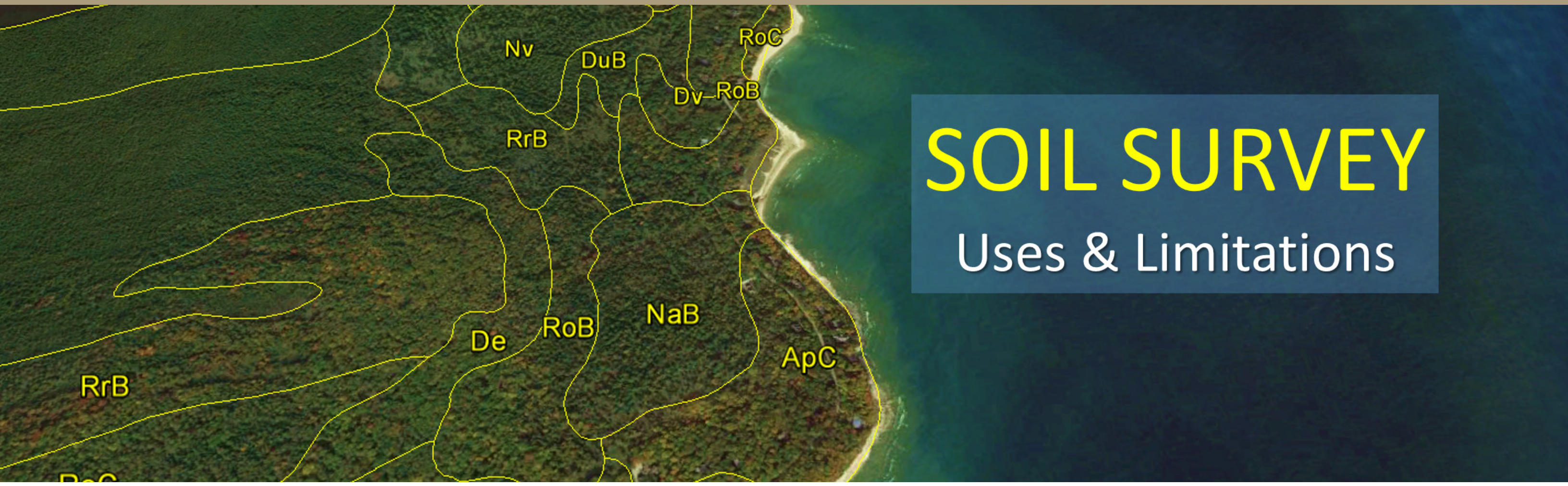
United States Department of Agriculture



SOIL SURVEY

Uses & Limitations

1. What is the Soil Survey Program?

The National Cooperative Soil Survey Program is an endeavor of the Natural Resources Conservation Service (NRCS) and other Federal agencies; State and local governments; and other cooperators. It provides a systematic study of the soils in a given area, including the classification, mapping, and interpretation of the soils. Soil types are classified from physical properties, drawing heavily on the principles of pedology, geology, and geomorphology.

2. History of Soil Survey in Wisconsin

The first soil map of Wisconsin was published in 1882. Much of the early survey work was done by the Wisconsin Geologic and Natural History Survey, the University of Wisconsin Soils Department, and the U.S. Bureau of Soils. The Federal soil survey work in Wisconsin began in 1899, and thereafter the soil survey became a cooperative effort between the Federal government and State agencies. The National Cooperative Soil Survey Initiative for the U.S. was launched in 1899 under the leadership of the U.S. Department of Agriculture (USDA), Division of Agricultural Soils, which became the USDA Bureau of Soils in 1901.

