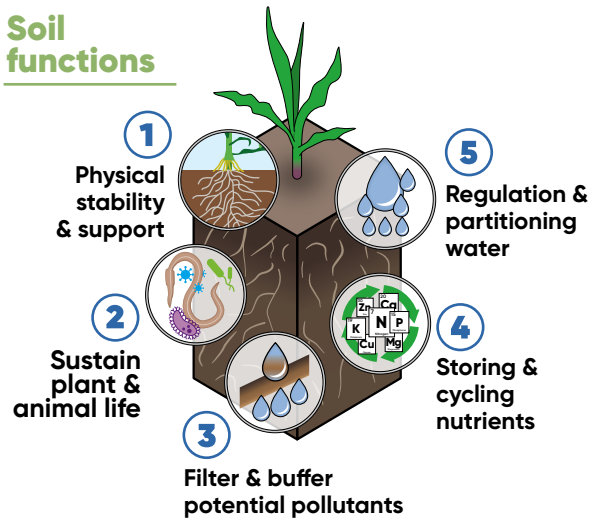
The value of managing the soil microbiome

The tiny organisms beneath our feet can have a big influence on farm success

From clays to silts to loams, every type of soil has one thing in common: It's alive with microorganisms in a complex ecosystem. Taken together, these microorganisms make up a microbiome that has profound effects on the health of plants and the agroecosystem. With a deeper understanding of this microscopic world and the way inputs affect it, farmers can better manage their soils to optimize productivity.

Sorting out the beneficial and the harmful

When we're thinking about protecting crops, it's tempting to focus only on the pests in soil—the diseases, insects and nematodes threatening yield. But in healthy soils, these damaging pests are balanced by a range of beneficial organisms. The right soil management approach not only reduces harmful microorganisms, but promotes beneficial ones, which can, over time, contribute to naturally controlling these pests.



SOIL MICROORGANISMS	
BENEFICIAL MICROORGANISMS	**MICROORGANISM PESTS**
Entomopathogenic nematodes and fungi: Species that attack and kill insect pests	**Plant parasitic nematodes:** Nematodes that feed on plant cells and roots
Invertebrate decomposers: Earthworms and other species that process dead plant matter and contribute to soil structure and nutrients	**Plant pathogenic microbes:** Bacteria and other microbes capable of infecting plants and causing damage such as leaf spots and blights
Mycorrhizae: Symbiotic fungi that help increase root absorption surface area	**Specialist and generalist soil insect pests:** Herbivore insect pests that feed on various plant species
Rhizobia: Nitrogen-fixing bacteria	
Plant growth-promoting bacteria: Bacteria that enhance plant growth and can protect against diseases and stress	

Playing the long game

Once farmers understand the beneficial organisms and the pests at work in their soil, they can make targeted decisions about which modes of action and inputs might help control pests while enhancing beneficials. This kind of approach requires taking a long-term view of soil health.

Decisions about inputs, controls and management practices today can help to nurture healthier soils in subsequent seasons. Choices that contribute to a healthy microbiome can eventually lead to a more self-sustaining soil ecosystem. In these kinds of systems, beneficial organisms can naturally suppress pests and improve soil function, reducing the need for more inputs. Healthier soil is of course also better for crop production, delivering more nutrients to growing plants and helping farmers bring in better yields. The benefits to managing soil health extend far beyond reducing a pest threat to improve this season's outcome. With an informed approach, soils can be healthier year over year—a process that takes patience but has a real payoff for farmers and the future of agriculture.

Check out future issues of *Groundwork* for more about the connection between healthy soils, farms, food and the planet.