

Taking the Guesswork Out of Soil Identification

Land Potential and Soil Variability

Determining land potential begins with developing an understanding of the soil. This typically requires digging a hole and observing or measuring a soil's physical, chemical, and/or biological properties either directly in the field or later in a laboratory. Characterizing soil properties across large areas can be a challenging task, even for soil scientists. This is due to the tremendous variability of soils across a landscape (see Fig 1).

The challenge of soil variability is often minimized by grouping soils into classes based on similar values for important soil properties (e.g., texture). Soil classes serve as information carriers, providing valuable insight into a soil's potential based on the documented range of soil properties values for that class. For example, if a farmer knows that the soil in their field belongs to class A, which is characterized by silty clay soils that are especially prone to compaction when wet, the farmer would know they need to delay spring tillage operations after a heavy rain.

Soil classes also provide information on the soil that is not easily determined in the field, such as the soil's nutrient status (e.g. available P and N, cation-exchange capacity, etc.), allowing land managers to modify their management practices based on known limitations associated with their soil.

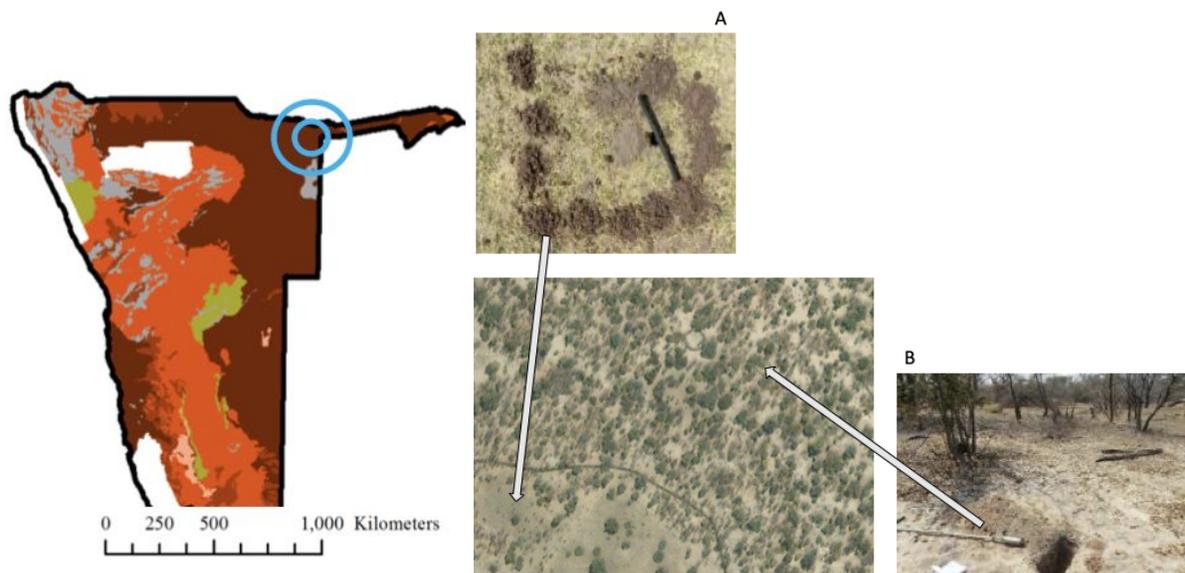


Figure 1: This soil map from Namibia shows uniform soils in the selected area, but in reality, the soils in that area vary a lot. Soil A is a loamy soil that holds water and nutrients, and will support crop production even during drought years. Soil B is a sandy soil that won't support crop production except for during wet years, and which needs manure or other nutrient supplements.

The Role of Soil Map Units (SMUs) in Determining Soil Class

Knowing which class your soil belongs to is an important first step in determining how you should manage your land. But figuring out the correct soil class is difficult and without proper knowledge and training often requires guessing. A main source of uncertainty arises from the fact that current soil maps do not display the exact location of soil classes. Instead most soil maps display soil map units, which are distinct areas of a landscape that often include more than one listed soil class, and may also include other soil classes.

For example, Figure 1. shows a soil map displaying several different map units. The 'Tc' unit has five soil components (or classes) associated with it. While most soil maps list the aerial percentage for each component within the unit (e.g., Component 1= 50% of the SMU area), they do not show their exact location. Consequently, the soil at the plot location marked by the red dot in Figure 1 could be any one of the five listed soil components.

