Fiscal Sponsor: Organic Trade Association

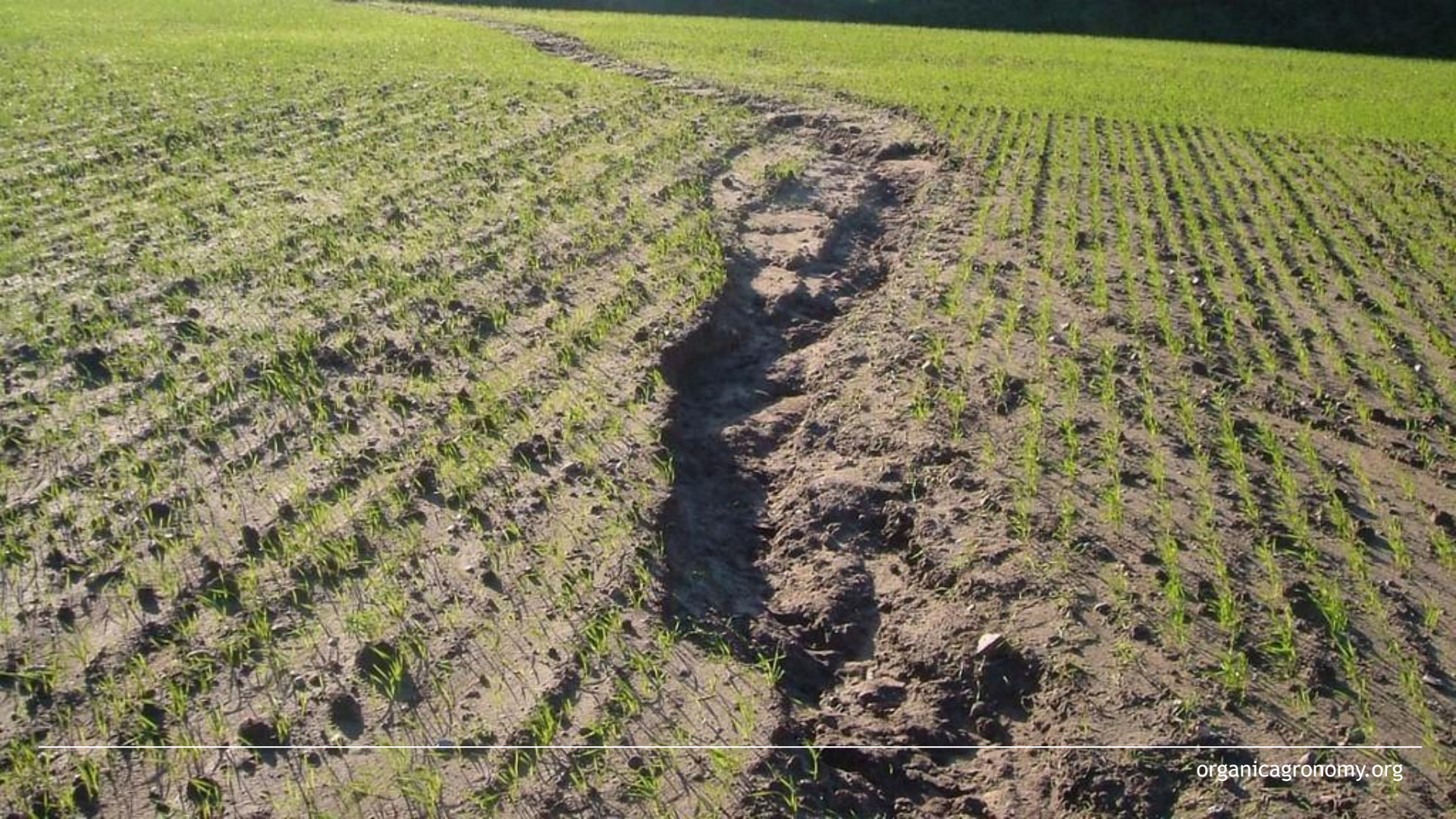
Overview of Soil Health in Organics & the USDA Organic Regulations

