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Soil Health

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Guidance on Field Grab Sampling for Soil Health Testing

Acknowledgments

Contributing authors include:

Ann Tan, Soil Scientist, Soil and Plant Science Division, USDA-NRCS
Laura Starr, Regional Soil Health Specialist, Soil Health Division, USDA-NRCS
Cory Owens, National Resource Soil Scientist for Partner Training, Soil and Plant Science Division, USDA-NRCS
Loretta Metz, National Program Coordinator, Soil Health Division, USDA-NRCS
Candiss Williams, National Soil Health Specialist, Soil Health Division, USDA-NRCS

Contributing reviewers include:

Sharon Perrone, Biological Scientist, Soil and Plant Science Division, USDA-NRCS
Francine Lheritier, National Resource Soil Scientist, Soil and Plant Science Division, USDA-NRCS
Shaunna Repking, Soil Scientist, Soil and Plant Science Division, USDA-NRCS
Kristine Ryan, South Carolina State Soil Scientist, USDA-NRCS
Joe Williams, Regional Soil Health Specialist Team Leader, Soil Health Division, USDA-NRCS

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Introduction

Soil sampling is a key part of soil testing; when both sampling and testing are done properly, it can provide a reliable and effective soil health assessment that can offer relevant and attainable conservation solutions. This guidance outlines how to sample soils using the grab sampling method and how to submit samples to laboratories.

This guidance applies to all land uses, including cropland, forest, rangeland, pasture, farmstead, associated agriculture lands, other rural land, and developed land.

Field Collection through the Grab Sampling Method and Laboratory Submission of Soil Sample

Soil health assessments are conducted to assess the condition of soil and how well it performs all functions. These assessments, especially when regularly repeated, offer a moving snapshot of how management impacts soil health, allowing farmers to optimize their activities.

While assessments provide useful information, they are only as good as the field sampling process used. Proper, consistent soil sampling ensures the accuracy of results, which then informs management actions. The following sections outline field sampling and laboratory submission procedures for an effective soil health assessment.

Before Sample Collection

1. Work with a local NRCS point of contact to determine which soil tests can meet the goals of the farmer, land manager, or project. This helps identify the appropriate soil testing laboratory to perform the analyses.
    a. See TN 470-01, "Choosing a Laboratory for Soil Health Testing," for more information.
    b. The grab method is not recommended for bulk density sampling. Consult with the laboratory selected for analysis for an appropriate method.
2. Contact the laboratory to ask about sample preservation, shipment of samples, and any special handling and packaging requirements specific to the analyses selected. Try to use the same soil testing laboratory each year to ensure consistency of results.
3. Work with a local NRCS office or advisor to determine sampling locations within an area of interest or planning land unit (PLU).
    a. Sampling locations should have a similar soil type, land use, and management.
    b. Sampling locations can vary in size or acreage depending on soil texture, topography, and cropping system.
    c. Obtain soil maps of the areas of interest (Web Soil Survey) with identified soil sampling locations.
4. Determine if the soils at the site being evaluated require special handling or disposal based on the USDA-APHIS regulations for prohibited, regulated, or quarantined soils.
5. Schedule soil sampling so that samples are suitable for testing. There are several factors that can impact test results, such as:

