Building Soil Health and Organic Matter in Ontario Agriculture

CITIES IN ACTION 2019

Bay Area Climate Change Summit

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2019

Outline

- What is soil health?
- What are the benefits of soil health?
- How have soils been changing?
- How can soil health be improved?
- Shared leadership & collaborative approach

What is Soil Health?

Defined as:

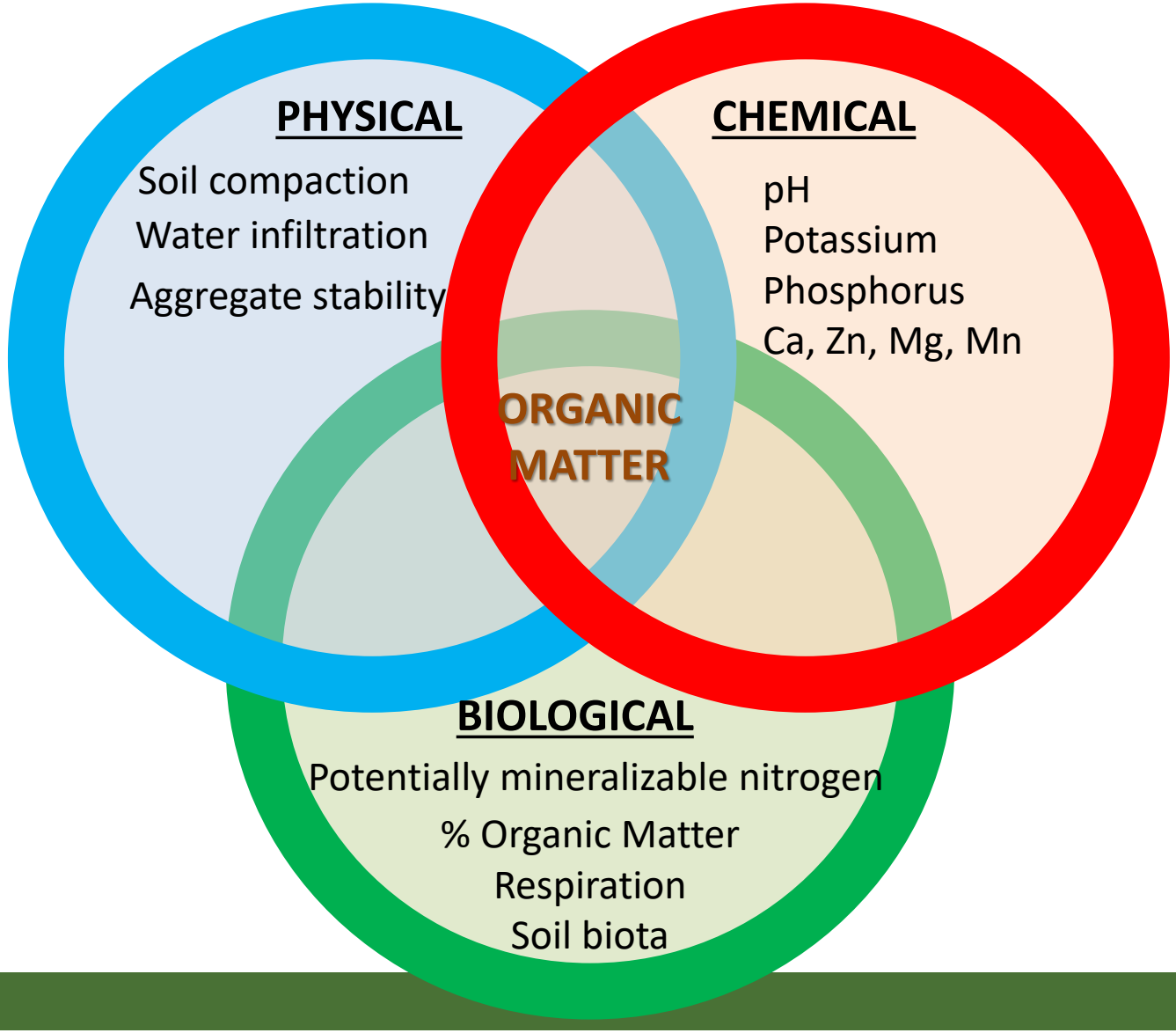
"continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans"