Presented By Mallory Krieger

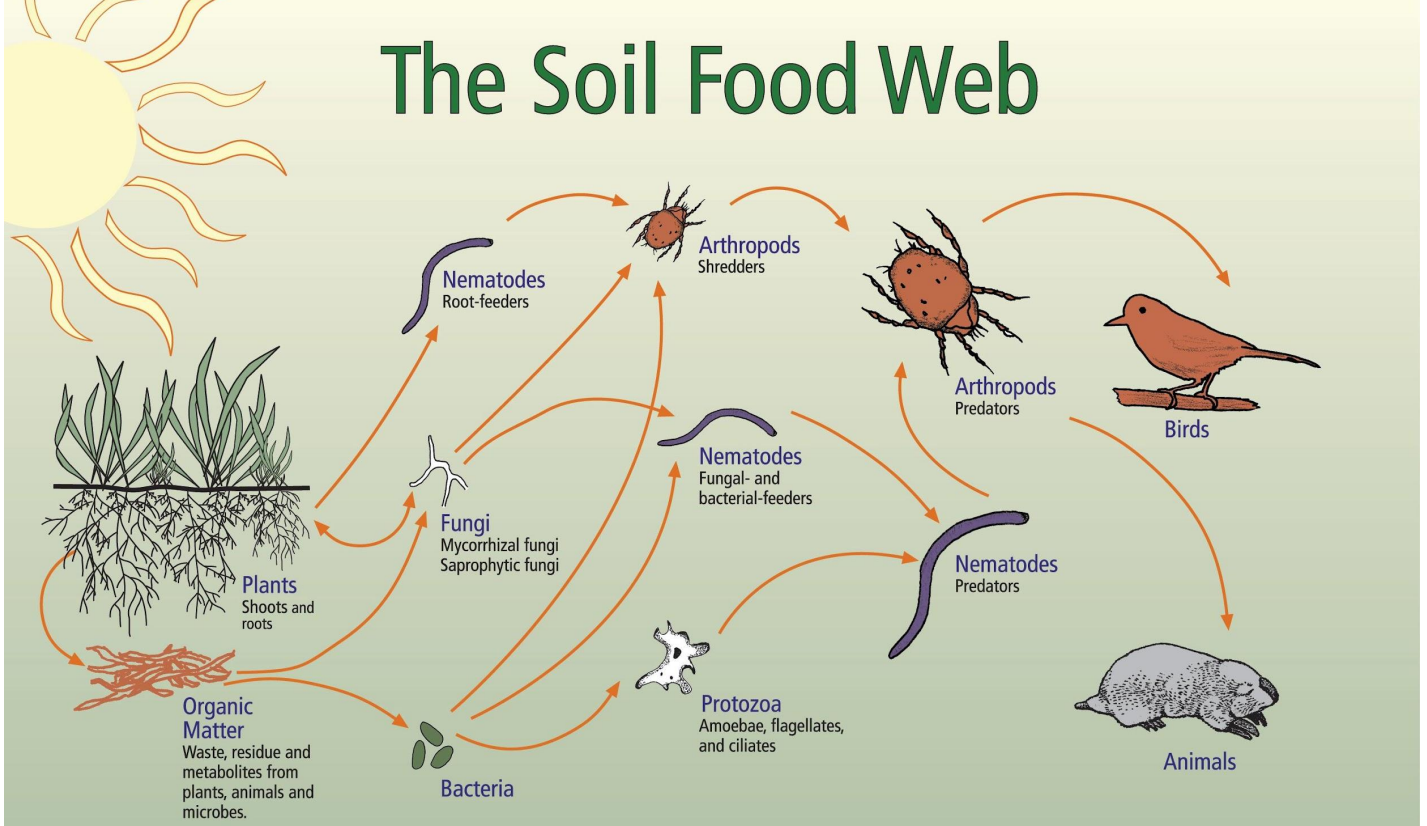
“Dirt” or “Soil”

Soil Functions

1) Providing the physical structure, nutrients and pH, and biological dynamism to support plant growth
2) Providing food and habitat for a range of beneficial soil-born organisms
3) Maintaining adequate soil oxygen so that both soil life and roots can breathe.
4) Cycling and storing carbon and plant nutrients
5) Filtering, buffering, degrading, immobilizing, and detoxifying organic residues and inorganic materials such as nutrients as well as potentially harmful chemicals
6) Suppressing pests, diseases, and weeds
7) Storing Carbon
8) Regulating water flow
9) Filtering nutrients, pathogens and sediments from water



