NRCS In-Field Soil Health Assessment & Importance of Soil Health Monitoring

Jennifer M. Moore, Ph.D.

Research Soil Scientist

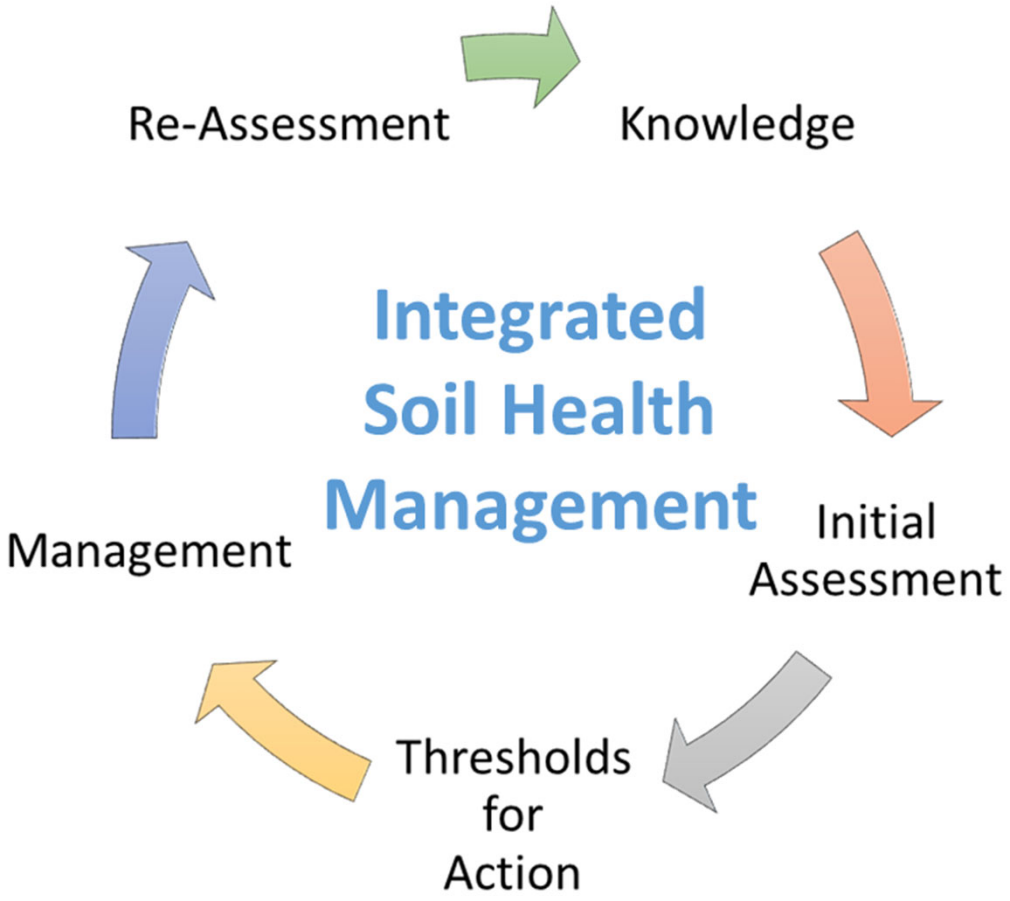
USDA-ARS, Corvallis, OR

Hawaii Women Farmers
Soil Health Workshop
Virtual Meeting

6/01/2021

Developing a Soil Health Management System

- **Knowledge**
  - Farm history
  - Identify problem(s)
- **Initial Assessment**
  - Field & laboratory
- **Identify Thresholds for Action**
  - Acceptable levels
- **Identify Management Strategies**
  - Short-term
  - Long-term
- **Re-assessment & Adaptation**



Adapted from: Manter, Delgado, & Moore-Kucera, 2018

The Value of Soil Health Monitoring

- Knowledge is power
- Creates awareness and inspires novel approaches
- Validates that your practices are having an impact on your system
- Identifies new opportunities
- Compare notes with neighbors and share learning
- Get on the map
- Bragging rights ☺

ASSESSMENT: Searching for signs of a healthy soil

United States Department of Agriculture
Agricultural Research Service

Searching for Signs of Healthy Soil

- In-field Assessment
  - No expensive equipment
  - Simple, multiple indicators
  - Originally used to determine if a soil health resource concern exits
  - With local guidance, it can be modified to assess current status and to track changes over time.