Natural Resource Conservation Service, US Department of Agriculture

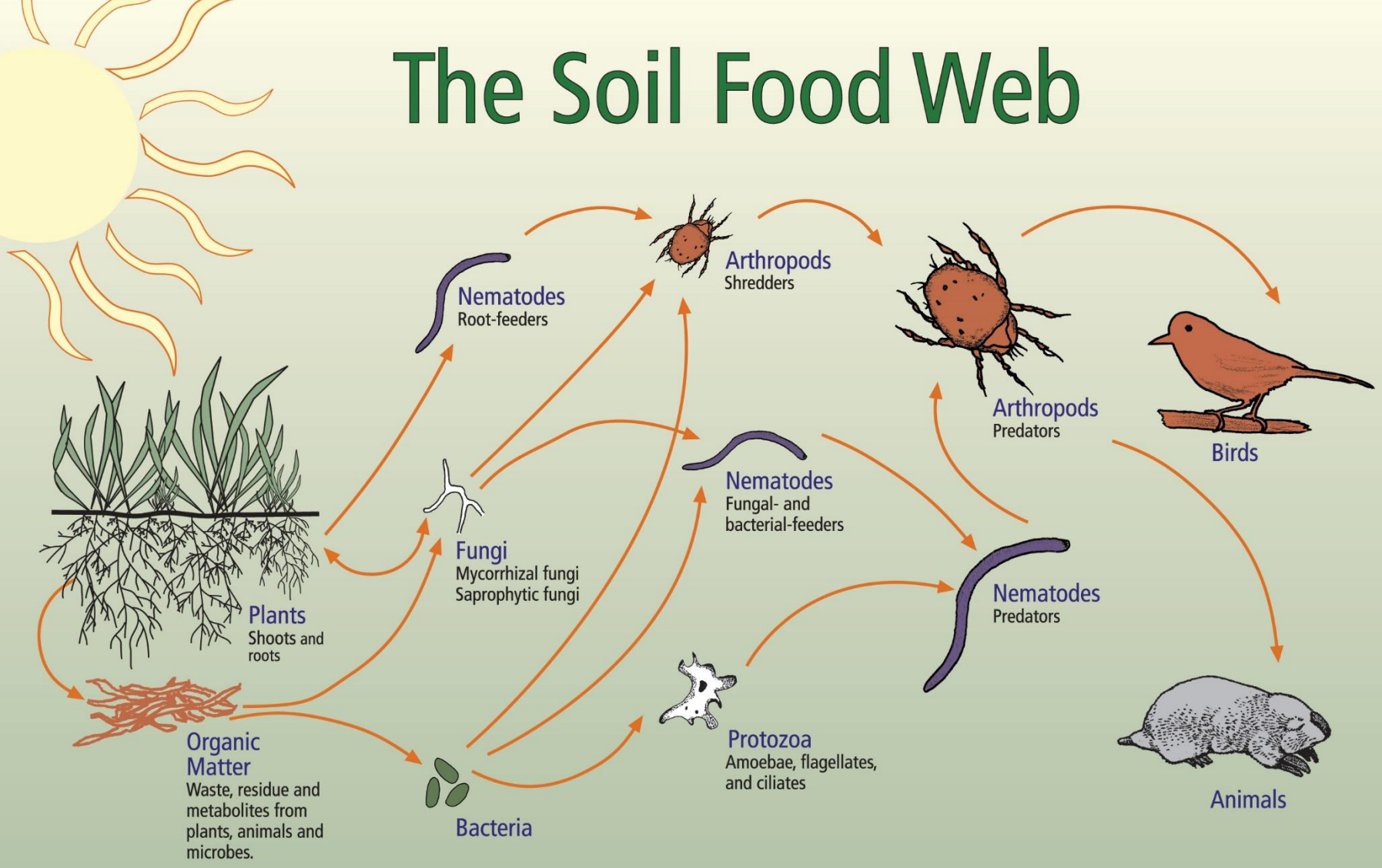
"the soil's fitness to support crop growth without becoming degraded or otherwise harming the environment."