The Soil Food Web



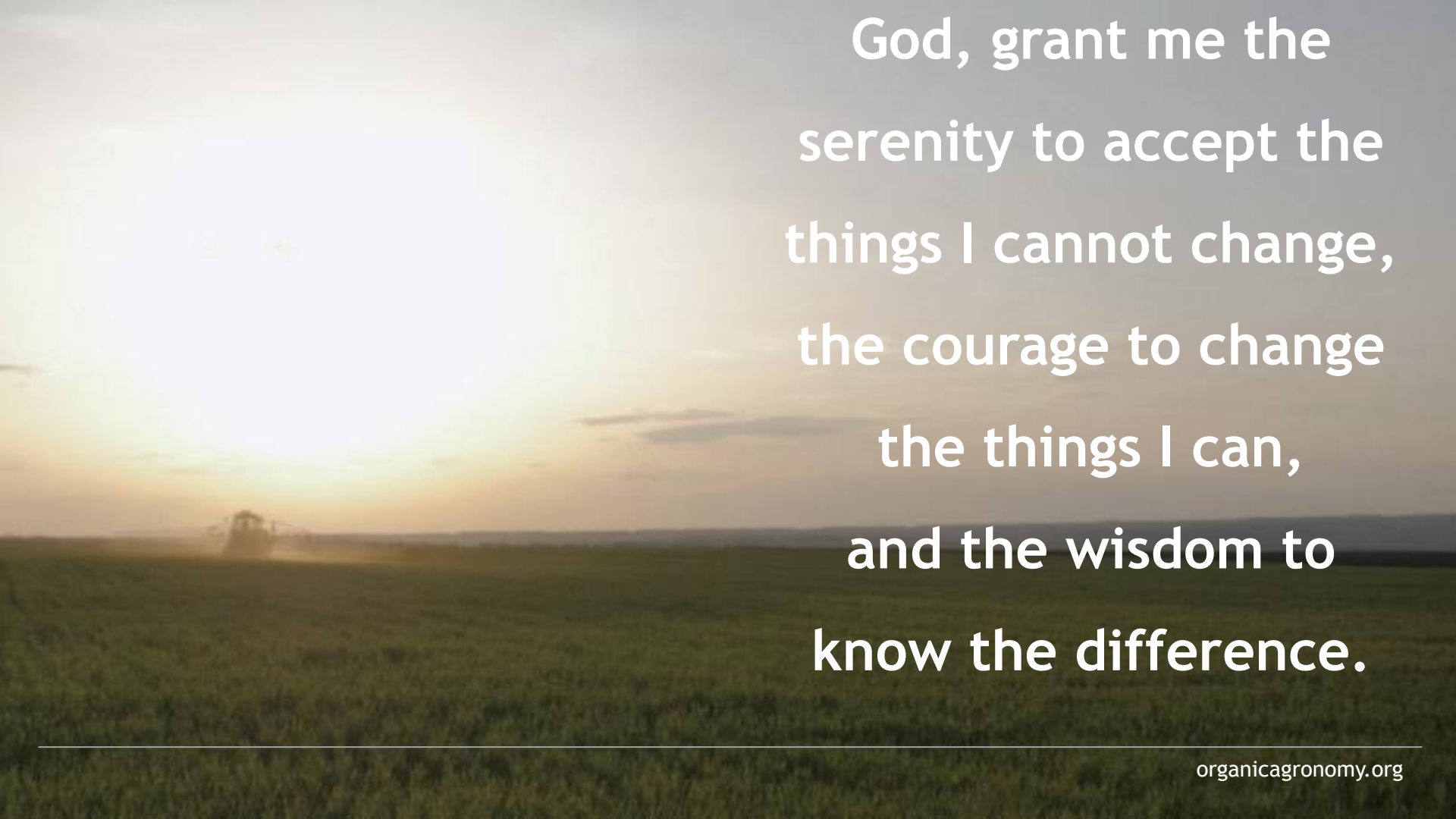
First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators


God, grant me the
serenity to accept the
things I cannot change,
the courage to change
the things I can,
and the wisdom to
know the difference.

