Soil Conservation Best Management Practices to Build Resilience and Protect Water Quality

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History of Soil Conservation efforts in the US

What we do…

Worcester County Conservation District

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

- **Planting trees** since the 1950's through our spring **Seedling Sale**!
- **Workshops** and **outreach** on soil health, sustainable agriculture practices, invasive species control, and wildlife habitat conservation
- **Soil Testing** and **technical assistance**
  - 75 site visits with landowners, >100 soil samples in 2020

Soil management is an important part of water management

Whatever happens to the land in the watershed that drains to a waterbody affects the quality of the water in that water body.

The way we use the land affects the quality of water and the animals that depend on it, including ourselves.

Climate Change Threatens Soils: Erosion

- More frequent heavy rain events because of climate change can increase soil erosion (loss of topsoil), which is vital to growing crops and healthy forest ecosystems.

Erosion threatens water quality

- As sediments, agricultural chemicals, and nutrients are washed from exposed soil in lawns, fields, and pastures into our waterways because of runoff from rain, they impact water quality.

Climate Change Threatens Soils: Drought

- Drought conditions can degrade soil health and further contribute to climate change, since water is essential for soil and plant life.
- Also hot, dry conditions increase the rate that soil carbon is turned into carbon dioxide and soil nitrogen is turned into nitrous oxide gas, limiting the availability of these food sources for soil life.

Climate Change Threatens Soils

- This worsens climate change, since both of these gasses emitted from soil in drought are greenhouse gasses.

USDA United States Department of Agriculture

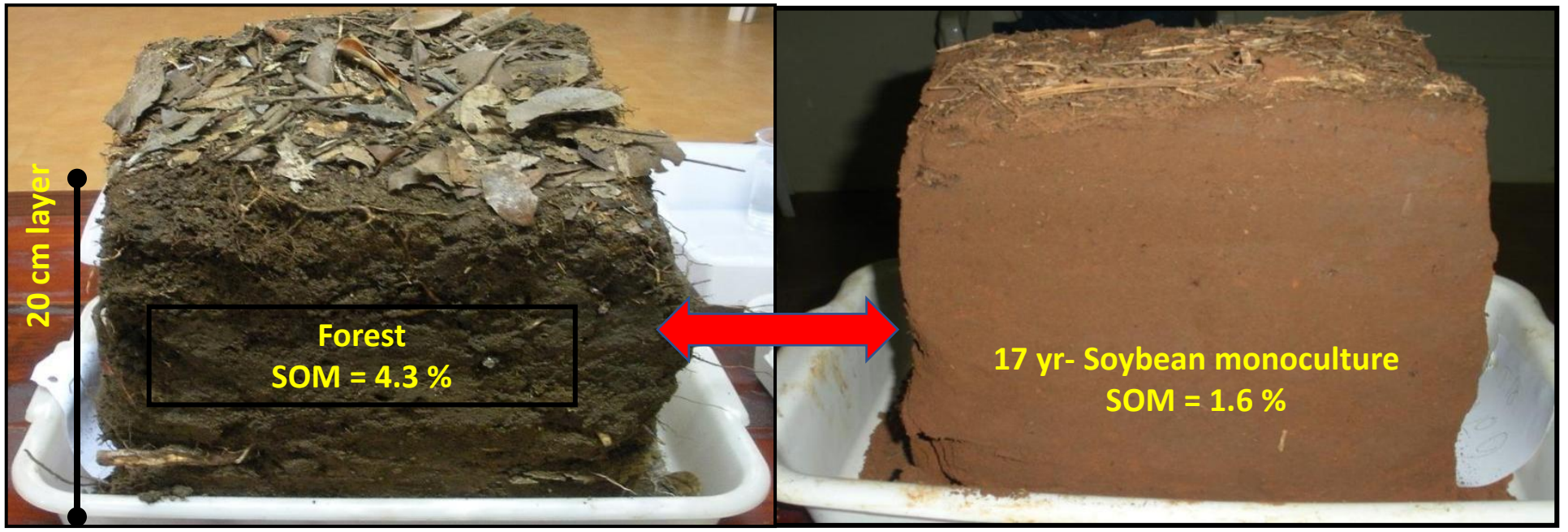
Investing in the health of the soil increases its resilience to these effects of climate change

What is soil health?

