States
 13. Field Indicators for Identifying Hydric Soils in New England.
 14. National Technical Service Center and State bulletins, directives, and amendments pertaining to technical standards of the National Cooperative Soil Survey.
- B. To authorize one NRCS soil scientist, of grade GS-11 or above, to serve as an advisor to the Board. The function of this position will include, but will not be limited to, the following:
1. Assure that the Board has the most up-to-date NCSS mapping standards;
 2. Notify the Board when significant changes in mapping standards have been implemented;
 3. Serve as a communication link with the National Cooperative Soil Survey Staff in conveying suggestions or recommendations from the Board; and
 4. Participate in the evaluation of the field mapping exam.
- C. To provide state soil legend numbers to certified soil scientists in order for them to carry out official business operations in New Hampshire, subject to appropriate documentation as outlined in the Site Specific Soil Mapping Standards for New Hampshire and Vermont, SSSNNE Special Publication #3 dated June 1997.
- D. To refer requests for soil map verification, of map products carrying the site specific soil mapping label, produced by the private sector, to the Board.

- E. To notify the Board, in writing, of actions that may reflect non-compliance of the Site Specific Soil Mapping Standards, agreed to under this Memorandum of Understanding, so as to allow the Board to carry out inquiries, as appropriate.

2. The Board Agrees:

- A. To establish and maintain a list of CEUs (Continuing Education Units) specifically geared for maintaining the Certified Soil Scientist's ability to produce products that meet the technical requirements of the Site Specific Soil Mapping Standards for New Hampshire.
- B. To insure NCSS material provided to the Board by the NRCS is made available to soil scientists.
- C. To recognize a liaison to the Board, to be filled by an NRCS soil scientist, serving in an advisory capacity on matters pertaining to the National Cooperative Soil Survey.
- D. To uphold high professional standards for certified soil scientists and to respond appropriately to allegations of non-professional conduct.
- E. To carry out any appropriate quality control/quality assurance activities on products developed by the private sector, to insure compliance with Site Specific Soil Mapping Standards for New Hampshire.
- F. To hold and save NRCS free from any and all claims or causes of action whatsoever resulting from the obligations undertaken by either party under this agreement or resulting from the work or work products provided for in this agreement.

3. It is mutually agreed:

- A. That this Memorandum of Understanding may be terminated by the Board or NRCS upon written notice to the other not less than sixty (60) days prior to the termination.
- B. The activities conducted under this Memorandum of Understanding will be in compliance with the nondiscrimination provisions contained in the Titles VI and VII of the Civil Rights Act of 1964, as amended; the Civil Rights Restoration Act of 1987 (Public Law 100-259); and other nondiscrimination statutes: namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975. They will also be in accordance with regulations of the Secretary of Agriculture (7 CFR-15), Subparts A & B), which provide that no person in the United States shall on the grounds of race, color, national origin, age, sex, religion, marital status, or handicap be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving federal financial assistance from the Department of Agriculture or any agency thereof.

Dawn W. Genes
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service

9/23/97
Date

Timothy Ferwerda
Chair
State of New Hampshire
Board of Certification of Natural Scientists

9/23/97
Date

APPENDIX C

SPECIAL FEATURES SYMBOLS FOR SITE-SPECIFIC SOILS MAPPING

CULTURAL FEATURES

BOUNDARIES

Municipal, state, or province 

County or parish 

Minor civil division 

Reservation (national, forest or park, state forest or park) 

Local grant 

Limit of soil survey (total) 

RAILROAD



POWER TRANSMISSION LINE (normally not shown)



PIPELINE (normally not shown)



FENCE (normally not shown)



HYDROGRAPHIC FEATURES

STREAMS

Perennial, double line 

Perennial, single line 

Intermittent 

SMALL LAKES, PONDS AND RESERVOIRS

Perennial water 

Miscellaneous water 

Sampling Site: 