[Figure 1: Albin Martinson and Donald Owens using a truck mounted hydraulic probe]

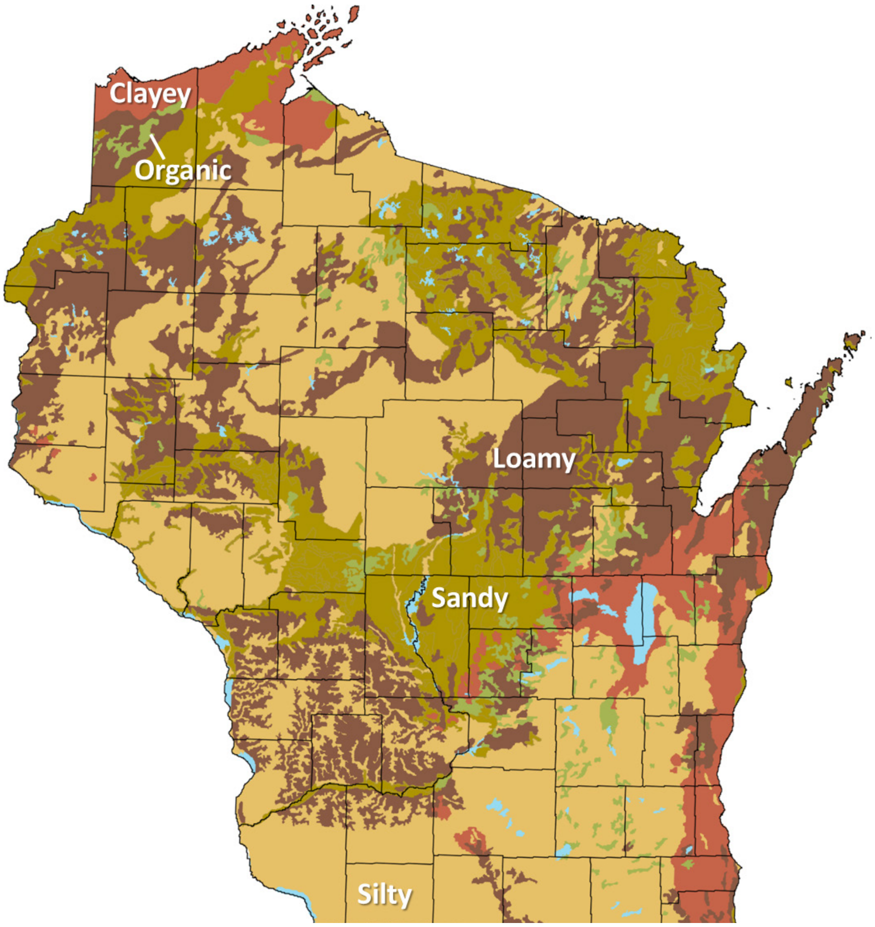
Soil survey work in Wisconsin began in earnest during the early 1900s, shortly after the inception of the National Cooperative Soil Survey. One of the earliest published soil surveys in Wisconsin was the Soil Survey of Racine County, Wisconsin. Field mapping for this survey was completed during the summer of 1906. The soil survey report, including the soil map, was published in 1907.

In 1933, the U.S. Department of Interior created the Soil Erosion Service to address the severe national soil erosion problems. Hugh Hammond Bennett was the Chief of the service. In 1935, the Soil Erosion Service was transferred to the U.S. Department of Agriculture and became the Soil Conservation Service (SCS). In 1995, the Soil Conservation Service became the Natural Resources Conservation Service (NRCS).

During the 1960s, 1970s, and 1980s, soil survey work in Wisconsin leapfrogged around the State on a county-by-county basis as cost-sharing monies became available from counties and other sources. In 2000, the State of Wisconsin weighed in to support soil surveys in Wisconsin. The Wisconsin Department of Administration signed an agreement with NRCS to complete the initial soil survey of the State. NRCS used the influx of funds from the State to hire more staff. The additional staff accelerated progress, and the last of the field mapping was completed in the fall of 2005. A “Last Acre Ceremony” was held October 7, 2005, at the Lac Courte Oreilles Conference Center in Hayward. On May 16, 2006, Wisconsin became the 10th State to have soil survey information for the entire State on the Web Soil Survey.

3. Ongoing Soil Survey Mapping

The completion of initial field mapping in 2005 marked the end of two eras for the NRCS Soil Survey Program (pretaxonomy and “modern mapping” post 1965) in Wisconsin and the start of another. The central focus of the program in Wisconsin shifted to updating and applying existing soil surveys. The older soil surveys are now being brought up to modern standards for mapping and soil science as more detailed soil maps and data are being developed using the latest GIS technologies. The surveys for Dunn, La Crosse, Pepin, Pierce, and Richland Counties have already been updated. Initials surveys were done on a county-by county basis. Survey updates are being done by physiographic region.