Soil health is the continued capacity of the soil to function as a vital living ecosystem that sustains plants, animal and humans.

What makes soil healthy?

Healthy soils have a lot of organic matter



Healthy soils are full of life!

Healthy soils are full of life!

Relative Amount of Microbes in Handful of Soil

	**Bacteria**	**up to 50 billion**
	**Actinomycetes**	**up to 2 billion**
	**Fungus**	**up to 100 million (many miles)**
	**Protozoa**	**up to 50 million**
	**Nematodes**	**10,000**
	**Arthropods**	**1000**
	**Earthworm**	**0 to 2**

USDA United States Department of Agriculture

Healthy soils have good aggregate stability

Healthy soils are not left bare or exposed

How is healthy soil more resilient to Climate Change impacts?

- Soil organic matter improves moisture holding capacity and helps prevent the negative effects of drought.

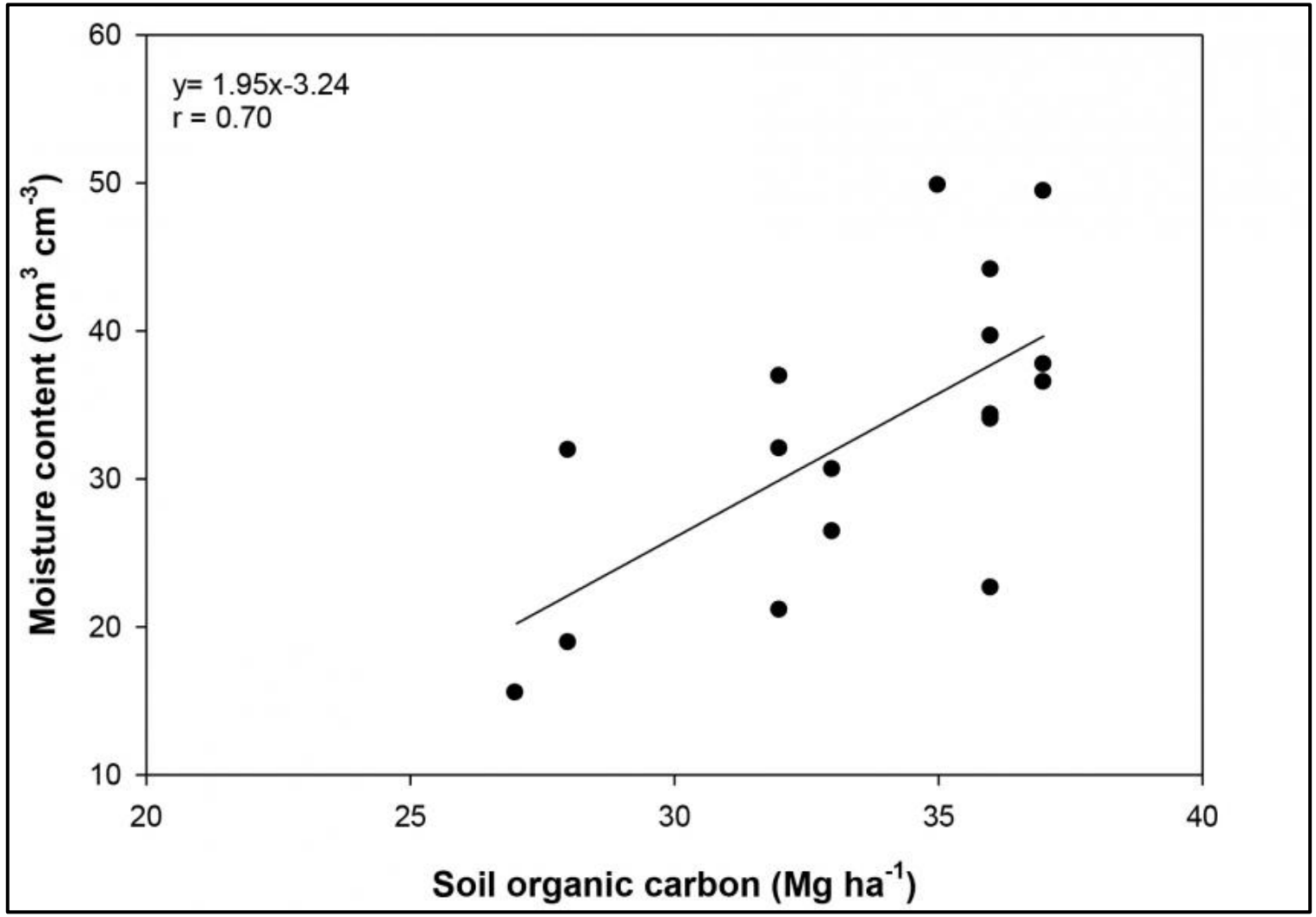
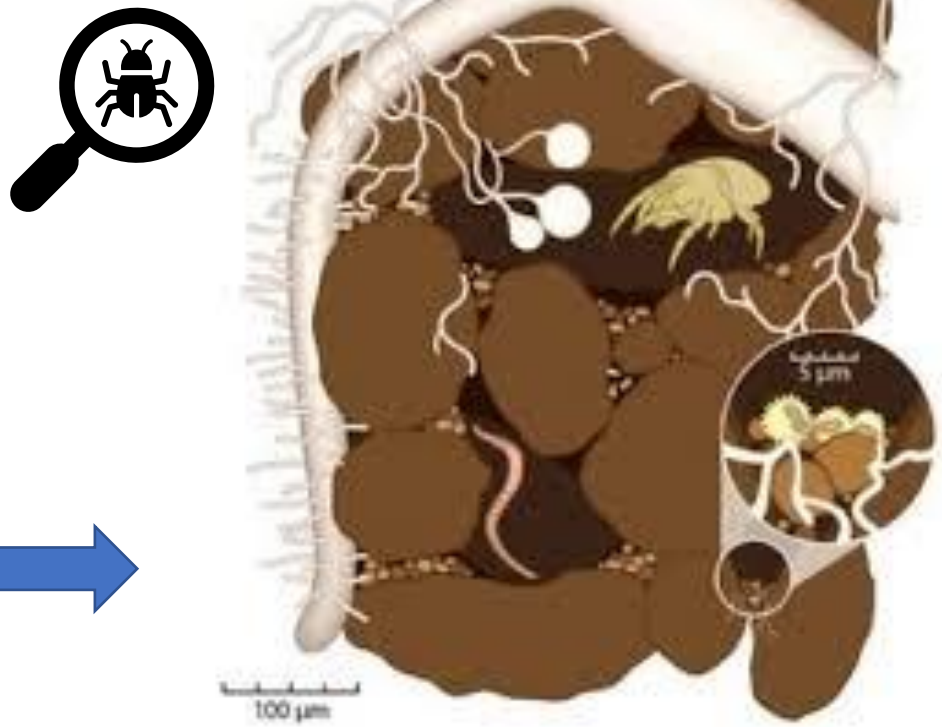