Field Conditions You Want to Avoid

Example of J-rooting (Photo source: D. Lamm (left), C. Thomas (right), NRCS-SHD.

Source: Chessman

Field Conditions You Want to See

Source: J. Moore

Examples of Corn and Soybean Residue Cover Percentages.
Source: Iowa State University

Photo sources: Beare et al. 1995. Plant & Soil 170:5-22; Kuzyakov et al. 2015. Soil Biol Biochem 83:184-199

Photo sources: NRCS; Global Soil Biodiversity Atlas; Iowalearningfarms.wordpress.com

USDA ARS
United States Department of Agriculture
Agricultural Research Service

Field Indicators for Soil Health

Surface


Surface Cover


Surface Crusting


Residue Breakdown


Ponding

Soil Physical


Penetration resistance


Soil Structure & Color


Aggregate Stability


Erosion

Soil Biological


Biopores

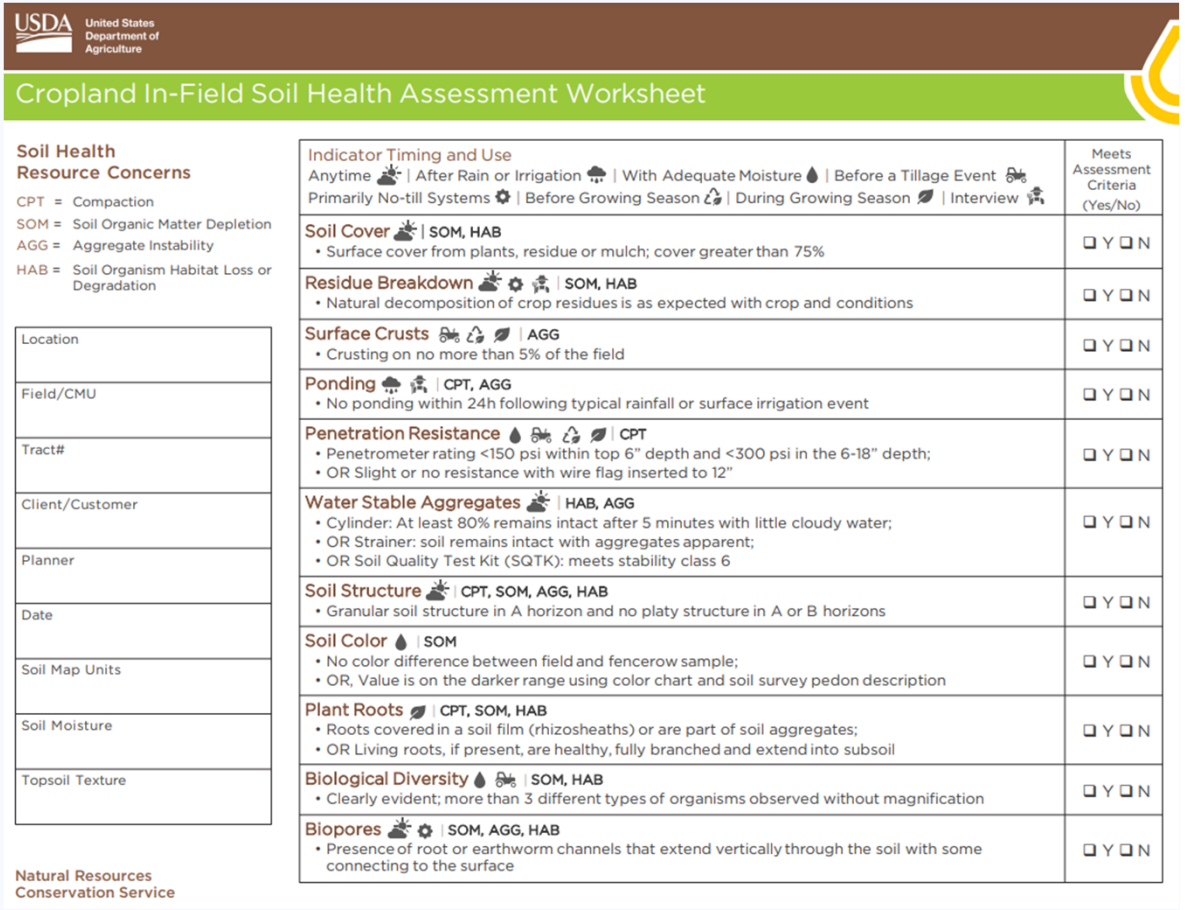

Root Depth & Distribution


Biological Activity

https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/assessment/

USDA ARS
United States Department of Agriculture
Agricultural Research Service

In-field Soil Health Assessment



USDA United States Department of Agriculture

Cropland In-Field Soil Health Assessment Worksheet

Soil Health Resource Concerns

CPT = Compaction
SOM = Soil Organic Matter Depletion
AGG = Aggregate Instability
HAB = Soil Organism Habitat Loss or Degradation

Location
Field/CMU
Tract#
Client/Customer
Planner
Date
Soil Map Units
Soil Moisture
Topsoil Texture

Natural Resources Conservation Service

Indicator Timing and Use Anytime | After Rain or Irrigation | With Adequate Moisture | Before a Tillage Event Primarily No-till Systems | Before Growing Season | During Growing Season | Interview	Meets Assessment Criteria (Yes/No)
Soil Cover | SOM, HAB • Surface cover from plants, residue or mulch; cover greater than 75%	❑ Y ❑ N
Residue Breakdown | SOM, HAB • Natural decomposition of crop residues is as expected with crop and conditions	❑ Y ❑ N