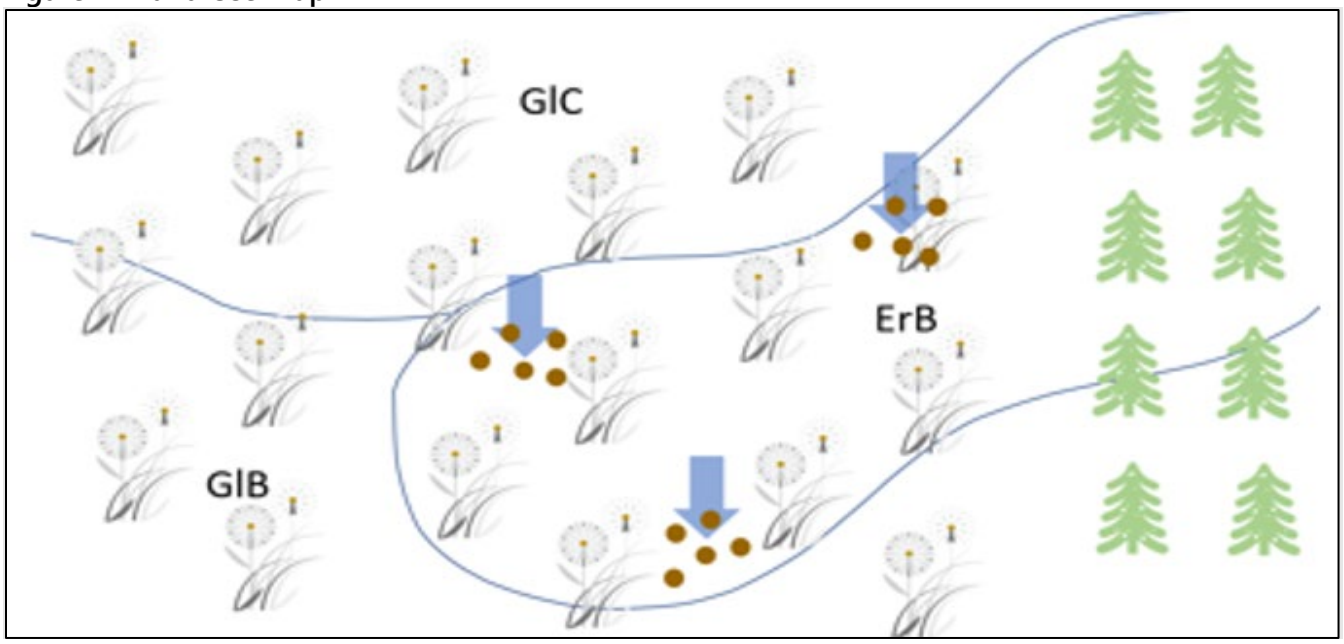
   a. **Weather**. Soil biological activity and other soil health methods are sensitive to soil moisture and temperature so schedule more than one day to allow for weather conditions that would affect the samples.
   b. **Chemical applications**. Schedule soil collection before any chemical amendment (e.g., fertilizer). If this is not possible, wait 3 to 4 weeks after last chemical application.
   c. **Time for testing**. Schedule soil collection to give enough time for the laboratory to finish tests by a deadline.
   d. **Monitoring**. Annual soil collections should be done around the same time and at the same place unless the assessment is for evaluating changes in soil health indicators within the same growing season at different crop growth stages.
6. Obtain the supplies needed:
   a. Shovel
   b. Soil knife
   c. One 5-gallon bucket, rinsed clean of any soil or non-soil debris and residue
   d. Rag to clean bucket between samples
   e. Gloves
   f. Six 1-gallon freezer bags
   g. Permanent marker and pen
   h. Clipboard
   i. In-field soil health assessment
      i. Refer to TN 470-06 for the cropland in-field soil health assessment
      ii. Contact the regional soil health specialist or state soil health point of contact for assessment protocols on other land uses
   j. Laboratory submission forms
   k. GPS, set to the WGS84 coordinate system
   l. Cooler with ice packs
7. Have extra supplies on hand while sampling.

Sample Site Selection

There may be several goals that a soil health sample design can help assess. A well-planned sampling design ensures that management goals can be properly evaluated from the samples taken and results received. Once the PLU is determined:

1. Select a unique soil on only one component and one land use or management (e.g., cropland). In figure 1, Earnest silt loam (ErB) is on cropland.
2. Within the PLU, choose at least three representative sampling locations that represents the variability of the land unit. Avoid odd areas in the field such as tire tracks and drive lanes, field borders, soil map unit boundaries, and depressions. Also avoid areas with historically lower or higher productivity (Figure 1).
   a. Sometimes the PLU has multiple similar soil components in the same or different soil map units, and they are all on the same land use and same management system. If the similar components are not expected to respond similarly under the same management system, including crops and cropping sequences, then they should not be included within the sampling framework.
3. Conduct the appropriate resource concern or soil health assessment within the selected PLU.

Figure 1 – Land Use Map



This map shows two different land uses (cropland on left represented by flowers and forestland on right represented by trees), soil map unit boundaries (in this case, consociations consisting of one component with map symbols), and three sampling locations identified by blue arrows and their nearby sample locations (brown dots). **Note**: The samples are collected within the ErB map unit, on a single soil component, and on only the cropland land use.

