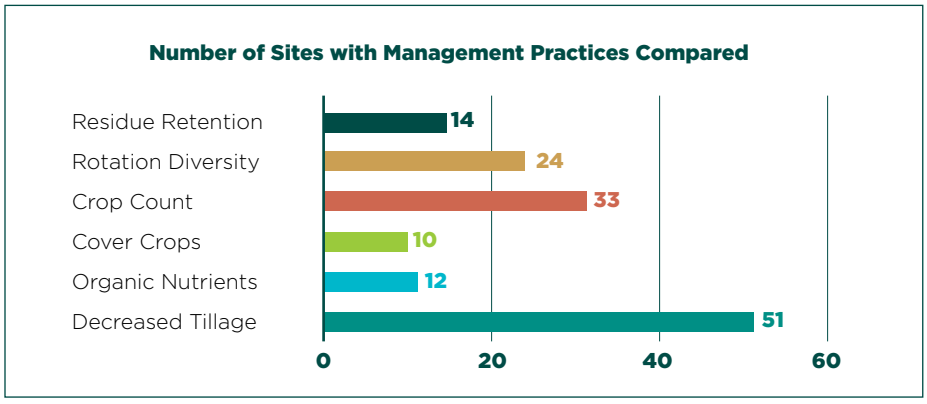
SOIL HEALTH INSTITUTE

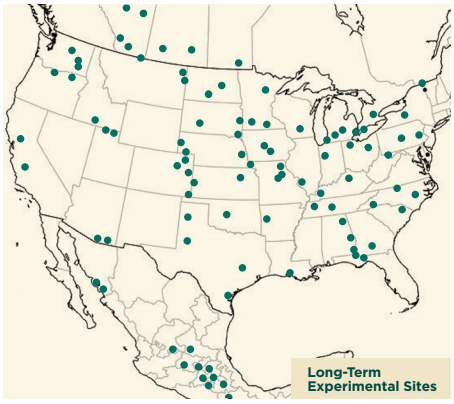
Enriching Soil, Enhancing Life

RECOMMENDED MEASUREMENTS FOR SCALING SOIL HEALTH ASSESSMENT

Selecting a Minimum Suite of Soil Health Indicators

The Soil Health Institute (SHI) partnered with over 100 scientists at 124 long-term agricultural research sites in the U.S., Canada, and Mexico to evaluate over 30 soil health indicators and identify a minimum suite of practical, affordable measurements for land managers. SHI considered how effectively each indicator responded to management across a wide range of soils, climates, and production systems, along with the indicator's cost, practicality, availability, and redundancy.





Recommended Soil Health Indicators

ORGANIC C CONCENTRATION

Soil organic carbon (C) is primarily comprised of non-living organic material in the soil – decomposed plant materials, root exudates, and microbial waste products. A smaller, living component of soil organic carbon is made up of a wide variety of organisms, including microbes that transform organic carbon compounds in the soil. Management that increases organic carbon content promotes greater soil structure, microbial activity, available water, and available nutrients.

This fact sheet details how laboratories can analyze soil C. Some soils, especially those in dry regions, will need a measure of inorganic C too.

CARBON MINERALIZATION POTENTIAL (BURST OF CO_2)

Soil organisms perform a lot of important work in the soil; they cycle nutrients, build structure, and form beneficial relationships with plants. As they do this work, they respire CO_2. Measuring how much CO_2 is released – or "mineralized" – from soil maintained under standardized conditions gives us an indication of potential microbial activity and is linked to the soil's ability to cycle carbon and nutrients. Carbon mineralization potential is strongly related to more intensive measures of total soil microbial biomass but is cheaper and more widely available.

This fact sheet details how to measure CO_2 respired by soil microorganisms upon rewetting an air-dried, sieved soil sample.

AGGREGATE STABILITY

Soil structure is the backbone of a soil's ability to support processes vital to the health and productivity of plants, animals, and ecosystems. Soil structural units, or aggregates, are clusters of sand, silt, and clay particles held together by organic matter, root exudates, and other materials. Because soil structure is difficult to measure, aggregate stability is often used as a proxy. Wet aggregate stability is a measure of a dry soil aggregate's ability to resist dispersion once rewetted. Soils with greater aggregate stability are more resistant to wind and water erosion, and are linked to improved water capture, infiltration, storage, and availability to plants.

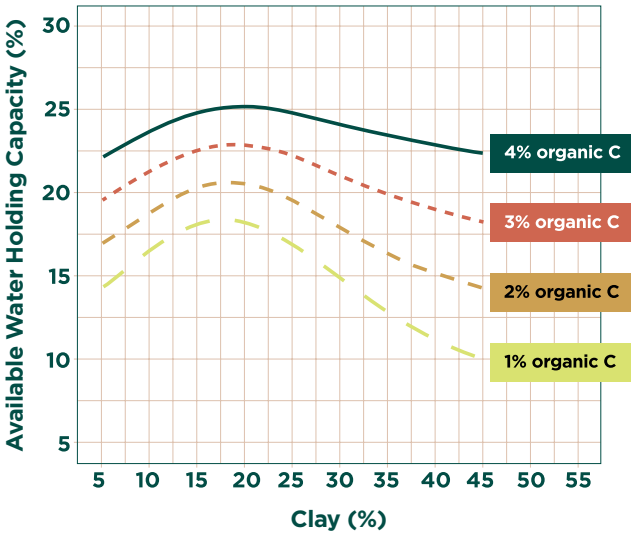
This fact sheet details an affordable and effective way to measure aggregate stability using a smartphone and free software.

Predicting Available Water Holding Capacity

A soil's plant available water holding capacity is the amount of water it can store and then provide to plants. A soil can become more drought resilient if managed to hold more available water between rainfalls or irrigation cycles. Available water holding capacity must be measured on intact soil cores to identify differences due to agricultural management. However, measuring available water on intact soil is very labor-intensive and not widely available at commercial soil labs. To address this issue, SHI scientists have developed equations to predict available water holding capacity using soil organic carbon, sand, and clay.

This fact sheet describes how to measure sand and clay if you don't already know them for your field.

As soil organic C increases, soil has more capacity to hold plant available water



KEY OUTCOMES

- Soil organic C concentration, C mineralization potential, and aggregate stability represent a cost-effective, minimum suite of soil health indicators for North America.
- Equations can be used to predict changes in available water holding capacity as soil organic C concentration changes.

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Learn more: Find links to published manuscripts, publication summaries, and standard operating procedures on the SHI website.

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