



## MARYLAND SOIL HEALTH CARD

### What is Soil Health?

Soil Health is the continued capacity of a soil to function. Healthy soils support plants, animals, and humans by:

- Cycling nutrients and increasing their availability;
- Increasing water infiltration and availability;
- Maintaining a stable porous structure that withstands natural forces (e.g., water, wind).

Healthy, fully functioning soil creates a habitat that sustains diverse soil micro- and macro-organisms.

### Why is Soil Health Important?

Soils that lack organic matter, structure, and microorganisms are susceptible to erosion, hold less water, and need more chemical inputs to rebalance their productivity. Improving soil health increases soil aggregates and improves soil structure, resulting in greater water infiltration, decreased erosion, and reduced runoff and sedimentation.

### Follow these 4 Key Principles to Improve Soil Health:

1. Minimize soil disturbance;
2. Maximize the diversity of plants in the rotation;
3. Keep living roots in the soil as much as possible;
4. Keep the soil covered with plants and plant residues at all times.

### What Is the Soil Health Card?

The Soil Health Card evaluates a soil's health as a function of a select number of soil, water, plant, and other biological properties. The Card is a tool to help you monitor and make suggestions on how to improve soil health based on your own field experience and a working knowledge of soils. Regular use will allow you to record long-term changes in soil health, and to compare the effects of different soil management practices. It provides a mix of quantitative and qualitative assessment of soil health and evaluation ratings that do not represent an absolute measure or value. The purpose is not to measure one soil type against another, but rather to use indicators that assess each soil's ability to function within its capabilities and site limitations. It can be used to compare one tillage practice or land use to another, of the same soil type. The Bucket Kit can be used as a follow up providing a more detailed analysis of the soil's health.

### How Do You Use the Soil Health Card?

- Step 1** The instructions to determine the "indicator descriptive ratings" is at the end of this document. Soil pH and organic matter information from recent soil tests can also be added.
- Step 2** Use the table on page 3 for the best times to assess each indicator of soil quality and health.
- Step 3** Divide the farm and fields into separate sections for evaluation in the same way you would divide them for soil-fertility sampling: separate by factors such as soil type, topography, and history of tillage, crop rotation, and manure application.
- Step 4** Select a representative spot in your field and evaluate each soil health Indicator. Read the Descriptive Ratings in the table, and based on your test results or judgment, rate the indicator as Good, Fair, or Poor by checking the box with the best description.
- Step 5** If you identify soil health indicators that are Poor or Fair, prescribe management strategies and conservation practices (see page 3) to improve soil health and quality over time.
- Step 6** Follow changes in each of the soil health indicators over time, examine current field management practices, and consider ideas for management changes in problem areas.

# MARYLAND SOIL HEALTH CARD

Farm/Tract/Field #s.: _____	Date: _____
Current Tillage System with number and kind of crops in rotation: _____	Assisted by: _____ Soil Texture: _____

Indicators	Descriptive Ratings		
	<i>Good</i>	<i>Fair</i>	<i>Poor</i>
<b>Surface Residue</b>	>60% visible at various stages of decomposition on soil surface	30-60% visible, non-decomposed residue on soil surface	0-30% visible non-decomposed residue on soil surface.
<b>Infiltration (Based on soil texture) (Refer to Infiltration Chart)</b>	Higher infiltration rate indicates soil absorbs water in a timely manner and is not susceptible to runoff or ponding.	Average infiltration rate indicates soil absorbs water, but more slowly, and runoff and ponding may occur.	Very slow infiltration rate indicates soil absorbs water very slowly, and runoff and ponding will occur.
<b>Compaction/Root growth</b>	Wire flag enters soil easily to a depth below the topsoil layer; unrestricted root penetration.	Wire flag enters soil, but requires force to reach a depth below the top soil layer; root growth restricted.	Wire flag enters soil with force, but does not penetrate through the top soil layer; roots growing laterally.
<b>Organic Matter (Visual or Munsell book)</b>	Soil is dark brown or black in color; organic matter is visible in the topsoil layer.  Value $\leq 3$ and chroma $\leq 3$ .	Soil is somewhat dark in color; little organic matter is visible in the topsoil layer.  Value = 4 and chroma = 4	Soil is bright to dull colored; no organic matter is visible in the topsoil layer.  Value > 4 and chroma > 4
<b>Soil Structure/Aggregation</b>	Soil is granular, soft and crumbly, held together with many fine roots. Looks like cottage cheese.	Soil is blocky and firmer with some fine roots.	Soil is single grain, massive or platy and hard to break apart. It has few or no fine roots.
<b>Earthworms and Macroinvertebrates</b>	Earthworms/grubs etc. >3 per spade, obvious middens, many pores and casts.	Earthworms/grubs etc. 1 to 3 per spade, few middens, few pores and casts.	Earthworms/grubs etc. None present per spade, no middens, pores or casts.
<b>Soil Odor</b>	Earthy/Sweet odor	Little odor at all	No odor at all or sour, metallic, kitchen sink, rotten egg