Collection of Soil Samples

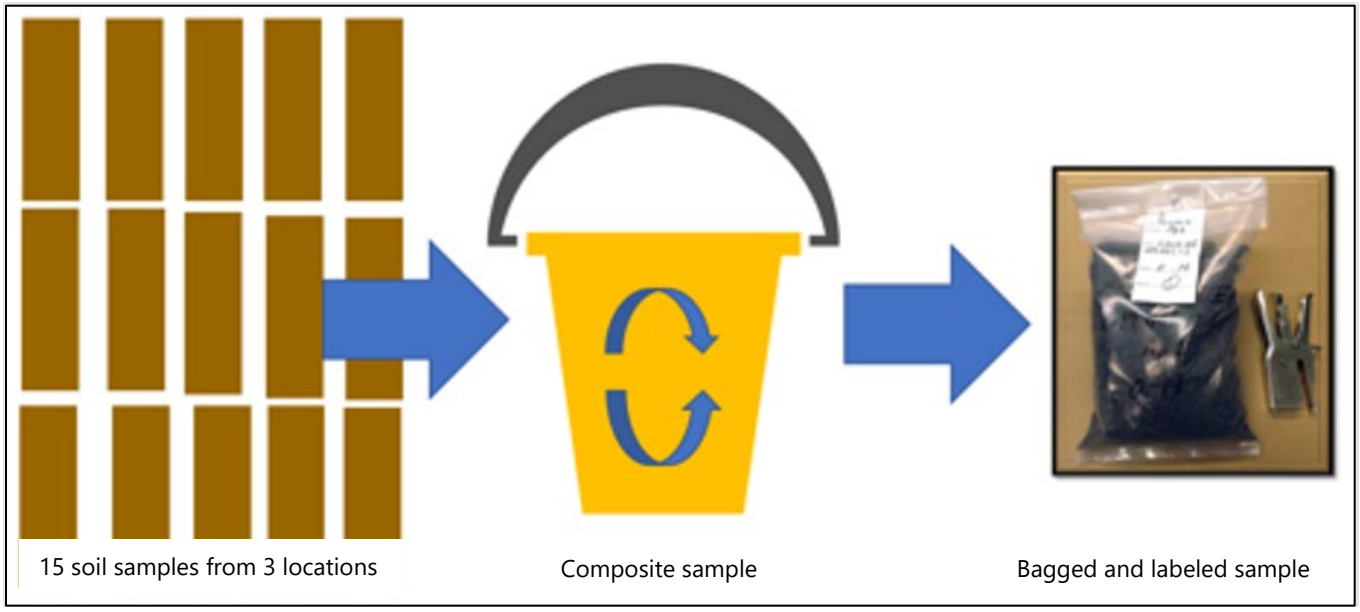
Within the PLU, for each representative location, collect one sample from the location and four subsamples about 20 to 50 ft away from the location (five samples per location, fifteen in total).

1. To collect a sample, dig a hole 8 in deep with a clean tile spade. It may help to measure the 8 inches on the tile spade with a permanent marker.
2. Remove a slice that is 2 in thick and 4 to 6 in deep from the face or side of the hole. To avoid bias, make sure the slice is the same thickness at the top and the bottom. Shave off parts of the slice as necessary to remove materials you do not want in your sample, ensuring at most an even 6-in by 2-in slice of soil.
3. Put the slice in a clean bucket and repeat the previous steps for the remaining 14 locations.
4. Gently and thoroughly mix all 15 soil samples to create one composite sample to ship to the laboratory (Figure 2). Make sure to use clean gloves when removing surface debris, stones, and root mats from the composite sample.
    a. Try not to crush natural aggregations (e.g., small clods, peds) that exist. A good composite sample should consist of a representative combination of naturally loose soil material and some soil peds.
5. Consult with the soil testing laboratory for specific instructions, but for most cases, put 4 to 6 cups of the composite soil into a 1-gallon resealable bag and label with:
    a. 5-digit zip code

b. Producer initials
c. Date (MMDDYY)
d. Soil map unit symbol (e.g., ErB from Figure 1)
e. Representative location number and PLU identification number or letter

6. Place the sample bag within another resealable bag.
   a. For aggregate stability testing, the laboratory might ask for the sample to be put in a more rigid container to preserve the natural peds.
7. Complete the lab or field data sheet, making sure to record the date, representative location number, and the latitude and longitude of all sample locations using the WGS84 coordinate system. This information is necessary for future sampling (timing and location).
8. Place the samples in a sturdy container for shipping or transport. The container may be your own or provided by the laboratory. The benefit of using materials provided by the laboratory is that they normally provide everything needed to submit soil samples, including soil sample bags, identification labels, a submission form, a prepaid mailer, and instructions.