Inherent Properties

Soil type

Texture

Stoniness

Depth

Dynamic Properties

Soil organic matter

Tilth

Structure

Aggregation

Nutrient Availability

Components of Organic Matter

1. Raw organic materials such as crop residues
2. Decomposing materials such as manure and aged residues
3. Humus

Long-Term Agroecological Research Experiment (LTAR)

Iowa State University

"The organic plots had up to 40% more biologically-active soil organic matter, which is important for fertility and nutrient availability. Organic soils also had lower acidity and higher amounts of carbon, nitrogen, potassium, phosphorus, and calcium."

(Long Term Study Shows Soil-Building Benefits of Organic Practices, www.certifiedcropadviser.org)

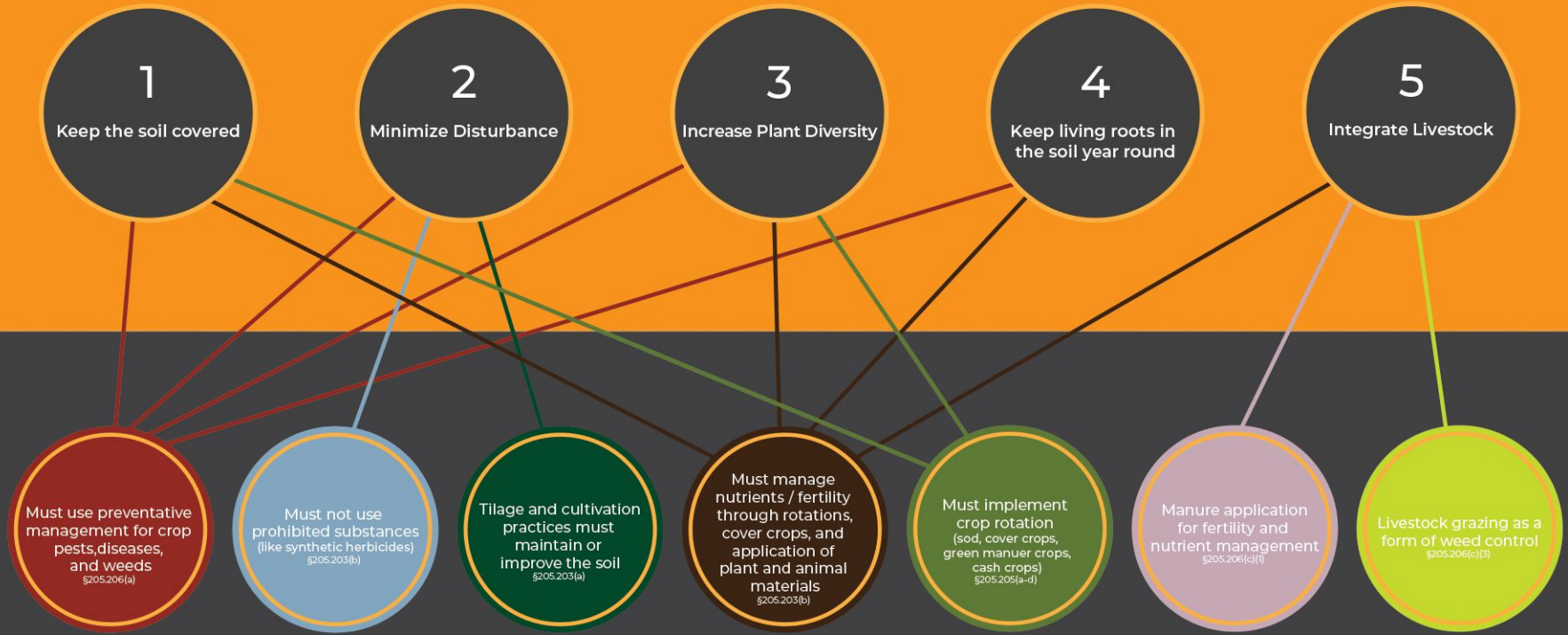
Definition of Organic Production

USDA Organic Regulation § 205.2

"A production system that is managed in accordance with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity."


Soil Health Principles
Soil Armor
Limit Disturbance
Plant Diversity
Living Roots
Livestock Integration

Principles of Soil Health



National Organic Program Regulations

The definition of organic production requires practices that foster cycling of resources, promote ecological balance,and conserve biodiversity.