Data from recent soil pH and/or organic matter analysis (if available): \_\_\_\_\_

## Using Soil Health Management Strategies and Associated NRCS Conservation Practice Standards to Improve Observed Fair and Poor Soil Health Indicators

### Surface Residue, Organic Matter, Soil Odor, and Earthworms Indicators

Management strategies such as:

- Using diverse high-residue crops -- see Conservation Crop Rotation (328);
- Using cover crops and cover crop mixes with grasses and legumes -- see Cover Crop (340);
- Using no-till or reduced tillage -- see Residue and Tillage Management (329) and (345);
- Reducing pesticide risk to beneficial soil organisms -- see Integrated Pest Management (595); and,
- Applying solid manure or compost at a proper agronomic rate -- see Nutrient Management (590).

These strategies will increase soil organic matter, soil biological activity, water holding capacity, and nutrient availability.

### Infiltration, Compaction, and Soil Structure Indicators

Management strategies such as:

- Using diverse high-residue crops -- see Conservation Crop Rotation (328);
- Using cover crops, cover crop mixes, and deep-rooted cover crops -- see Cover Crop (340);
- Managing equipment traffic, especially on wet soils; and,
- Using no-till or reduced tillage -- see Residue and Tillage Management (329) and (345).

These strategies will improve soil structure and aggregation by increasing organic matter content and porosity, and will improve infiltration while minimizing compaction.

### Best Times to Assess Indicators

Indicators	Recommended Timing for Assessment				
	<i>Early Spring Before Planting</i>	<i>Spring</i>	<i>Summer</i>	<i>Fall</i>	<i>After Rainfall</i>
<i>Surface Residue</i>	X	X		X	
<i>Infiltration</i>	X	X	X	X	
<i>Compaction</i>	X	X		X	
<i>Organic Matter</i>	X	X	X	X	
<i>Soil Structure</i>	X	X	X	X	X
<i>Earthworms</i>	X	X		X	X
<i>Soil Odor</i>	X	X	X	X	X

## Instructions to determine the Indicator Descriptive Ratings

**Equipment needed:** tape measure, small spray bottle of water, rags or paper towels, 1 quart water, shovel, pin flag. Photos, charts and guides in Attachment.

All determinations are performed either on the soil surface or within the topsoil layer, 6-12 inches thick. (You should dig a hole to determine the thickness of the topsoil layer).

### Soil Texture

1. Follow directions on Guide for Estimating Soil Texture by Feel. See [Attachment A](#) for more details.
2. Take sample from topsoil layer and from subsoil layer, if needed.

**Surface Residue:** Visual judgement by using NRCS residue photos or with a measuring tape. See [Attachment B](#).

### Infiltration (see [Attachment C](#)):

1. Dig a small 3 inch deep hole so that it has a fairly flat bottom.
2. Likely scratch the bottom and sides of the hole.
3. Pour in 3 inches of water.
4. Time how long it takes water to completely infiltrate.
5. Repeat three times.

### Compaction:

1. Hold pin flag about 12-15" from lower end.
2. Push lower end into soil surface, while wiggling.
3. Observe how deep the pin flag penetrates the soil.

### Organic Matter (see [Attachment C](#)):

1. Select soil sample from topsoil layer.
2. Moisten soil if dry.
3. Match soil with organic matter color chart or use Munsell color chart.

**Soil Structure:** Visual judgement by using NRCS photos. Physical judgement using NRCS consistence guides. See [Attachment D](#) for details.

### Earthworms:

1. Remove a large shovel of topsoil.
2. Separate the soil gently looking for earthworms and other macroinvertebrates.
3. Count number of them present.

### Soil Odor:

1. Cup soil in both hands and smell
2. Healthy soil should have a sweet earthy aroma.
3. If soil smells sour, metallic, or like kitchen cleanser, this may be a good indicator that the soil is not functioning