Figure 2 – Sample Workflow



Mixing all 15 soil samples in the same clean bucket creates the one composite sample that will be sent to the laboratory for analysis.

Conclusion

After receiving laboratory results, reach out to an NRCS soil health specialist, cooperative extension service agent, or other knowledgeable consultant if assistance is needed in interpreting the results, planning appropriate conservation practices to breathe more life into soils, or developing a regular soil sampling plan to meet goals.

Example of Soil Health Sampling Process, from Start to Finish

Step 1

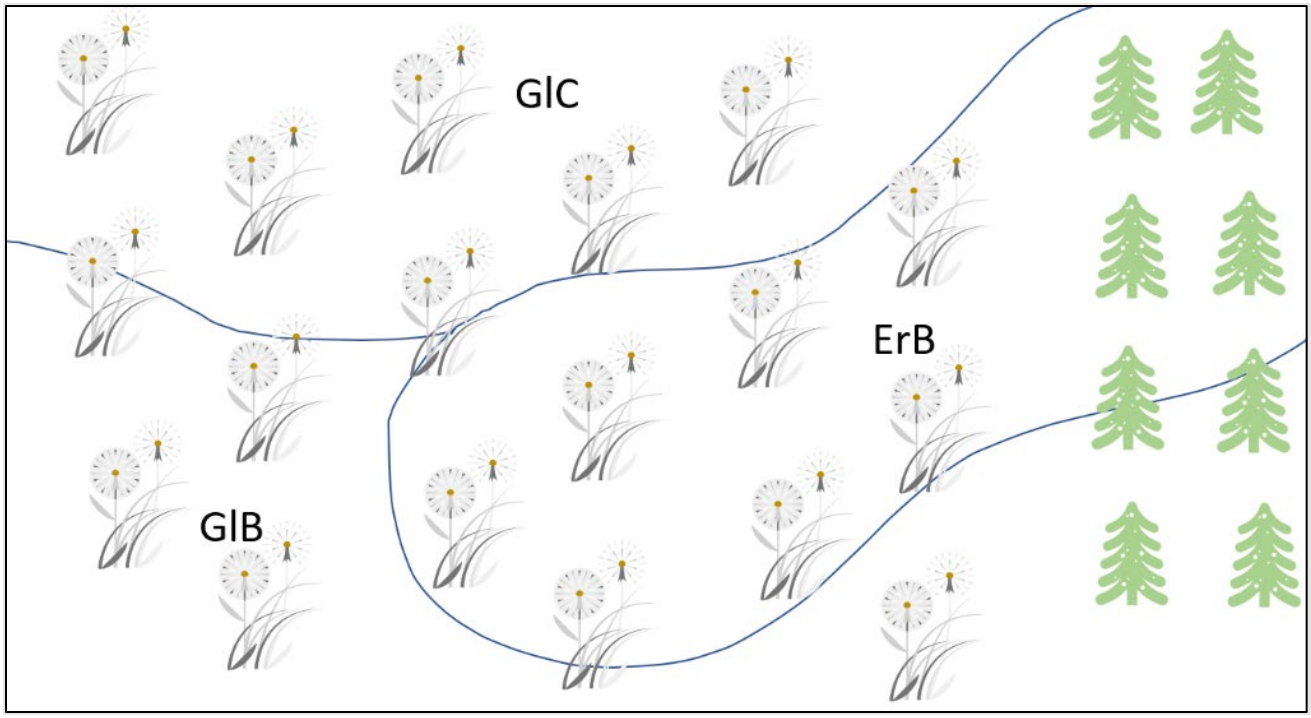
Farmer Max wants to improve soil health on his land. He has both forestland and cropland and knows he needs to manage the soils differently but is not sure how else to break up his farm.

Step 2

The conservation planner uses Web Soil Survey to create a soil map for Max's land. The conservation planner identifies three soil map units on the farm:

