

# Site-Specific Soil Mapping Standards For New Hampshire and Vermont

For Making Soil Survey Map  
Products Following the Standards  
of the USDA/NRCS National  
Cooperative Soil Survey

**Version 3.0**

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**SSSNNE Special Publication No. 3**

Society of Soil  
Scientists  
of  
Northern New England



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

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

**SSSNNE Special Publication No. 3  
Version 3.0, December, 2006**

## **I. INTRODUCTION**

**T**his 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 Soil Scientists Society of Northern New England, Special Publication No.3, Version 2.0 published in January, 1999. These standards have been effect in New Hampshire and Vermont for ten years. This version represents an enhancement over 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 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.

## **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 soils mapping is synonymous with Order 1 soils 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.

### **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 are 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 soils 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 mis-interpretation 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 soils 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 43).*

The original Federal authority for the National Cooperative Soil Survey is contained in the record of the 53<sup>rd</sup> 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. Agricultural Handbook 18, Soil Survey Manual, 1993, USDA, NRCS  
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 investigation procedures are based on universally accepted (American Society for Testing and Materials, Soil Science Society of America, et.al.) scientific design and sampling strategy and are documented sufficiently to allow others to apply these methods consistently (USDA/NRCS/NSSC Soil Investigations Report No. 42. 1996).

## **VI. 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. 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 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 the following sources:

Society of Soil Scientists of Northern New England, P.O. Box 76, Durham, NH 03824.  
An order form is attached as Appendix F.

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

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

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  
Federal Building, 2 Madbury Road  
Durham, NH 03824

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

## **IX. SITE-SPECIFIC SOIL MAPPING STANDARDS<sup>1</sup>**

### **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.  
(SSM 2.6-2.9)

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

## **2. MAPPING BASE**

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.

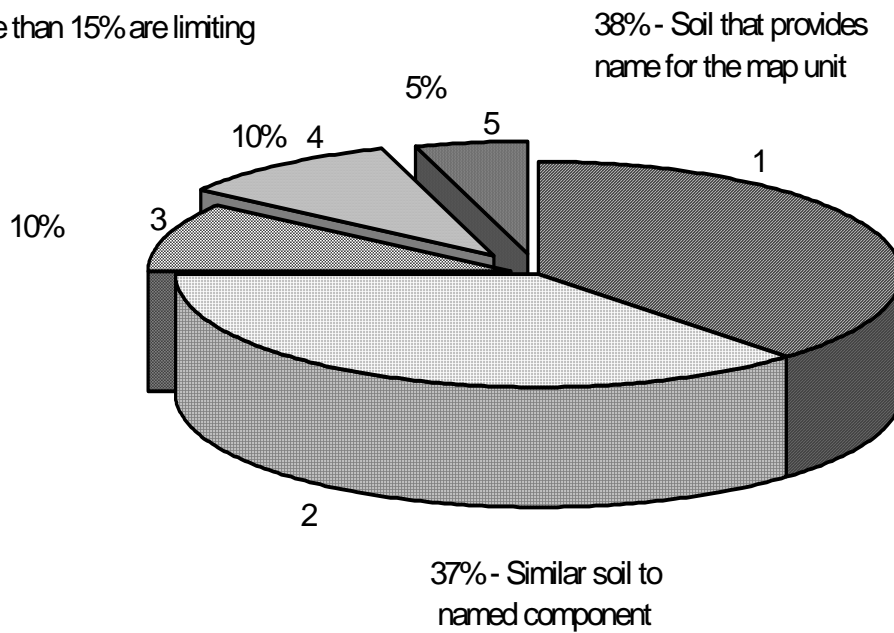
## A. Consociations

(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 unit can be made at the discretion of the soil scientist.)

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



**FIGURE 1: 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 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

<u>Alpha Slope Symbol</u>	<u>Range</u>
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

<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. 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

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 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. 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 3, dated April, 2004 (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.

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:

#### **II. Tidal Soils**

Soils that are flooded daily by tides

#### **III. Histosols**

Soils having organic soil materials at or near the soil surface that are greater than 16 inches thick.