Agriculture and Agri-food Canada, Health of Our Soils Report

What is Soil Health?



The Soil Food Web



First trophic level:	Second trophic level:	Third trophic level:	Fourth trophic level:	Fifth and higher trophic levels:
Photosynthesizers	Decomposers Mutualists Pathogens, Parasites Root-feeders	Shredders Predators Grazers	Higher level predators	Higher level predators

Image credit: US Natural Resource Conservation Service

Long-term Benefits of Soil Health & Conservation

Environmental Benefits

- Better water quality as nutrient and sediment runoff is minimized
- Reduced greenhouse gas emissions from soil carbon & fertilizers
- Better resilience to climate change and extreme weather
- Increased soil biodiversity

Economic Benefits

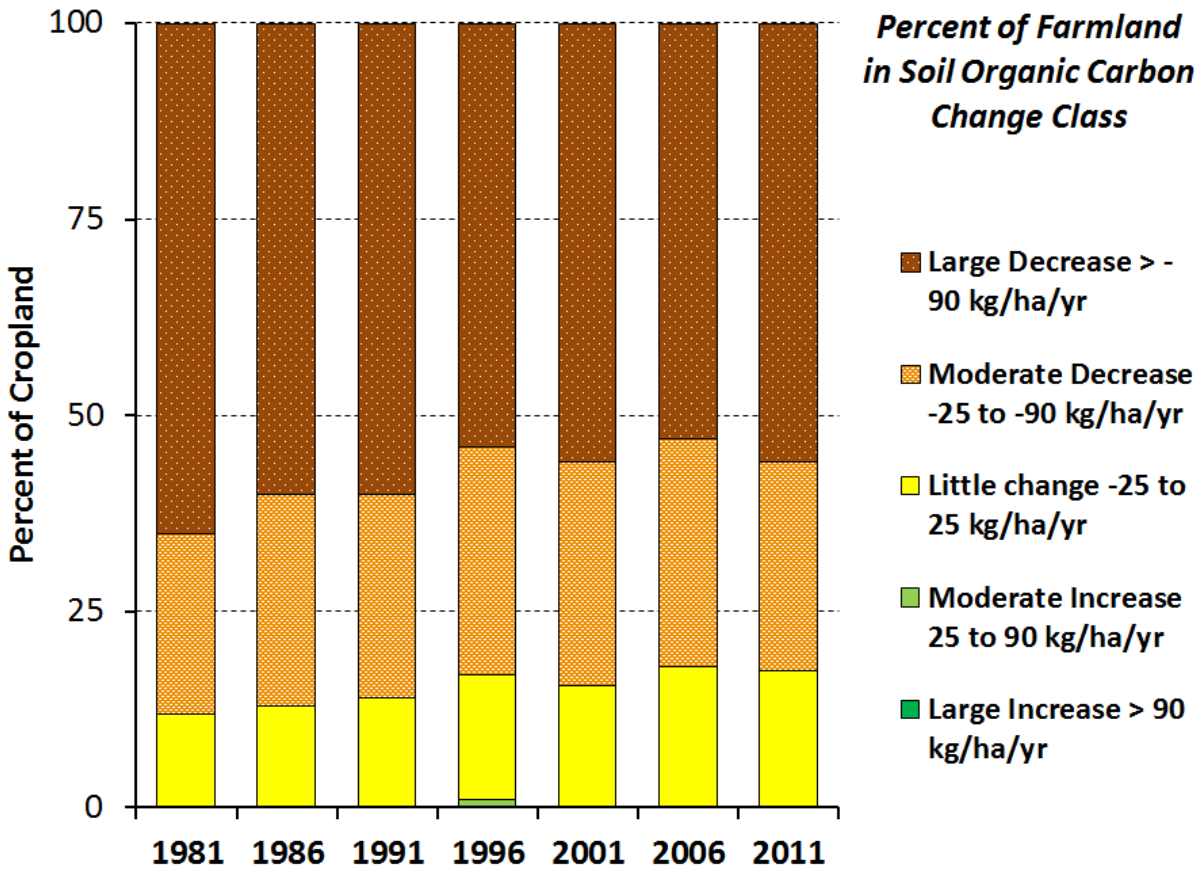
- Sustained long-term farmland productivity
- Long-term reduction in on-farm input needs (e.g. pest suppression, nutrient cycling, water retention)
- Contribute to long-term on-farm cost savings and profitability