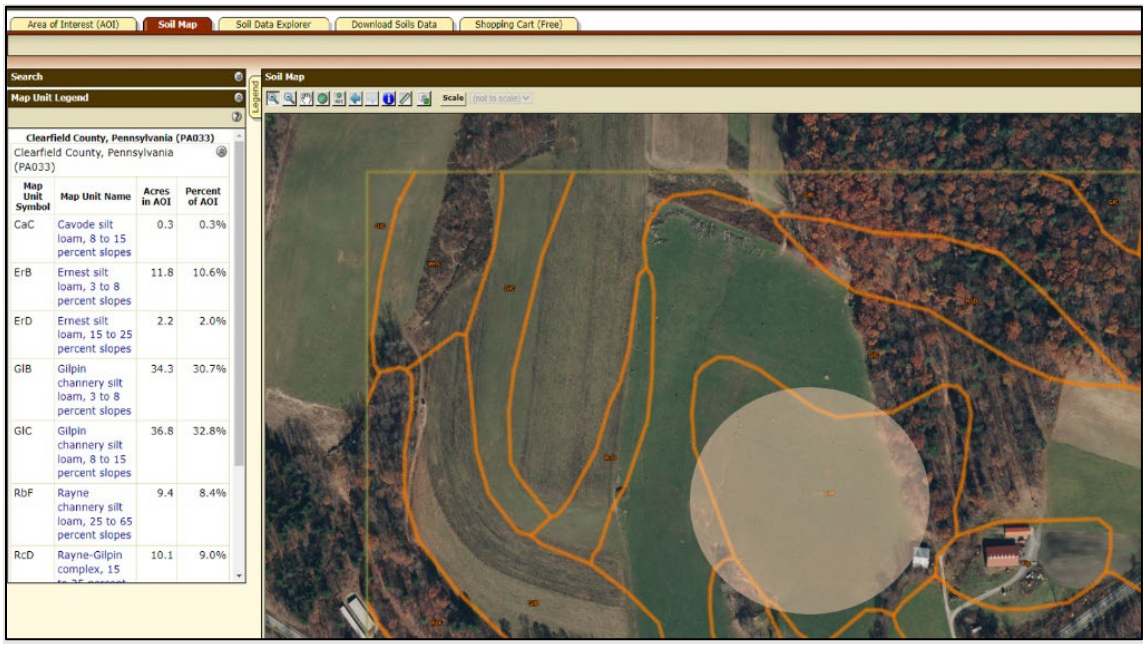
- Ernest silt loam at 3-8 percent slopes: ErB
- Gilpin channery silt loam at 3-8 percent slope break: GlB
- Gilpin channery silt loam at 8-15 percent slope break GlC

Max decides he wants to manage the two soils differently.