#### **IV. Histic Epipedons**

Soils having a layer of organic soil material at or near the surface that is 8 to 16 inches thick and directly underlying the O horizon, or, if present, the A horizon, is a horizon with redoximorphic features.

#### **V. Mineral Histic**

Any mineral soil having a layer 4 to 8 inches thick of slightly to well decomposed organic soil material and/or a mucky A or Ap horizon and is directly underlain by a horizon with a depleted or gleyed matrix

#### **X. Sandy with Redox**

Soils that do not have a spodic horizon and

A. have a layer 4 to 8 inches thick of slightly to well decomposed organic soil material and/or mucky A or Ap horizon and are directly underlain by a horizon with a loamy fine sand or coarser texture with 2 percent or more redoximorphic features

## 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:

#### **VI. Depleted or Gleyed Matrix**

within 10 inches of the top of the mineral soil material and directly underlying an A or Ap horizon, is a horizon with a depleted or gleyed matrix

#### **VII. Depleted Below Dark Surface**

Beginning within 20 inches of the top of the mineral soil material and directly underlying a thick or very thick, dark A or Ap horizon is a horizon with a depleted or gleyed matrix that is 4 inches or more thick.

#### **VIII. Dark Mineral Soils**

Soils with a matrix chroma of 2 or less that extends to a depth of 20 inches below the top of the mineral soil material and that have a dark A or Ap horizon that is directly underlain by a horizon with a matrix value of less than 4 and within 12 inches of the top of the mineral soil material or directly underlying an A or Ap horizon, whichever is shallower, 2 percent or more redoximorphic features that extend to either:

- A. a depth of 20 inches below the top of the mineral soil material or
- B. a depleted or gleyed matrix, whichever is shallower, or

#### **IX. Spodosols**

Mineral soils having a spodic horizon and one of the following morphologies:

- A. within 6 inches of the top of the mineral soil material have an E horizon with 2 percent or more redoximorphic features and/or have a stripped matrix that is directly underlain by a spodic horizon with either:
  - 1. a Bh, Bhs or Bs horizon with 2 percent or more redoximorphic features or
  - 2. a Bh and/or Bhs horizon that is directly underlain, but within 20 inches of the top of the mineral soil material, by a horizon with 2 percent or more redoximorphic features.
- B. Beginning within 10 inches of the top of the mineral soil material and directly underlying a dark A or Ap and/or shallow E horizon, there is a Bh and/or Bhs horizon that is greater than 2 inches thick that is directly underlain but within 20 inches of the top of the mineral soil material, by a horizon with 2 percent or more redoximorphic features.
- C. Beginning within 10 inches of the top of the mineral soil material and directly underlying a dark A or Ap horizon is one of the following:
  - 1. an E horizon with 2 percent or more redoximorphic features and/or a stripped matrix directly underlain by a Bh, Bhs or Bs horizon with 2 percent or more redoximorphic features.
  - 2. a Bh and/or Bhs horizon that is directly underlain, but within 20 inches of the top of the mineral soil material, by a horizon with 2 percent or more redoximorphic features
  - 3. a Bs horizon with 2 percent or more redoximorphic features

**X. Sandy With Redox**

Soils that do not have a spodic horizon and:

- B. beginning within 10 inches of the top of the mineral soil material and directly underlying a dark A or Ap horizon is a horizon with a loamy fine sand or coarser texture with a matrix color due to wetness of chroma 3 or less, value 4 or more, with 2 percent or more redoximorphic features.
- C. beginning within 15 inches of the top of the mineral soil material and directly underlying a thick, very dark A or Ap horizon there is a horizon with a matrix color due to wetness of chroma 3 or less, value 4 or more, with 2 percent or more redoximorphic features, or

**XI. Any Texture**

Soils that do not have a spodic horizon and

- A. beginning within 10 inches of the top of the mineral soil material and directly underlying a dark A or Ap horizon is a horizon with 5 percent or more redox depletions and within 20 inches of the top of the mineral soil material there is a horizon with a depleted or gleyed matrix
- B. beginning within 15 inches of the top of the mineral soil material and directly underlying a thick, very dark Ap horizon is a horizon with 5 percent or more redox depletions and within 20 inches of the top of the mineral soil material there is a horizon with a depleted or gleyed matrix, or