Social Benefits

- Contribute to long-term security of local and global food supply
- Contribute to better food quality and nutrition

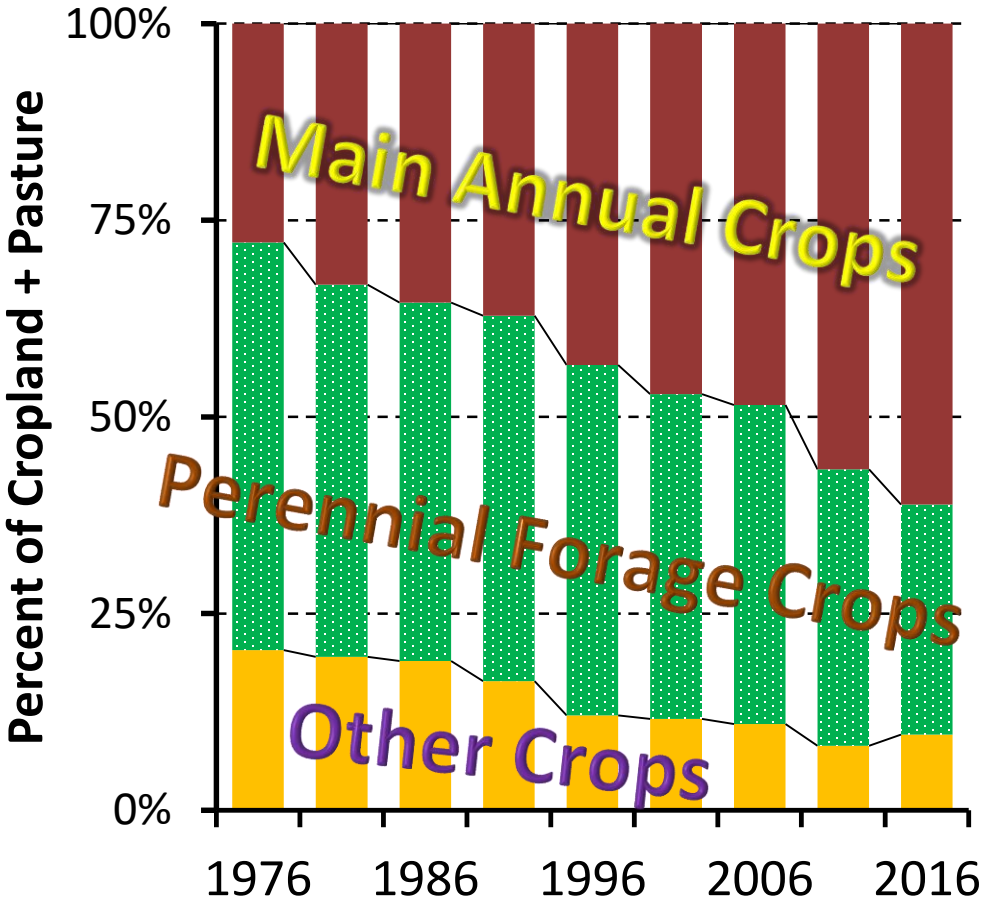
Trend in Soil Organic Carbon

- Most of Ontario cropland (82%) estimated to be losing soil carbon
- Percentage of farmland losing soil carbon decreased 1981-1996, little change 2001-2011.
- Limited improvement over long term.
- Reduced tillage conserves soil carbon
- Conversion of perennial forages to annual crops decreases soil carbon
- Estimates based on modelling, not direct measurement



Source: Agriculture & Agri-food Canada

Changing Crop Trends 1976-2016



Source: Statistics Canada, Census of Agriculture.