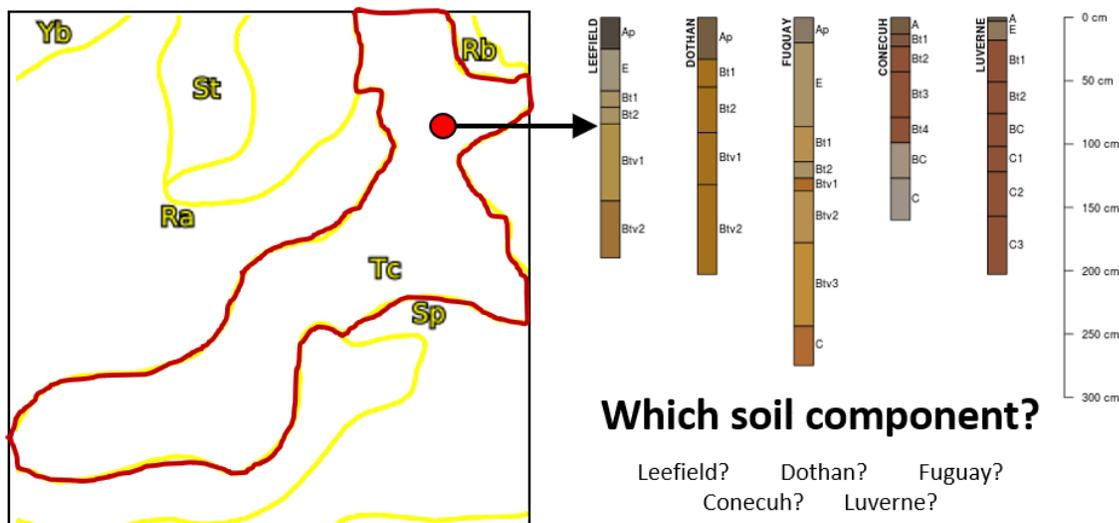


Figure 2: Example area of a soil map illustrating the delineation of 5 different soil map units. The 'Tc' SMU has five soil components within it. Since the exact location of the soil components is unknown, the actual soil type at the plot location marked by the red dot could be any one of the listed five. Also note that while this map shows each map unit occurring just once, they can repeat across the landscape. For example, soils formed on a series of mountain ridges with the same geology and climate will typically have the same group of soils, so would have the same soil map unit.

How to Use LandPKS to Get a Better Soil Class Prediction

LandPKS can help you ID your Soil in three simple steps (Figure 2):

SoilID Steps: Improved Soil Classification Prediction Based on Your Data

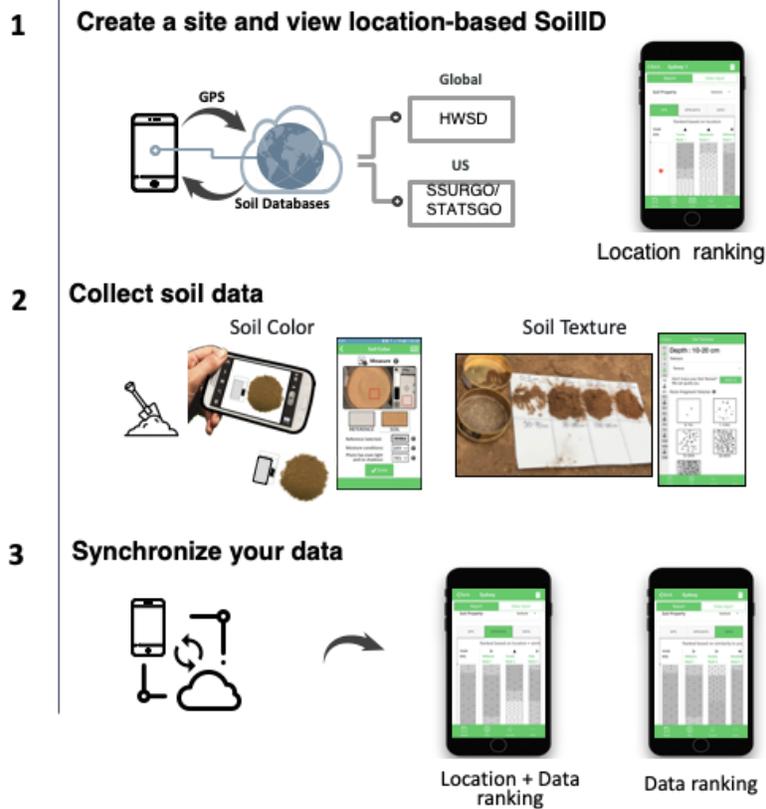


Figure 3: Steps to run the LandPKS SoilID tool.