**XII. Any Texture**

Soils that have a very dark A or Ap horizon less than 10 inches thick that are directly underlain by a horizon with a matrix color due to wetness of chroma 3 or less, with 10 percent or more redoximorphic features and within 6 inches of the top of the mineral soil material have 2 percent or more redoximorphic features, and within 18 inches of the top of the mineral soil material have 2 percent or more redox depletions

## **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, that 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 mesophytic crops 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 interpretive limits of well drained.\*

\* Upland soils in the Northeast that perch a thin layer 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 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** – 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 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 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, Tenth Edition, 2006.

**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 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.

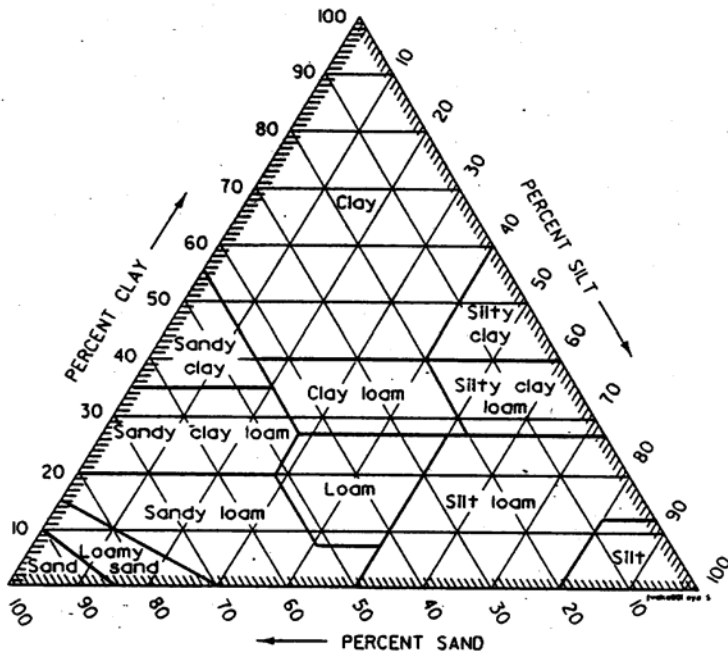
**SOIL MAP UNIT** - an area defined and named in terms of its soil properties. Each individual area shown on the map is a delineation of a soil map unit. Each map unit contains a map symbol which indicates the soil type, or soil types if the map unit is a complex.

**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 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.

**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



**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**- 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.

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. 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.

The following individuals are currently serving on this subcommittee.

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

Karen Dudley, Soil Scientist  
Natural Resources Conservation Service  
Concord Center, Ferry Street  
Concord, NH 03301

Francesca Latawiec, Soil Scientist  
Smart Associates  
72 North Main Street  
Concord, NH 03301

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

Thomas Villars, Soil Scientist  
Natural Resources Conservation Service  
28 Farmvu Drive  
White River Jct. VT 05001

Cindy Balcius, Soil Scientist  
New Hampshire Soil Consultants  
RR1, Box 196A  
Alton, NH 03809

### 13. BIBLIOGRAPHY

See Appendix D for Web Addresses

United States Department of Agriculture Handbook No. 18, 1993. Soil Survey Manual, and amendments, USDA Natural Resources Conservation Service.

United States Department of Agriculture, 1999. Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys, Second Edition, Soil Conservation Service, US Department of Agriculture Handbook 436, 869pp 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, 2006. Keys to Soil Taxonomy, Tenth Edition, US Government Printing Office, Washington, DC.

United States Department of Agriculture, Natural Resources Conservation Service, Official Series Descriptions for New Hampshire.

United States Department of Agriculture, December 2006, New Hampshire State-Wide Numerical Soils Legend, Issue #7 and amendments. Natural Resources Conservation Service.

United States Department of Agriculture. 1991. Hydric Soils of the United States, US Department of Agriculture Miscellaneous Publication No. 1491, unnumbered.

New England Interstate Water Pollution Control Commission, 1995. Field Indicators for Identifying Hydric Soils in New England. Version 3, April 2004, 83pp.