§205.2

Crop pest, weed, and disease management practice standard

USDA Organic Regulation § 205.206(a)

“(a) The producer must use management practices to prevent crop pests, weeds, and diseases…”

Land Requirements

USDA Organic Regulation § 205.202(b)

“Any field or farm parcel from which harvested crops are intended to be sold, labeled, or represented as “organic,” must:

(a) Have had no prohibited substances, as listed in § 205.105, applied to it for a period of 3 years immediately preceding harvest of the crop”

Soil fertility and crop nutrient management practice standard

USDA Organic Regulation § 205.203(a)

“(a) The producer must select and implement tillage and cultivation practices that maintain or improve the physical, chemical, and biological condition of soil and minimize soil erosion.”

Soil fertility and crop nutrient management practice standard

USDA Organic Regulation § 205.203(b)

“The producer must manage crop nutrients and soil fertility through rotations, cover crops, and the application of plant and animal materials.”

Crop rotation practice standard

USDA Organic Regulation § 205.205

"The producer must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provide the following functions that are applicable to the operation:

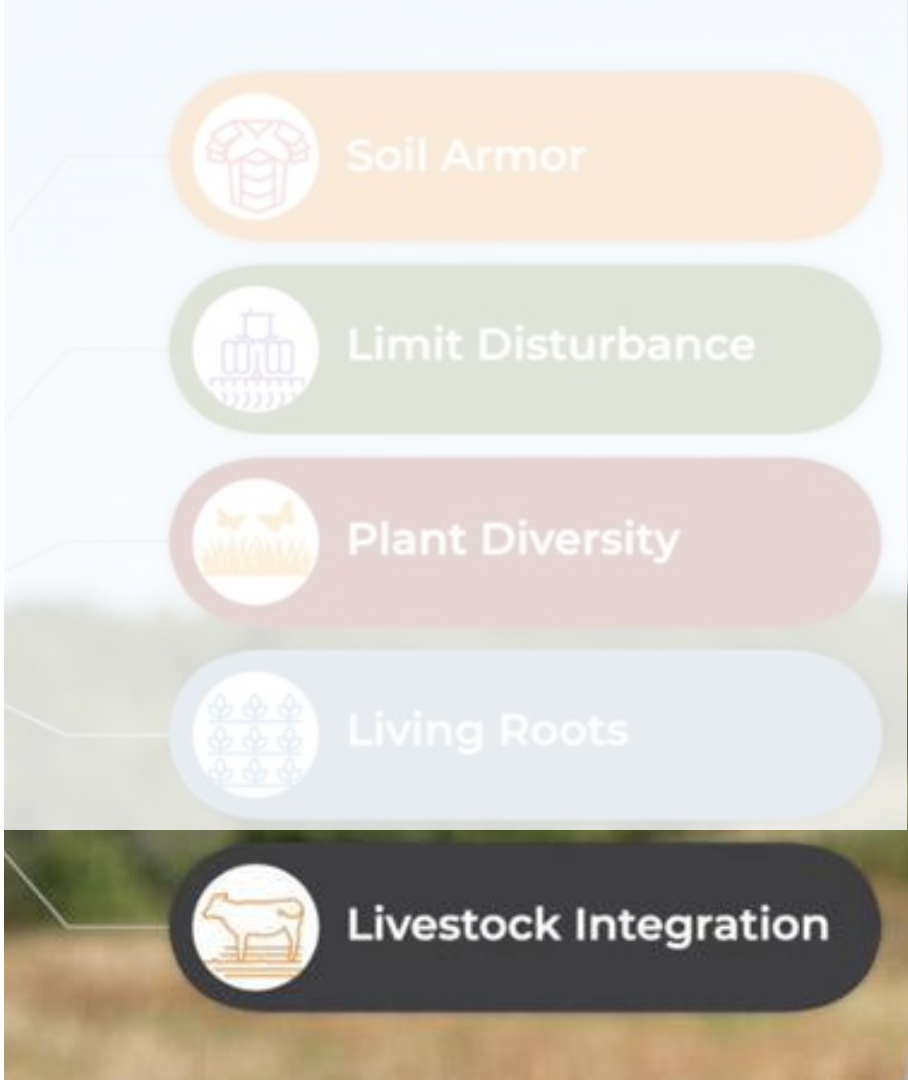
(a) Maintain or improve soil organic matter content;
(b) Provide for pest management in annual and perennial crops;
(c) Manage deficient or excess plant nutrients; and
(d) Provide erosion control.