Figure 1. Increase in soil moisture storage capacity with increase in soil organic carbon in 10 years tillage and crop rotation study (Al-Kaisi et al., 2014).

How is healthy soil more resilient to Climate Change impacts?

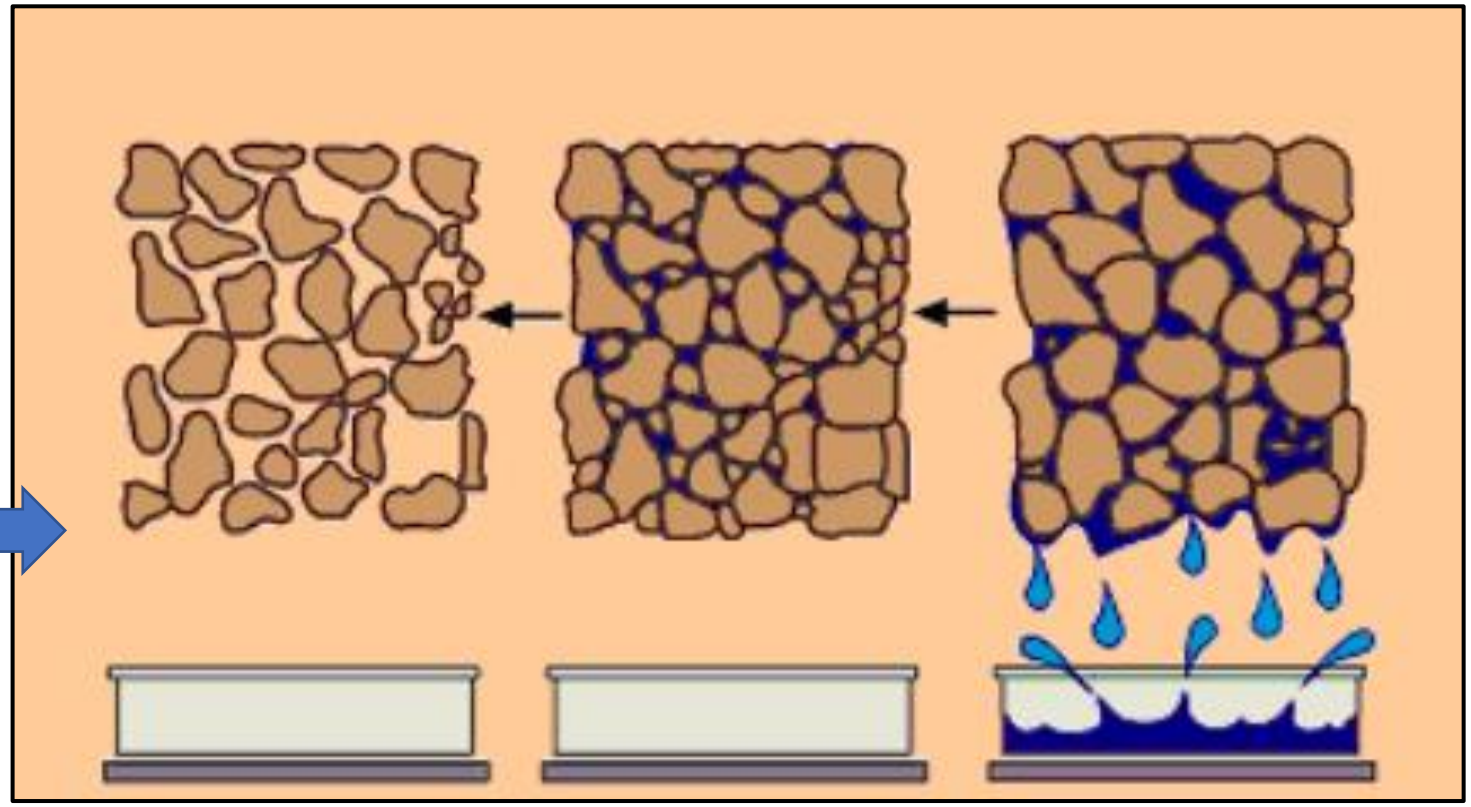
- Soil Aggregate Stability helps keeps soil in place preventing erosion caused by increased heavy rain events



- With the help of the roots of plants and fungi

How is healthy soil more resilient to Climate Change impacts?