SPECIAL FEATURES SYMBOLS FOR SOIL SURVEY

MISCELLANEOUS WATER FEATURES

Spring 

Well, Artesian 

Well, Irrigation 

LANDFORM FEATURES

ESCARPMENTS

Bedrock 

Other than bedrock 

SHORT STEEP SLOPE



GULLY



DEPRESSION



SINKHOLE



EXCAVATIONS

PITS

Borrow pit 

Gravel pit 

Mine or quarry 

LANDFILL



MISCELLANEOUS SURFACE FEATURES

Sandy spot 

Severely eroded spot 

Slide or slip 

Spill area 

Stony spot, very stony spot 

Wet spot 

Marsh or swamp 

Rock outcrop (includes sandstone and shale) 

Clay spot 

Gravelly spot 

APPENDIX D

Internet addresses pertaining to the USDA/NRCS National Cooperative Soil Survey, Site-Specific Soil Mapping Standards. Most of these Internet addresses link to many other sources of soil science data and technology.

Natural Resources Conservation Service National Cooperative Soil Survey

<http://ncg.nrcs.usda.gov:80/Welcome.html>

Home Page: Natural Resources Conservation Service

<http://www.statlab.iastate.edu:80/soils/soildiv>

Home Page: USDA/NRCS Soils Division

<http://www.statlab.iastate.edu:80/soils/nscc>

USDA/NRCS National Soil Survey Center

<http://www.nhq.nrcs.usda.gov/BCS/soil/smanual.html>

Soil Survey Manual, USDA Agricultural Handbook No.18

<http://www.statlab.iastate.edu/soils/keytax>

Keys to Soil Taxonomy, Seventh Edition, 1996

<http://www.statlab.iastate.edu:80/soils/nsdaf>

USDA National Soil Data Access Facility

<http://www.statlab.iastate.edu:80/soils/osd>

Official Soil Series Descriptions for the United States

<http://www.statlab.iastate.edu:80/soils/hydric>

Hydric Soils of the United States

<http://www.ncg.nrcs.usda.gov/consortium/consort.html>

National Science and Technology Consortium

<http://159.189.24.10/wetsci.htm>

NRCS National Wetlands Science Institute

<http://www.statlab.iastate.edu:80/survey/SQI/sqihome.shtml>

NRCS National Soil Quality Institute

**New Hampshire
Cooperative Soil Survey Program**

<http://www.nh.nrcs.usda.gov>

Home Page: New Hampshire Natural Resources Conservation Service

<http://www.nh.nrcs.usda.gov/soils/key>

Status of Soil Surveys in New Hampshire

<http://nhst02.nh.nrcs.usda.gov/ssavail.html>

Availability of Soil Survey Information in New Hampshire

<http://www.nh.nrcs.usda.gov/soils.htm>

New Hampshire State-Wide Numerical Soil Legend

<http://www.nh.nrcs.usda.gov/key.htm>

Catina Key of New Hampshire Soils

Supporting Soil Resource Information

<http://www.wolfe.net/psmall/nscss.html>

National Society of Consulting Soil Scientists

<http://www.agronomy.org/ssa.html>

Soil Science Society of America

<http://vendigo.uni-soilsci.gwdg.de/soilidbr.htm>

Check out color images of soil profiles from European Countries

<http://Plants.usda.gov/plants>

National Plant Data Center - for species list for any state

<http://www.netins.net/showcase/swcs/.index.html>

Soil and Water Conservation Society

<http://www.metla.fi/info/vlib/soils>

World Wide Web's Virtual Library of Soils and Substrates

http://www.statlab.iastate.edu/soils/nssc/field_gd/field_gd.htm

Field Book for Describing and Sampling soils

**Soil Mapping Orders
produced by the
USDA/NRCS National Cooperative Soil Survey**

Introduction

The National Cooperative Soil Survey produces and publishes soil resource maps at five (5) different levels of detail and accuracy. They are called mapping "orders"