Crop pest, weed, and disease management practice standard

USDA Organic Regulation § 205.206(c)(3)

“(c) Weed problems may be controlled through:

(3) Livestock grazing”

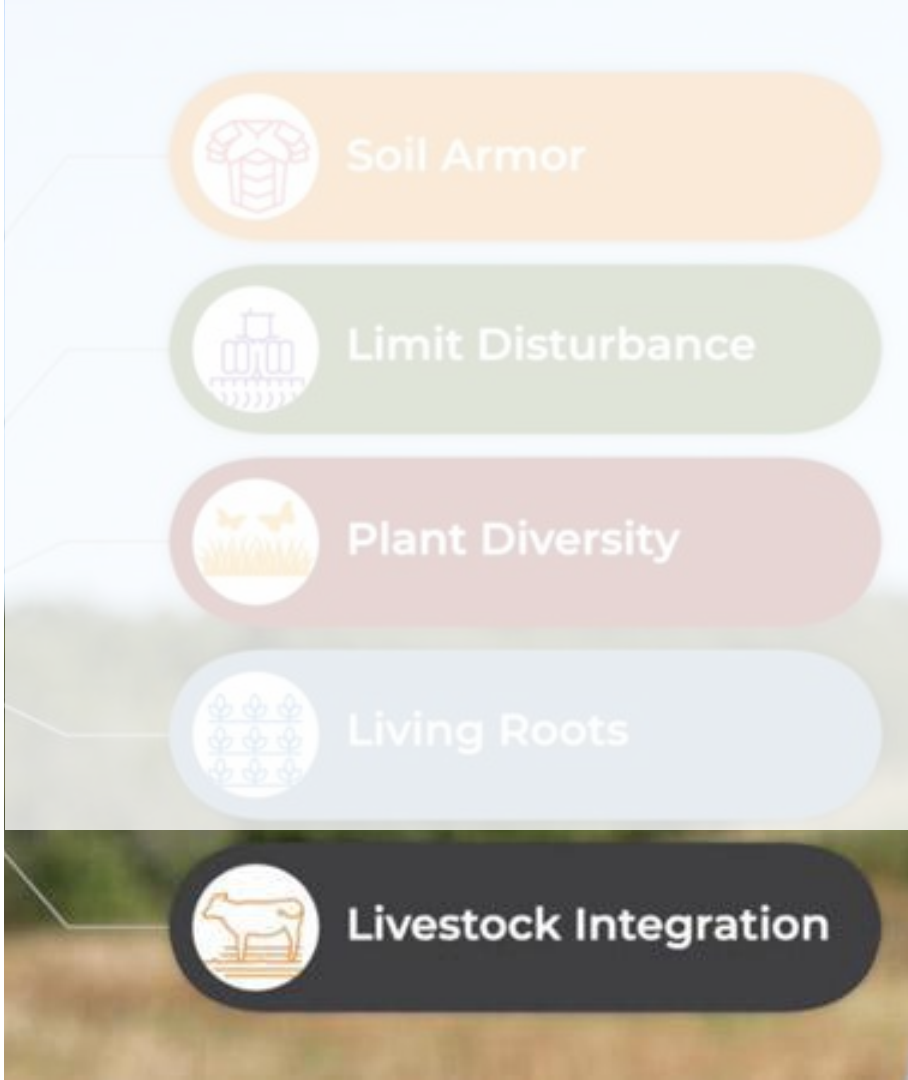


Soil fertility and crop nutrient management practice standard

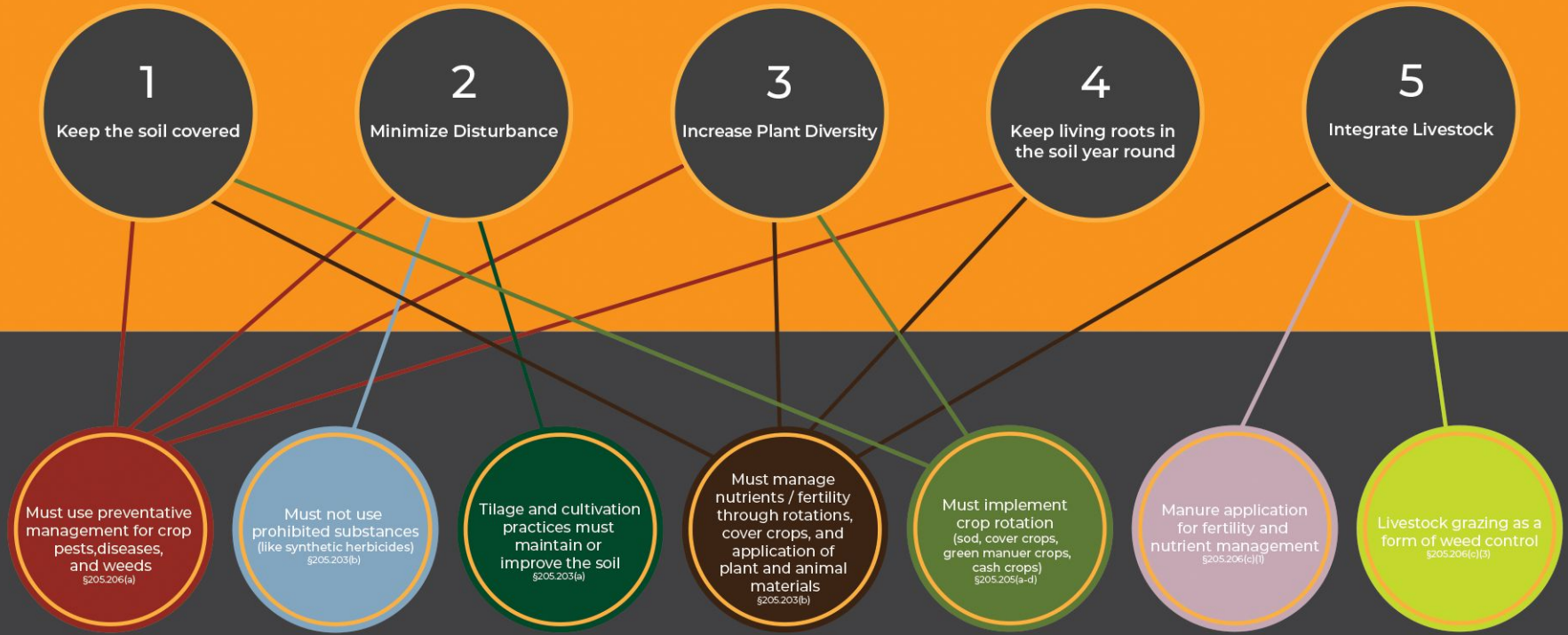
USDA Organic Regulation § 205.203(c)(1)

“(c) The producer must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances. Animal and plant materials include:

(1) Raw animal manure…”



Principles of Soil Health



National Organic Program Regulations

The definition of organic production requires practices that foster cycling of resources, promote ecological balance,and conserve biodiversity.

§205.2


No Cover Crop
Radishes in the Fall

Indicators of Soil Health - In-Field Observation

1. Soil structure (granular/massive/platy) - compaction
2. Aggregate stability – resistance to erosion
3. Color, relative to type – SOM
4. Penetration hardness – compaction
5. Water infiltration/ponding – ability to absorb & hold water
6. Surface crusting – biological activity
7. Topsoil depth
8. Plant health
9. Plant root structure
10. Visible biological activity
11. Smell
12. Residue breakdown
13. Surface water quality

Indicators of Soil Health - Laboratory

1. Soil Organic Matter
2. Available water capacity
3. Soil protein index
4. Soil respiration
5. Active carbon
6. Standard nutrient analysis
7. Cation Exchange Capacity