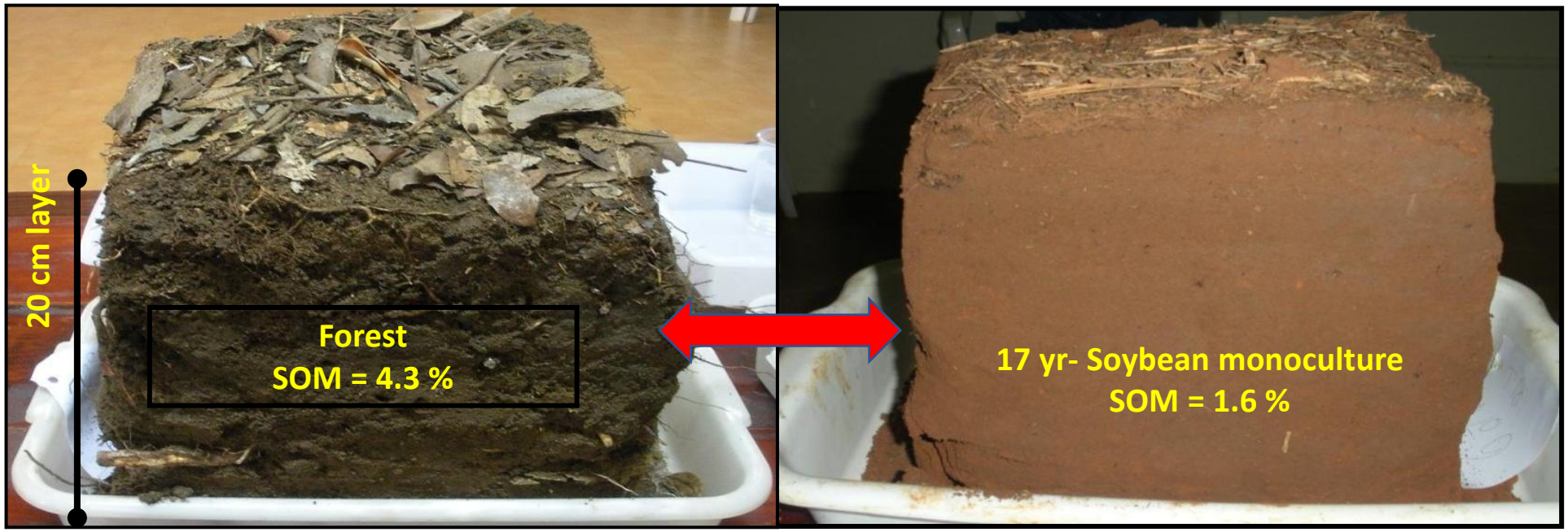
- Soil Aggregate Stability and roots help increase drainage through pore spaces in soil, preventing flooding and erosion



How is healthy soil more resilient to Climate Change impacts?

- Earthworms and other soil life also help increase drainage through creating pore spaces in soil and increasing aggregate stability, preventing flooding and erosion

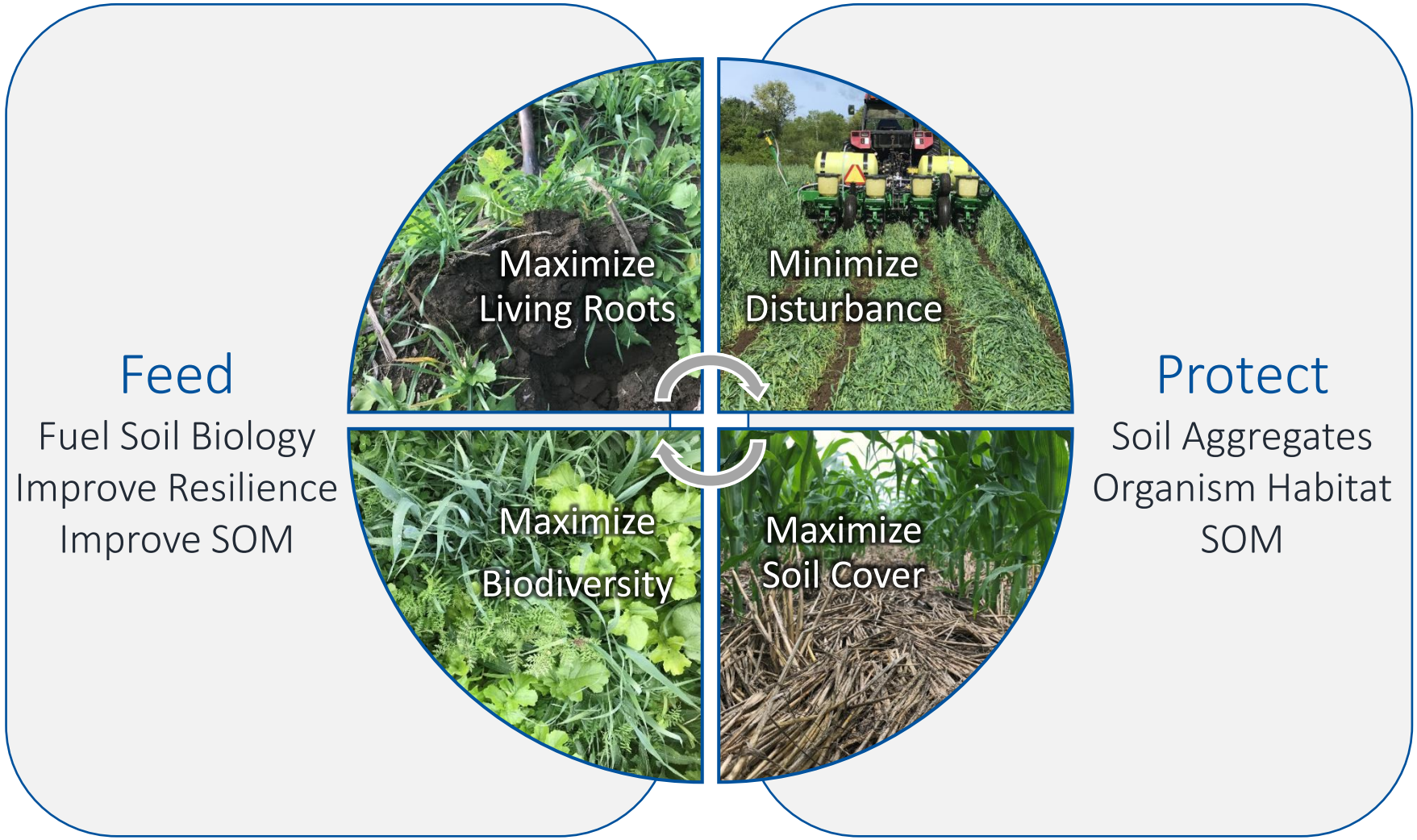
Organic matter in soil is also a carbon sink!