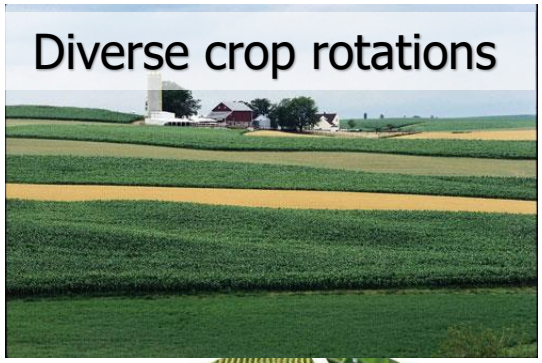
- Increasing percentage of land in annual crops:
  - 28% to 61% 1976-2016
- Long-term increases in soybeans and corn.
- Decreases in hay and pasture for livestock feeding.
- Simplified crop rotations.
- Tillage increasing after long decline.
- Increased use of cover crops.
- Heavier, faster equipment.
- Market-driven changes.
- Similar to other jurisdictions.

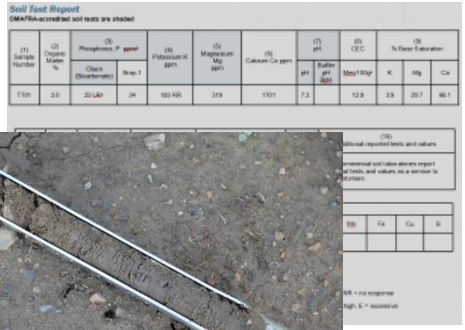
Guiding Principles for Soil Health

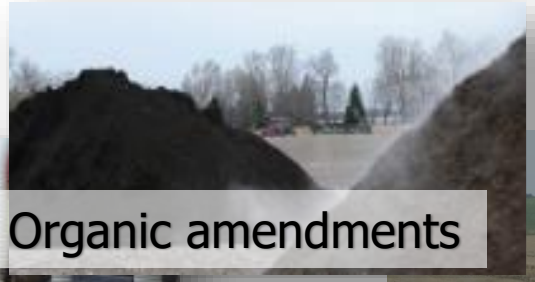
- **Build soil organic matter**
  - Use manure, compost, residue
- **Diversify crops, plant cover**
  - Diverse crop rotations, cover crops
- **Minimize soil disturbance**
  - Reduce tillage if used, rotational grazing, reduce compaction, reduce erosion, optimize inputs
- **Keep living roots as much as possible**
  - Perennial crops, cover crops
- **Keep soil covered as much as possible**
  - Perennial crops, cover crops, retain residue

Image credits: General Mills, AAFC

Practices and Technologies to Build Soil Health







Practices and Technologies to Build Soil Health

Approaches to Soil Stewardship

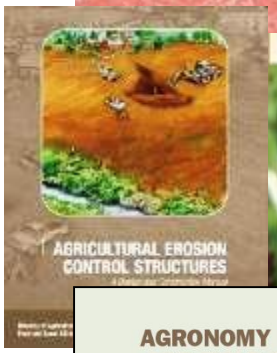
- Education and Technology Transfer on soil best practices
  - Technical advice, peer-to-peer learning
  - Publications, workshops, meetings

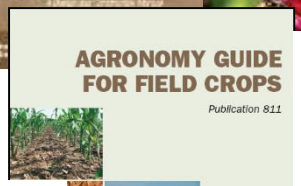
- Risk assessment
  - Environmental Farm Planning
    - Identification of risks to soil
    - Promotion of soil best practices
  - Farmland Health Check Up

- Cost sharing on soil practice changes
  - Canadian Agricultural Partnership
  - Lake Erie Agriculture Demonstrating Sustainability
  - Conservation Authority programs

- Soil inventory and mapping

- Research - Guelph, other institutions, government, farm organizations
  - Development and refining of BMPs





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A Collaborative Approach to Soil Health

- Shared responsibility and leadership among industry, government & other partners for sustaining productive soils
- Collaborative approach needed
- Soil Strategy to guide actions
- Gain support from farmers, farm groups and other partners.

Technical working group:

- Farm groups, academia, conservation groups, government
- Helped develop soil strategy
- Build support and shared responsibility

Farmers Reaping Rewards from Soil Care