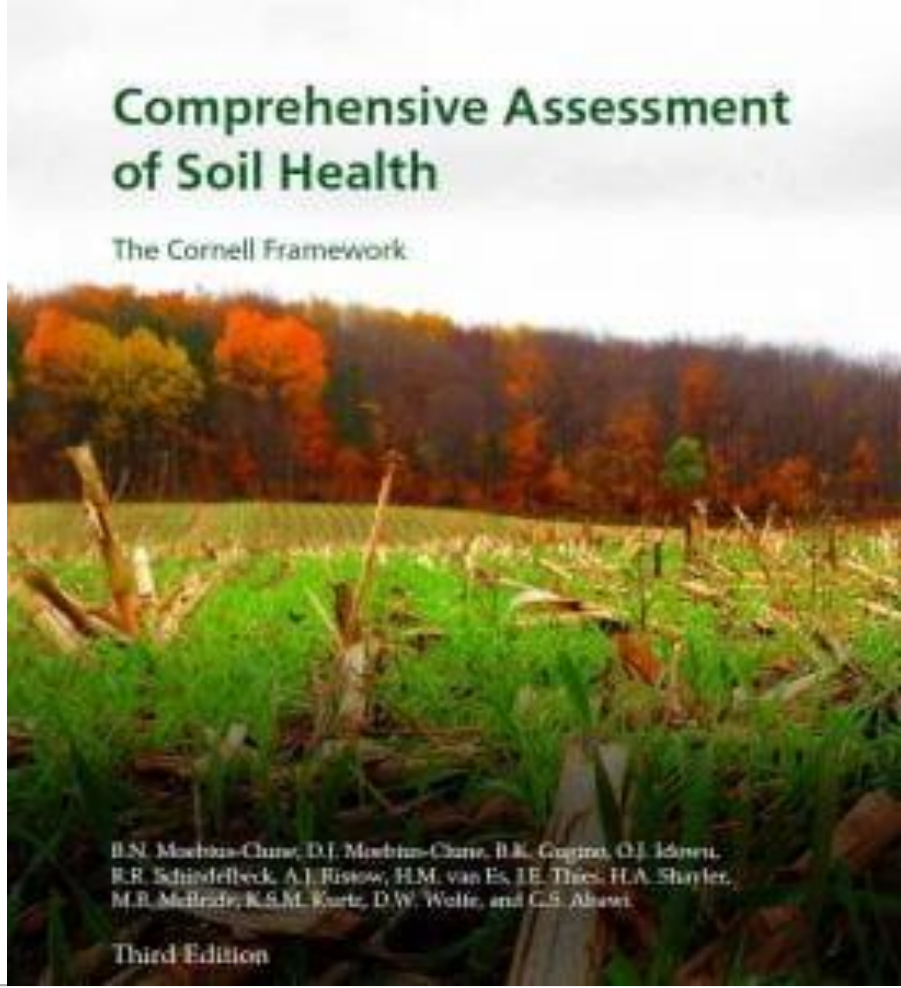
Testing

1. Every 2-5 years
2. Take baseline readings & assess progress
3. Standard soil sampling procedure – follow lab guidance
4. Required for micronutrient applications 205.601(j)(7)

Common Biological Lab Tests

CASH – Cornell's Comprehensive Assessment of Soil Health

https://soilhealth.cals.cornell.edu/manual/



Common Biological Lab Tests

Haney Test

Evaluates:

- Soil respiration
- Water-soluble organic carbon
- Organic Nitrogen
- Nitrate
- Amonia
- Phosphate
- Aluminum, Iron, Phosphorus, Calcium, Magnesium, and Sodium

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Soil organic carbon is affected by organic amendments, conservation tillage, and cover cropping in organic farming systems: A meta-analysis

Robert Crystal-Ornelas, Resham Thapa, Katherine L. Tully

Abstract

Meta-analysis is often used to compare how soil health differs between organic and conventional farming systems. However, the burgeoning primary literature on organic farming now allows direct evaluation of the best management practices (BMPs) within organic farming systems on soil health improvements. Therefore, the main objective of this meta-analysis was to investigate the effect of BMPs, such as organic amendments, conservation tillage, and cover cropping, on soil health within organic farming systems. We focused on two principal soil health metrics: soil organic carbon (SOC) and microbial biomass carbon (MBC) concentrations. On average, adoption of BMPs increased depth-weighted SOC and MBC concentrations by 18 and 30 %, respectively, relative to organically-managed control groups. Among BMPs, organic amendments and conservation tillage practices showed net positive effect on soil health with 24 and 14 % increase in depth-weighted SOC concentrations, respectively. Although cover cropping did not have an overall influence on SOC concentrations, we found a temporal trend such that cover cropping significantly increased SOC concentrations after 5 years of its adoption. This indicates that the soil health benefits from BMPs accrue over time and highlights the need of long-term adoptability of BMPs to achieve agricultural sustainability. Future primary articles that focus on under-

CROP ROTATION

The MOST important tool on organic farms

A well designed crop rotation…

- Provides living roots year round
- Provides soil armor
- Increases plant diversity
    - Long & phenologically diverse!
- Minimizes disturbances
    - Specifically reduces tillage instances
- Provides weed control support

Fiscal Sponsor: Organic Trade Association

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Thank you.

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