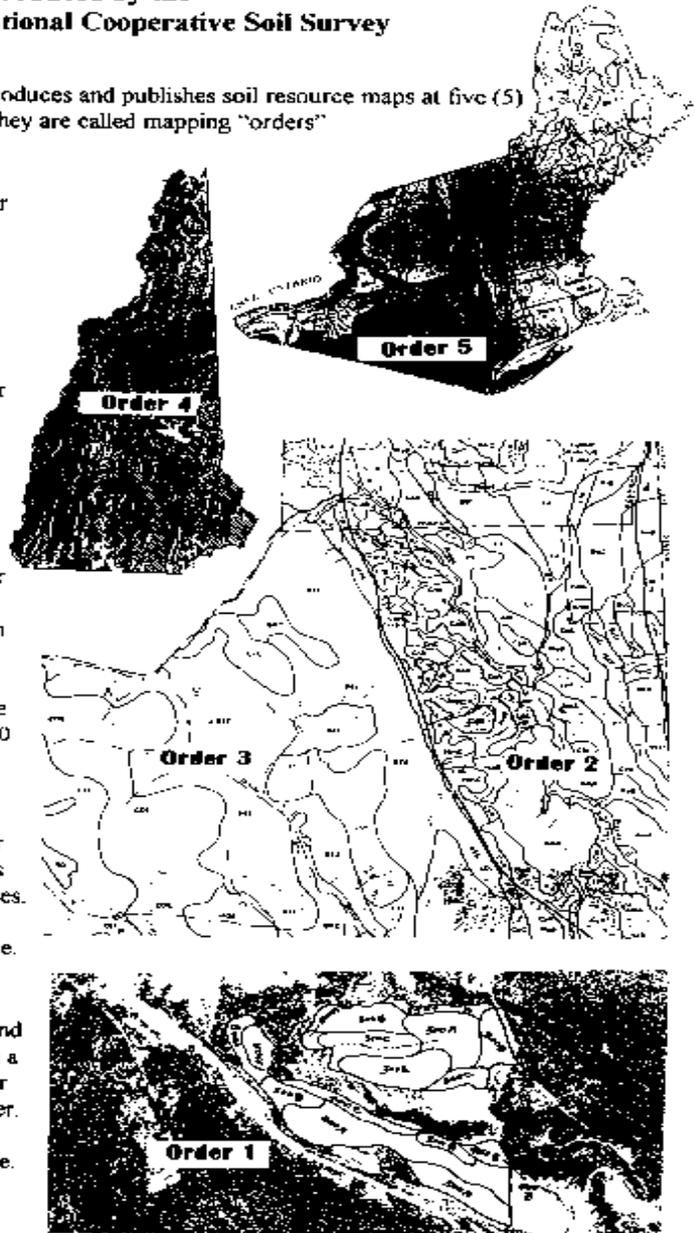
An **Order 5** soil survey is completed for entire countries or regions of the World. Scale is about 1:1,000,000 and the smallest soil delineation is thousands of square miles in size.

An **Order 4** soil survey is completed for individual states, or small regions of the World. Scale is about 1:250,000 and the smallest soil delineation is hundreds of square miles in size.

An **Order 3** soil survey is completed for remote regions of the country dominated by a single land use. The soils information is used in forest management, rangeland management and other forms of broad land use. Scale is about 1:20,000 and the smallest soil delineation is about 25 to 100 acres in size.

An **Order 2** soil survey is completed for individual counties or communities and is used for general land use planning purposes. Scale is about 1:20,000 and the smallest soil delineation is about 3 to 5 acres in size.

An **Order 1** soil survey is site-specific and is completed for an identified land use on a specific parcel of land. Scale is 1:12,000 or larger and more typically 1:1,200 or larger. The smallest soil delineation ranges from one acre down to less than a ¼ acre in size.



APPENDIX F

ORDER FORM

**Site-Specific Soil Mapping Standards
for New Hampshire and Vermont
Version 2.0 January, 1999**

**Society of Soil Scientists of Northern New England
SSSNNE Special Publication No. 3**

Date: _____

Mail a copy of these Standards to:

Name

Address

City

State

Zip

Quantity of Publications: _____ @ \$8.00 each = **Total Order:** \$____.____

Amount Enclosed: \$____.____

Enclose check or money order for the full amount payable to:

**Society of Soil Scientists of Northern New England
P.O. Box 986
Durham, NH 03824**

Please allow 4 weeks for delivery.