The physiographic regions are known as Major Land Resource Areas (MLRAs). In addition to updating the inventory of the soils, NRCS also provides training and support for the interpretation and use of soil survey information.

Soil Survey Annual Data Refresh

NRCS in Wisconsin works with Regional Soils Offices and traditional partners to prioritize ongoing soil science priorities. Every year on September 30th, the new soil survey information from ongoing work is released to the public.

4. Official Soil Survey Data

Official soil survey information is in the public domain and is available on the Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/). The Web Soil Survey is the sole source for official soil survey data. When data is updated on the Web Soil Survey, the older data is no longer considered official.

Example:

The soils data files for RUSLE2 (R2) are currently generated by the State Agronomist from official soils data. Because of soils data being refreshed once a year, there may be minor differences between the soils data in R2 and the soils data in the WSS until the State Agronomist updates the R2 soils information.

Other soils data:

Outside groups are free to use whatever soils data they want to use for models or decision support systems like SnapPlus. If they chose to not update their soils information on an annual basis when NRCS updates our official soils information, there will, inevitably, be differences between their soils data and the official soils data and these will increase over time.

5. Uses of the Soil Survey

Soil survey information can be used to predict or estimate the potentials and limitations of soils for many specific uses. A soil survey includes an important part of the information that is used to make workable plans for land management. The information must be interpreted to be useable by professional planners and others.

Predictions based on soil surveys serve as a basis for judgment about land use and management for areas ranging from small tracts to regions of several million acres. These predictions, however, must be evaluated along with economic, social, and environmental considerations before they can be used to make valid recommendations for land use and management.

Examples

Soil survey information is important for planning the specific land uses and practices needed to obtain specific results. For example, a soil survey can indicate the limitations and potentials of the soil for development of recreational areas. A landscape architect can use a soil survey when designing for the area. A contractor can use the survey in planning, grading, and implementing an erosion control program during construction. A horticulturist can use it in selecting suitable vegetation.

Soil surveys provide the basic information needed to make decisions about land management, including those operations that must be combined for satisfactory soil performance. For example, soil survey information is useful in planning, designing, and implementing an irrigation system for a farm. A knowledge of the characteristics of the soil helps in determining the run length, water application rate, soil amendment needs, leaching requirements, general drainage requirements, and field practices needed to maintain optimal soil conditions for plant growth.

Soil surveys are also helpful for locating possible sources of sand, gravel, or topsoil.

Technology Transfer

Soil surveys are an important component of technology transfer. They are needed to move knowledge from agricultural research fields and plots to other areas. Soil surveys allow us to identify areas that have soils that are similar to those in the research fields. Knowledge about the use and management of soils is spread by applying experience from studied areas to areas that have similar soils and related conditions.

The relationships between soils and deficiencies of phosphorus, potassium, nitrogen, magnesium, and sulfur are widely known. In recent years, important relationships have been worked out between many soils and their deficiencies of trace elements, such as copper, boron, manganese, molybdenum, iron, cobalt, chromium, selenium, and zinc. Relationships between soils and some toxic chemical elements have also been established. By no means have all of the important soils been characterized, especially for the trace elements. More research is needed.

Land Valuations

Soil is one of many attributes that contribute to land value. The relative importance of soil varies widely among land uses. The soil is a major factor in areas used for farming, ranching, and forestry. In these areas, the soil's capacity to produce and its requirements for production are critical elements of land value. Soil interpretations are used in assessing farmland for taxation and equalization, in appraising land for loans, and in guiding land buyers.

The soil is one of several elements in the appraisal of land value within a specific local, economic, and institutional environment. Many of the other elements that determine value of real estate change with time. The soil types recorded in an official soil survey, however, remain valid over time and can be easily reinterpreted as economic or institutional conditions change.

