Web Soil Survey

How Soil Surveys are Made:

A Users Guide Series

Past, Present, and Future

In the previous article we looked at the history of Soil Survey through the years. Next we will be looking at how surveys are developed and their evolution over time. We last learned that soil surveys started in the US in 1899. Early soil scientists at this time would be using a horse and buggy to get around and drawing their own maps by hand. As one would suspect, as tools and technology have improved so has the quality and quantity of data results we get. In present day, soil scientists utilize pickups with soil probes and high resolution color aerial photography. Even with modern advances, soil scientists still utilize a lot of the same basic fundamentals when surveying and mapping soils which are explained in the next few paragraphs.

Soil scientists will observe the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dig many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed.

The soils in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landform or with a segment of the landform. By observing the soils in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists will then record the characteristics of the soil profiles that they studied. They note soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigns the soils to taxonomic classes. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile.

After the soil scientists classify and name the soils in the survey area, they compare the individual soils with similar soils in the same taxonomic class in other areas so that they can confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

As for the future of soil survey it can be expected that tools and technology will continue to improve assisting soil scientist to complete surveys quicker and more accurately. Work will continue to complete or get lower order surveys in areas where surveys have already been completed. A soils survey order refers to the level of detail a survey is done. A 1st order soil survey is the most detailed and is used for highly intensive land use planning, such as for citing agricultural experiment stations. The scale of these maps is 1:12,000 indicating that 1 inch on the map equals 12,000 inches on the ground. Most county soil surveys are done as 2nd order surveys, with a map scale of 1:20,000. These surveys provide information for intensive land use, whether for agricultural or non-agricultural purposes. 3rd order soil surveys (Campbell County) have map scales from 1:24,000 up to 1:250,000 and provide for extensive land use activities such as woodland and watershed management. 4th order surveys provide information about general land use planning and have a scale of 1:100,000 to 1:300,000. 5th order soil surveys are used for general land use planning at regional or national levels, such as general land potential for crops, forest, or urban development. The scale of these maps is from 1:250,000 to 1:1,000,000

Now, this article only scratches the surface of the work soil scientists do to create a soil survey. If you are interested in knowing more there are soil scientists to ask or, if interested, there are plenty of publications available online that covers the process far more in depth.

FUTURE ARTICLES IN THIS SERIES

So far we have covered the history of soil survey and the methods and techniques used to develop them. Next we will be looking at how to use the WSS online so you can explore and learn about soils in an area of interest to you.

USDA

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