- In the U.S. each year, adoption of BMPs can lead to sequestration of 83-270 million metric tons of carbon (or a mean of about 650 million metric tons of CO2)

https://www.soils.org/files/science-policy/caucus/briefings/carbon-sequestration.pdf

Soil Health Best Management Practices:



Some Best Management Practices to Build Resilience and Protect Water Quality are…

- Cover Crops
- No-Till
- Adding compost
- Grassed waterways/Filter Strips
- Conservation buffers
- Grazing fences and rotational grazing



Cover crops

No-till Farming

***No-till farming sequesters an average of 0.3 metric tons of carbon per acre per year, or the same as what is emitted by 2730 miles driven by an average car

Add compost!

***Adding compost to gardens and farms BUILDS <u>soil organic health</u>* and therefore increases resilience to drought and erosion.**

- Inoculates soil with organic matter, and healthy doses of beneficial bacteria, fungi, nematodes, and micro-arthropods

Grassed waterways and Filter Strips

- You can prevent loss sediment, pesticides, fertilizers, and other pollutants from soils to waterways after heavy rains. Maintain healthy filter strips to provide erosion control and trap sediment and pollution before it enters surface waters

Conservation buffers

- Protect waterbodies from polluted runoff and provide habitat. Also provide shade to streams, keeping them cool.

Livestock fencing to maintain buffers

- Keep livestock out of water bodies using fencing and alternate water sources, protecting from bank erosion and direct pollution

Rotational grazing

- Use temporary fencing to rotate livestock on pastures frequently to avoid too much vegetation removal and erosion.

Conservation agriculture is part of the solution to climate change, both building resilience and capturing carbon

- These practices help make lessen the impacts of climate change on our soils and therefore also on water quality
- Project Drawdown says Conservation Agriculture could take in over 9 gigatons of carbon dioxide in the next 30 years!
- About equivalent to annual global fossil fuel emissions

Managing for soil health is investing in water management

- Increasing the resilience of our soils increases the resilience of our water bodies as well.

What you can do if you are not a farmer

Point out places of erosion at your school or in your town

If your family has horses make sure you aren’t degrading your pasture

Know which farm you get your food from and ask about their soil conser-vation practices

Start a garden and use cover crops, compost, and crop rotation

Thank you!

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CONSERVATION DISTRICT

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