6. Limitations of the Soil Survey

Soil survey data seldom contain detailed, site-specific information. They are not intended for use as primary regulatory tools in site-specific permitting decisions. They are, however, useful for broad regulatory planning and application.

Soil survey information cannot replace site-specific details, which require onsite investigation. It is a valuable tool where acquiring onsite data is not feasible or is cost prohibitive. It is most useful as a tool for planning onsite investigation. Understanding the capability and limitations of the different types of soil data is essential for making the best conservation-planning decisions.

Soil Interpretations

Any use of soils data to make predictions falls under the broad category that soil scientists call “soil interpretations.” NRCS maintains a set of interpretations in the Web Soil Survey. These include calculated values, such as K and T, and features, such as Hydrologic Soil Groups and Unified Soil Classification. The interpretations also include various ratings of suitability and limitation for land uses.

Official soils data may be interpreted by organizations, agencies, units of government, or others based on their own needs; however, users are responsible for this use. NRCS does not accept reassignment of authority for decisions made by other Federal, State, or local regulatory bodies. NRCS will not make changes to Official Soil Survey Information, or provide supplemental soil mapping, for purposes related solely to State or local regulatory programs. Official Soil Survey Information is science based. NRCS should be consulted regarding the potentials and consequences of soil interpretations beyond those in the Web Soil Survey.

NRCS understands that other entities will develop soil interpretations without technical assistance from NRCS. It is important, however, to reiterate that NRCS does not accept responsibility for soil interpretations other than those delivered by the Web Soil Survey. Collaboration with NRCS on soil interpretations is critical to the successful use of soils data.

7. Tool for Planning

Soil survey data is an invaluable tool for comparing soil properties over broad areas. It can dramatically facilitate planning and preparation for onsite investigation. Soil maps can effectively communicate the nature of soil differences across an area. In the context of general land-use planning, soil survey data provides an irreplaceable tool for basic and objective-based resource planning. In the context of land-use planning for areas smaller than 4 or 5 acres, on-site investigation is clearly required. At the intensity of a single auger boring or a half-acre lot, caution must be raised on the use of the published information. On-site data is required when the focus is on a specific parcel of land.

Table 1: Soil Survey Mapping Scales and Minimum Delineation Size

Map scale	Inches per mile	Minimum size delineation (acres)
1:10,000	6.3	1
1:12,000	5.3	1.4
1:24,000	2.64	5.7
1:250,000	0.25	623
1:30,000,000	0.0021	9,000,000

[Soil surveys are conducted at various scales. The “minimum size delineation” is the smallest area that will be separated on a soil map at the indicated scale.]

Table 2: Soil Survey Database and Wisconsin Data Facts

Field	Count	Note
Legend Map Unit	8,383	The number of map units linked to soil survey areas and related to spatial data polygons by the database element “lmapunitiid,” a.k.a. “mukey.”
Map Unit	6,427	The number of map units identified by the database element “muiid.”
Major Component	5,921	The number of soils listed as major components. Typically, a major component is greater than 10% of a map unit. The total number of components in the State is 11,839.
Minor Components	5,918	The number of soils listed as minor components. Typically, a minor component is less than 10% of a map unit.
NRCS Soil Interpretations	122	The number of soil interpretations available on Web Soil Survey for the State. Soil interpretations are models that use specific soil properties or qualities that directly influence a specified use or management of the soil. Examples of soil interpretations include texture, K-factor, T-factor, suitability for septic tank adsorption fields, AASHTO classification, Unified classification, and hydrologic soil group (HSG).
Properties	600	Properties are attributes of soils or sites that are (or can be) directly measured. Examples are sand, silt, clay, and Calcium Carbonate. The count of 600 is an estimate of the number of properties measured for map unit components, horizons, sites, pedons, ecological sites, and lab data.
NASIS Columns	3,914	Total number of data columns.
NASIS Tables	785	Total number of data tables.
Soil Survey Area	69	Total number of soil survey areas.
Spatial Soil Map Unit Polygons	1,496,783	Total number of spatial polygons represented.

[NRCS develops and maintains soils information in the National Soil Information System (NASIS). This table refers to elements in NASIS for Wisconsin.]