Soil Health & Assessment

National Association of Conservation Districts (NACD)

Urban and Community Development Webinar Series

Presented by,
Eileen Miller, Soil Health Specialist
USDA NRCS NJ
January 15, 2015
What is soil?

- Soils have four major components: mineral matter, organic matter, air, and water.

- Soil has biological, chemical, and physical properties that are always changing.

Figure 1.—Four major components of soil volume (Michigan Field Crop Ecology, 1998, E-2646, page 13).
Soil Properties

**Inherent**- what the soil is born with through soil formation. (texture, depth to bedrock)

**Dynamic**- human induced changes-
Use and Management
Soil is a natural body of solids, liquid, and gases, with either horizons, or layers or the ability to support rooted plants.

Pedology, the study of soil, is a unique discipline.
Soil Organic Matter

Is necessary for all soil functions, and it is the most important indicator of soil health.
What is Soil Health?

Soil health is defined as “the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental health, and promote plant and animal health.”
The Soil Water Cycle

- Precipitation
- Infiltration
- Soil water storage
- Percolation
- Runoff
- Evapotranspiration
- To deep groundwater
- To stream
How can we tell if soil is HEALTHY?
Soil Health Parameters
Physical Components

• Surface Hardness/Compaction
• Structure
• Friability
• Consistence
• Soil Tilth
• Drainage/Infiltration of Rainwater
Chemical Components

• Nutrient Holding Capacity
• pH
• Use of a laboratory Soil Test
Biological Components

- Organic Matter
- Soil Color
- Roots
- Soil Life
- Plant Growth
The NJ Soil Health Assessment Guide

NEW JERSEY SOIL HEALTH ASSESSMENT GUIDE
...A Locally Adapted Field Tool For NJ Communities

The natural water cycle
To get started—Dig a Hole!
Visual Observation
How compacted is the soil?
Soil Compaction

- a) good soil structure: porous (loose-fitting) crumbs and blocks
- b) compacted soil: surface crust, tightly packed crumbs, large blocks with few cracks, subsoil compaction
Soil Structure Categories

Example: Identify a soil that is 40% sand, 22% clay, and 38% silt.
1. Find 40 on the x-axis for sand.
2. Draw a line in the direction of the arrow.
3. Do the same for clay (22%) and silt (38%).
4. The spot where the three come together is the soil texture. In this case, the soil is a loam.
Aggregate (crumb)

small pore – Important for long term moisture retention

Intermediate pore - Important for water retention and biological functions

large pore – Important for drainage, aeration and rooting

A well aggregated soil has a range of pore sizes. This medium size soil crumb is made up of many smaller ones. Very large pores occur between the medium size aggregates.
Glomalin
A Manageable Soil Glue

A strong glue, glomalin, is produced by a beneficial fungus that grows on plant roots. The glue comes off of the fungus and is deposited on soil particles. This process leads to build up and stabilization of aggregates.
Erosion by Wind & Water
Is your soil FUNCTIONING?
Is Rainwater Infiltrating into the soil or ponding?.
The living systems occurring above and below the ground surface are determined by the properties of the soil.
Benefits of Soil Carbon

- Soil Carbon
- Aggregation & Infiltration
- Productivity
- Water & Nutrient Holding
- Air & Water Quality; Wildlife Habitat

Soil Quality vs. Time
Organic Matter, Color, & Roots

- Color
- Structure
- Porosity
- Root density
Soil Life

- Dark color
- Organic residue
- Earth worms
- Macropores
- Roots
Moisture Retention

Available water capacity is the amount of soil moisture available to plants.
CHEMICAL

Nutrient Holding Capacity
pH
Organic Matter & Clay Content play a major role.
Lab Assessments-
Don’t Guess, Soil Test!
What if I score FAIR to LOW?

• There is a solutions page that will give reasons why as well as ideas on how to improve the situation.
How to Improve Soil Health

• till the soil as little as possible
• grow as many different species of plants as possible to provide maximum diversity of species.
• keep living plants in the soil as long as possible
• and keep the soil surface covered with residue year round
CONCLUSION

• Assessing Soil Health helps us determine the level of Soil Function.

• Proper Soil Management results in a more resilient soil that functions in ways that improve and sustain our soil for future generations.
To access the Soil Health Assessment Guide on line version go to soildistrict.org
Hard copy versions also available.

For More Information of Soil Health go to our website at:
www.nrcs.usda.gov

My Contact Information:
Eileen Miller, Soil Health Specialist
USDA NRCS

Eileen.miller@nj.usda.gov

Thank You!