1. Create a site and view location-based SoilID in the **Report** tab

The first step occurs automatically whenever a new LandPKS plot is created (Figure 2, top). Using the phone's GPS location, SoilID searches for all mapped soil components surrounding your location and retrieves all available soil property data. Using the location information associated with each soil component (i.e., map unit distance and component aerial percentage), SoilID provides an initial ranking of the most likely soil components at your location (i.e., 'GPS' ranking).

Look at the soils displayed. If they all look very similar and have similar descriptions, you may not need to go any further, though it's always good to at least complete a quick check of soil texture for at least the 1-10 and 20-50cm (0.5-4" and 8-20") depths (see #2 below).

2. Collect soil data in the **Data Input** tab

In the second step (Figure 2, middle) switch to the Data Input tab and complete the Soil Texture and Soil Color sections of the LandInfo module for

at least the top 4-5 depths (can combine the top 2 if same), as well as Land Slope and the first question in Soil Limitations (cracking). More information allows LandPKS to provide better predictions in #3. Video tutorials and guided question keys assist with soil property measurements on the soil texture screen.

3. Synchronize Your Data and Review Updated Soil Prediction ranks the **Report** tab

You can complete the third step (Figure 2, bottom) anytime you record new soil property data for your site. Tap “Synchronize” at the top of the screen to ask LandPKS to use your data to rank the soils that *could* occur at your location. In the Report tab you can now see 3 different ranks. The **GPS** tab continues to rank the soils based on location alone: the first soil is the most common one. The **DATA** tab ranks the soils based on how closely they match data you have provided in **Data Input**. The **GPS+DATA** tab ranks them based on your data, but takes into account the possibility of errors in soil property determination by putting extra weight on the dominant soils at your location. Any time new soil property data is recorded or when existing data is modified *and* these changes synchronized, the ‘DATA’ and ‘GPS+DATA’ rankings are updated to reflect this new data.

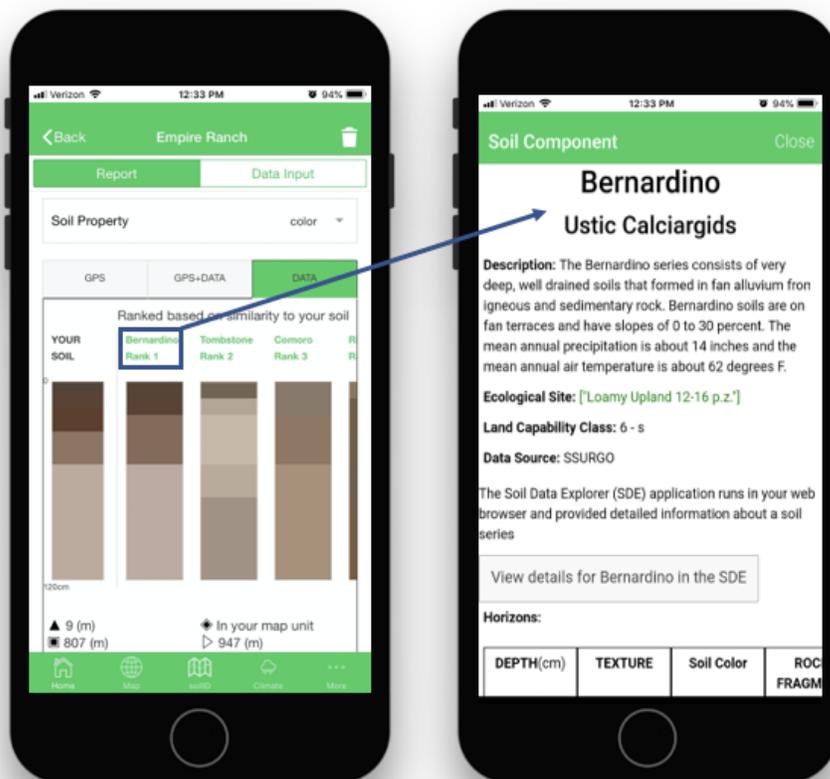


Figure 4: SoilID Report and the linked Soil Component Information screens.

Tapping a component name will reveal additional information about each component (Fig 4). In the US, the Soil Component screen includes information on its Land Capability Class and Ecological Site Description where this information is available for the soil. Users can also click on a link to the Soil Data Explorer (SDE) application which provides the complete NRCS Official Series Description, available laboratory data, and other interpretation tools. The Ecological Site Descriptions link to [EDIT](#), while the SDE links to a UC Davis [California Resource Lab](#) website. For the rest of the world, the Soil Component screen provides a detailed description of the soil component, with a focus on information relevant to soil management and the information is stored on your phone in the app after it is downloaded when you create a new site.