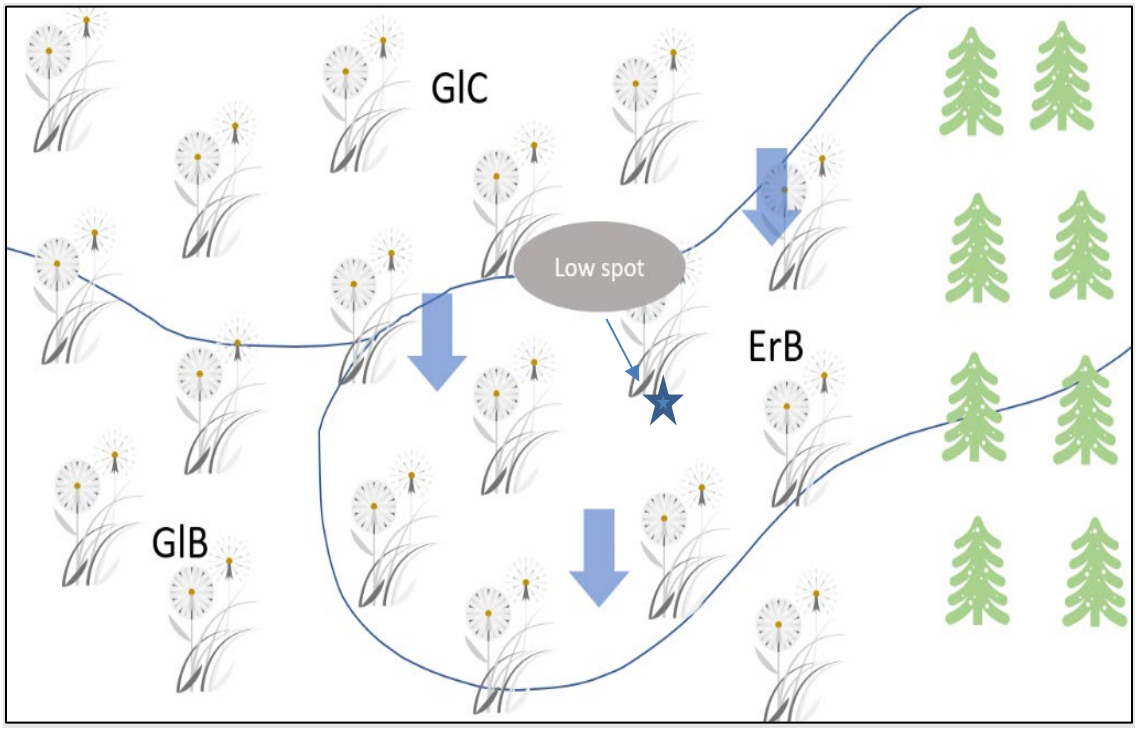
Step 3

Farmer Max wants a soil health management plan for his cropland based on the Ernest soil series. He selects ErB for soil health testing.



Step 4

Farmer Max selects three representative locations, avoiding the field border and the low spot in the field.



Step 5

Farmer Max also selects four subsampling sites for each of the three representative locations. The sites are 20 to 50 feet from their representative locations. These sites also avoid the low spot.

Step 6

At each of the sites, the sample collector takes a 5-cm (2-in) thick, 10 to 15-cm (4 to 6-in) deep slice out of a hole and mixes it in a bucket with the rest of the samples (pictures A-D).

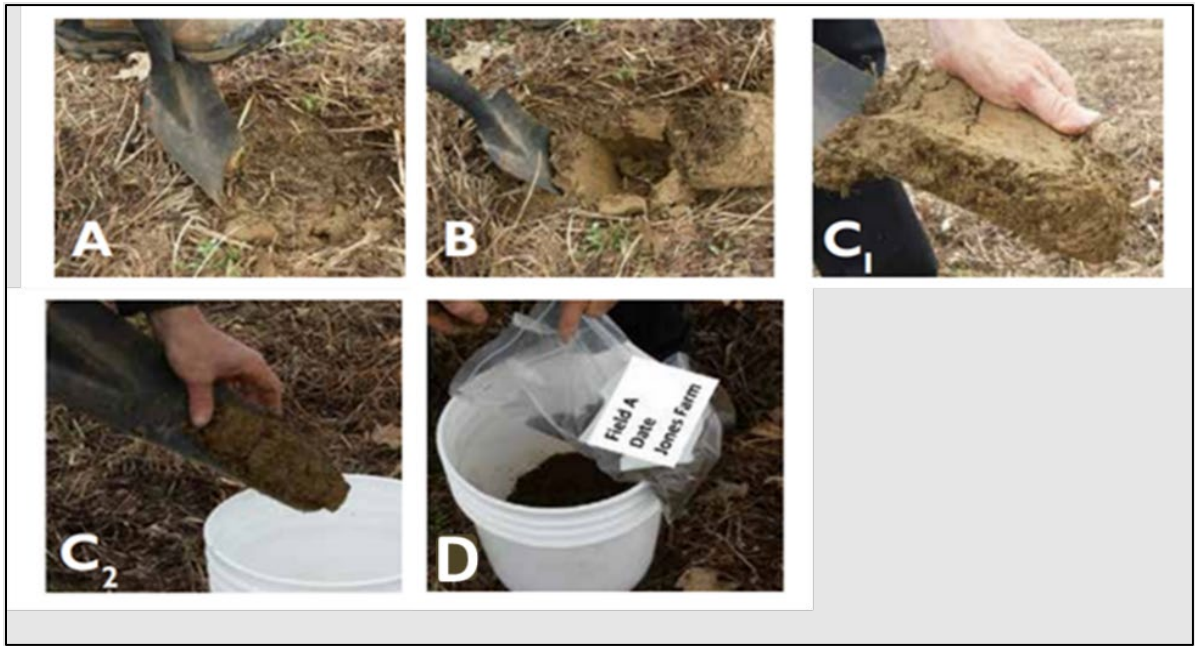


Photo: Moebius-Clune et al., 2016.

Step 7

The collector takes 5 cups of mixed soil from the bucket and bags and labels it.

Step 8

The collector submits a copy of the completed laboratory or field data sheet to the appropriate persons, making sure to record the date, representative location number, and the latitude and longitude of all sample locations using the WGS84 coordinate system.

Step 9

Once the collector properly bags and labels the soil samples, they prepare the samples for shipping using the laboratory-supplied materials (boxes, shipping labels, laboratory, and field sheets).

Step 10

Once collector receives the results from the laboratory, they work with the landowner to interpret the results and develop a soil health management plan for Max's cropland.

Further Readings

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