Surface Crusts | AGG • Crusting on no more than 5% of the field	❑ Y ❑ N
Ponding | CPT, AGG • No ponding within 24h following typical rainfall or surface irrigation event	❑ Y ❑ N
Penetration Resistance | CPT • Penetrometer rating <150 psi within top 6" depth and <300 psi in the 6-18" depth; • OR Slight or no resistance with wire flag inserted to 12"	❑ Y ❑ N
Water Stable Aggregates | HAB, AGG • Cylinder: At least 80% remains intact after 5 minutes with little cloudy water; • OR Strainer: soil remains intact with aggregates apparent; • OR Soil Quality Test Kit (SQTK): meets stability class 6	❑ Y ❑ N
Soil Structure | CPT, SOM, AGG, HAB • Granular soil structure in A horizon and no platy structure in A or B horizons	❑ Y ❑ N
Soil Color | SOM • No color difference between field and fencerow sample; • OR, Value is on the darker range using color chart and soil survey pedon description	❑ Y ❑ N
Plant Roots | CPT, SOM, HAB • Roots covered in a soil film (rhizosheaths) or are part of soil aggregates; • OR Living roots, if present, are healthy, fully branched and extend into subsoil	❑ Y ❑ N
Biological Diversity | SOM, HAB • Clearly evident; more than 3 different types of organisms observed without magnification	❑ Y ❑ N
Biopores | SOM, AGG, HAB • Presence of root or earthworm channels that extend vertically through the soil with some connecting to the surface	❑ Y ❑ N

https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=44419.wba

USDA ARS United States Department of Agriculture
Agricultural Research Service

Important Considerations

- Be consistent (timing, approach)
- Sample at simple timepoints each year
- Consider sampling multiple times during the first year or two
- Use a soil map
- Keep a journal
- Take pictures
- Trust your senses
- Don’t give up!

Mahalo!

Jennifer.Moore@usda.gov

541-738-4180 (office)