Understanding and Using A Soil Survey

Surveys Help Contractors Avoid Cost Overruns, Construction Failures

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A soil survey consists of a soil map, descriptions of the soils, and interpretations (predictions) of their potential uses or limitations as both raw material and structural support. This information is especially useful to land developers, engineers and contractors, who rely on the survey to uncover general soil problems they can expect to encounter in a proposed construction area—for example, slow permeability, low bearing strength, corrosive to metal and concrete, or high shrink/swell capacity. Cost overruns or construction failures can be avoided in many cases by consulting a soil survey first.

Making Soil Surveys

Soil surveys are the product of the National Cooperative Soil Survey, a nationwide, coordinated effort by federal and state agencies, universities, and professional societies to deliver scientifically based soil information. The data is initially collected by professional soil scientists, who go into an area of interest on foot to examine the area's soil profile and record landscape features such as native plants/crops and rocks, slopes, streams, drainage-ways and lakes, as well as man-made features such as roads, railroads, dams and gravel pits.

A soil profile is a vertical section of soil that shows the sequence of natural layers, or *horizons*, which are distinguished by color, texture, structure and other characteristics. After the profile at each hole is compared with other soil profiles in the area, the soils are classified and named according to a national system of soil taxonomy and then plotted on aerial photographs. Each soil is then interpreted or translated with regard to how it will respond when subjected to various uses and management.

Soils that have very similar profiles make up a *soil series.* Their horizons are similar in thickness and arrangement, as well as in their physical, chemical and mineralogical makeup. The soils within a series also have similar reactions to use and management. Each series is named for a town or geographic landmark near the place where the soil was first observed.

Soils within a series can, however, differ in texture of the surface soil, slope, stoniness or other characteristics that affect how the soil is used or managed. These differences divide the series into *soil phases*. The name of the phase includes the feature of the soil that affects its use. "Crider silt loam, 12 to 18 percent slopes, severely eroded" is an example of a soil phase.

NRCS soil scientists examine a soil sample in the field. Photo by Charlie Rahm, USDA NRCS.

Using a Soil Survey

Printed soil surveys can be obtained from a number of sources. In addition to the state or local offices of the USDA's Natural Resources Conservation Service (NRCS), libraries, soil conservation district offices, and county agricultural extension offices keep copies of local soil surveys that can be used for reference. The Soil Data Mart of the NRCS (online at **http://soils.usda.gov/survey/online_ surveys**) now includes some 2,800 soil surveys. The NRCS' Web Soil Survey, opening this summer, will provide viewable maps and many other enhancements.

Once you have obtained the survey, locate your general area of interest on the General Soil Map, identify the name of the map unit in the area and then refer to the section General Soil Map Units for a general description of the soils in your area. To find information about your *specific* area of interest, locate that area on the Index to Map Sheets. Note the number of the map sheet, and turn to that sheet.

NRCS employees digitize soil survey information for integration into Geographical Information Systems (GIS). Photo by Bob Nichols, USDA NRCS.

Locate your area of interest and note the map unit symbols (letters and/or numbers) that are in that area. Turn to the Index to Map Units, which lists the map units by symbol and name and shows the page where each map unit is described. For data on a specific land use for each detailed soil map unit, consult the Summary of Tables. An actual soil survey will most likely contain much more information than is outlined here. (For example, see the *Soil Survey of Van Wert County, Ohio* at **http://www.dnr.ohio.gov/soilandwater/soils/soilsurveys/VanWert.pdf.)**

If, after reviewing the soil survey report, you still have unanswered questions about the survey or the soil on your construction site, you can contact the nearest NRCS or conservation district office. The NRCS website also offers the publication "Understanding Soil Risks and Hazards—Using Soil Surveys to Identify Areas with Risks and Hazards to Human Life and Property" (**www.soils.usda.gov/use/risks.html**). As the title suggests, it provides an overview of soil-related risks and hazards that are important to city and county planners, developers, contractors and others who build facilities on or in soils.

Additional Soil Survey Resources

- "Survey Says! The Soil Survey Explained," by Mike Johnson of the Indiana Department of Natural Resources, Division of Soil Conservation, at **http://www.clarkswcd.org/InTheField/MikesPage_ssurvey_0404.htm.**
- The North Dakota State University of Agriculture and Applied Science Extension Service's bulletin titled "Soil Survey: The Foundation for Productive Natural Resource Management" by Bruce Seelig, Water Quality Specialist, at **http://www.ext.nodak.edu/extpubs/plantsci/soilfert/eb60w.htm#How%20a.**
- Fact Sheet SL-11, a series of the Soil and Water Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida at **http://edis.ifas.ufl.edu/SS160.**

Soil Survey Limitations

While the soil survey is clearly a valuable and sometimes indispensable tool, it does have certain limitations that should be noted. For example, a general soil map is a small-scale map that gives a broad picture of the type and distribution of soils that occur in a given area. Maps of this scale usually do not show sufficient detail for comparing the soils in areas smaller than about five acres, even though they may differ significantly from the adjacent soils. Onsite soil examination and testing are therefore necessary to determine soil suitability for intensive use of small areas. The other limitation is that soil mapping is a continual process similar to research in other scientific disciplines. As soil survey reports age, some parts may continue to accurately reflect existing soil conditions, while other parts may lose their utility. Again, depending on the date of the survey, onsite soil examination and testing may be required.

Despite these caveats, the relatively low investment of time required to review a soil survey is more than offset by the benefits of using the right soil for the right purpose or understanding the possible soil limitations prior to site planning, development, and construction above ground or below ground. ***UC***