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

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

<u>Date</u>	<u>Amendments</u>
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, Bethel, Maine.
August 25, 2006	Site-Specific Soil Mapping Standards for New Hampshire and Vermont, Version 3.0, edits and revisions approved at the full membership of SSSNNE, Northfield, Vermont. Grammatical edits, committee membership, and web addresses will be updated with publication date agreed-to: December 2006.

# **STATE SUPPLEMENTS**



## **X. 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 updated in September of 1997 and is part of these Standards, contained in Appendix B.

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 to make 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](http://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 MLRA Project Leader should be contacted. These individuals can be contacted in a number of different ways:

State Soil Scientist  
(603) 868-7581: office  
(603) 868-5301: fax

MLRA Project Leader  
(603) 223-6025: office  
(603) 223-6030: fax

- 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 September 2002. 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 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."

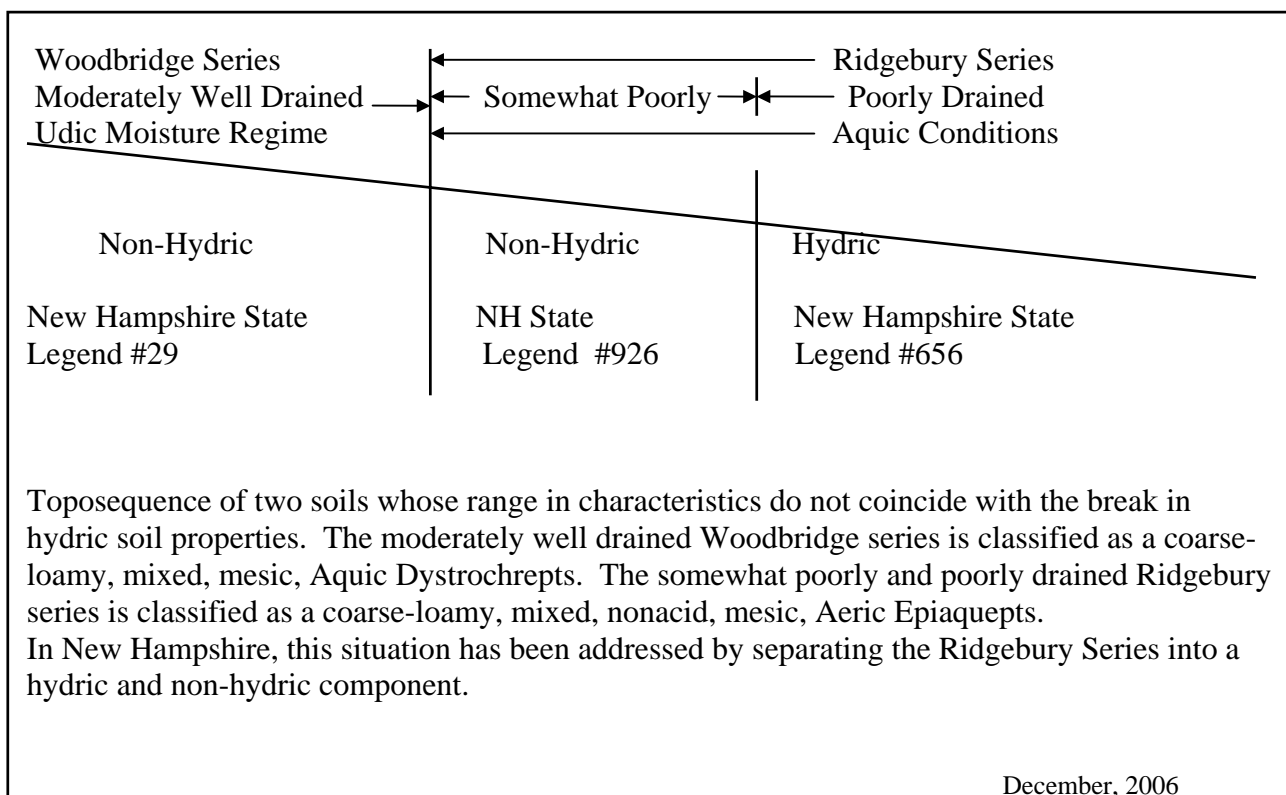
- a. This statement will not be used in situations as explained in paragraph 6.A.4.e of these standards.
- b. Should a client impose constraints on the certified soil scientist that precludes him or her from producing a product that meets the standards of the National Cooperative Soil Survey, a statement 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**

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.



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.



# Vermont Supplement

## INTRODUCTION

This 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:

State Soil Scientist  
USDA Natural Resources Conservation Service  
356 Mountain View Drive, Suite 105  
Colchester, VT 05446  
Phone: (802) 951-6796 ext. 236

## 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 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 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**

### **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



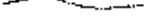



## APPENDIX C

### SPECIAL FEATURES SYMBOLS FOR SITE-SPECIFIC SOILS MAPPING
























#### CULTURAL FEATURES

<b>BOUNDARIES</b>	
Municipal, state, or province	-----
County or parish	-----
Minor civil division	-----
Reservation (includes forest or park, state forest or park)	-----
Local grant	-----
Limit of soil survey (shown)	-----
<b>RAILROAD</b>	-----
<b>POWER TRANSMISSION LINE</b> (normally not shown)	-----
<b>PIPELINE</b> (normally not shown)	-----
<b>FENCE</b> (normally not shown)	-----

#### HYDROGRAPHIC FEATURES

<b>STREAMS</b>	
Perennial, double line	
Perennial, single line	
Intermittent	
<b>SMALL LAKES, PONDS AND RESERVOIRS</b>	
Perennial water	
Miscellaneous water	
<b>Sampling Site:</b>	

### SPECIAL FEATURES SYMBOLS FOR SOIL SURVEY

<b>MISCELLANEOUS WATER FEATURES</b>		<b>EXCAVATIONS</b>	
Spring		<b>PITS</b>	
Well, artesian		Borrow pit	
Well, irrigation		Gravel pit	
		Mine or quarry	
		<b>LANDFILL</b>	
<b>LANDFORM FEATURES</b>		<b>MISCELLANEOUS SURFACE FEATURES</b>	
<b>ESCARPMENTS</b>		Sandy spot	
Bedrock		Severely eroded spot	
Other than bedrock		Slide or slip	
<b>SHORT STEEP SLOPE</b>		Spill area	
GULLY		Stony spot, very stony spot	
<b>DEPRESSION</b>		Wet spot	
<b>SINKHOLE</b>		Marsh or swamp	
		Rock outcrop (includes sandstone and shale)	
		Clay spot	
		Gravelly spot	

## Appendix D Access to Web Sites:

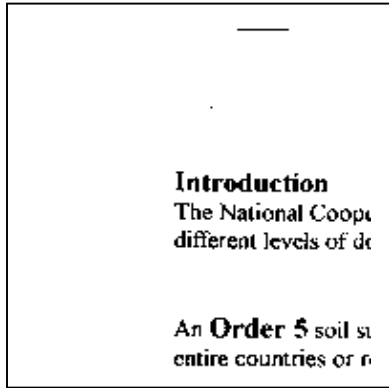
**Society of Soil Scientists of Northern New England:**    <http://www.sssnne.org>

<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.

<b><u>Soil Survey</u></b>	<b><u>Photo Gallery</u></b>
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	<b><u>Soil Use and Management</u></b>
	Hydric Soils
<b><u>Technical References</u></b>	Soil Quality
National Soil Survey Handbook	Soil Risks and Hazards
Soil Survey Manual	State of the Land
Technical Notes	Thematac 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	<b><u>Partnerships</u></b>
	National Cooperative Soil Survey
<b><u>Soil Education</u></b>	List of Universities
Smithsonian Soils Exhibit	Professional Organizations
Soil Facts	
Soil Science Glossary	
State Soils	
K-12	
Organizations	
Professional Development	

# Appendix E





APPENDIX F

**ORDER FORM**

**Site-Specific Soil Mapping Standards  
for New Hampshire, and Vermont  
Version 3.0 2006**

**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:** \_\_\_\_\_ @ \$10.00 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 76  
Durham, NH 03824**

Please allow 4 weeks for delivery.

