St Marys Watershed: Welcome And More About Soil Health

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St Marys Watershed Project

About the Project: Purdue University and their partners are working throughout the St. Marys Watershed to build strong, productive partnerships. The St. Marys Watershed Team is working on three fronts:

- Monitoring soil health - read more to learn about what we are monitoring and to view preliminary data!
- Cataloging water quality
- Building a foundation

Learn more about the St. Marys Watershed Project

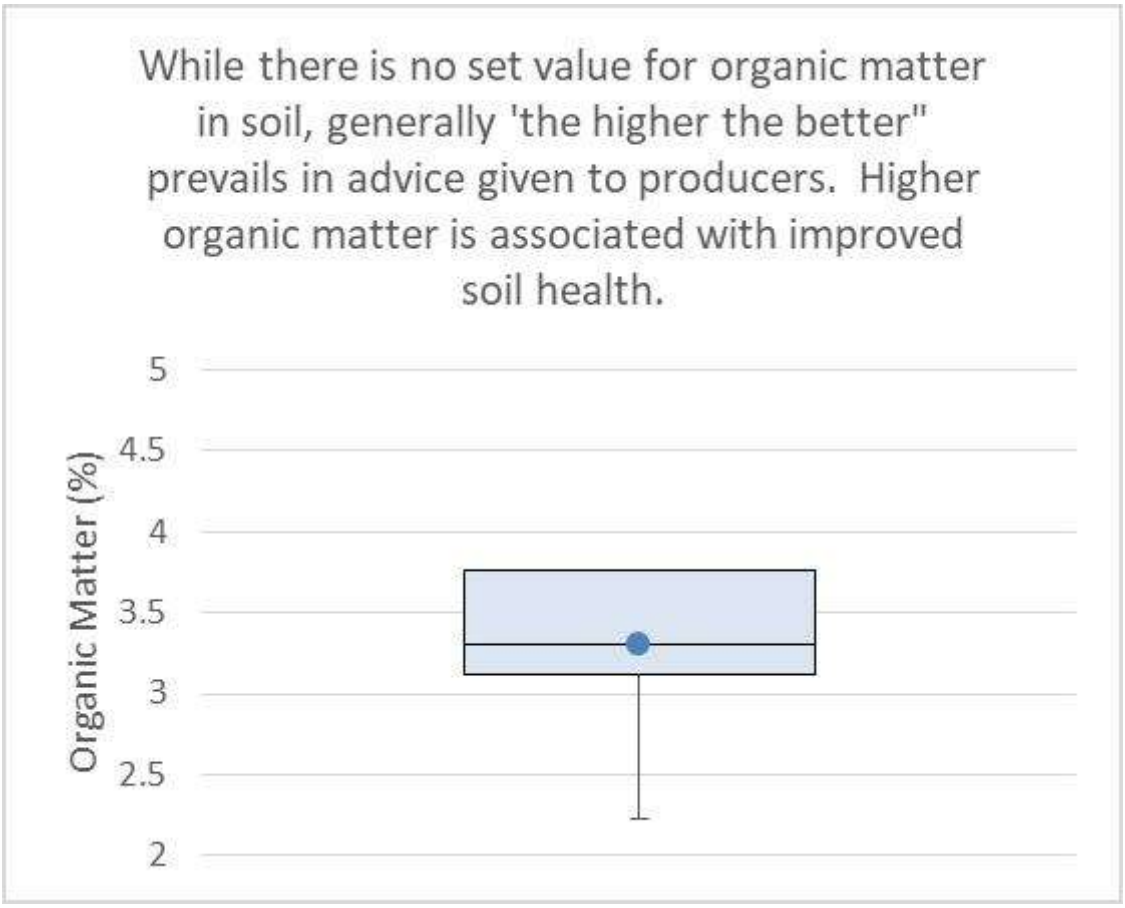
What We're Monitoring: Soil Health

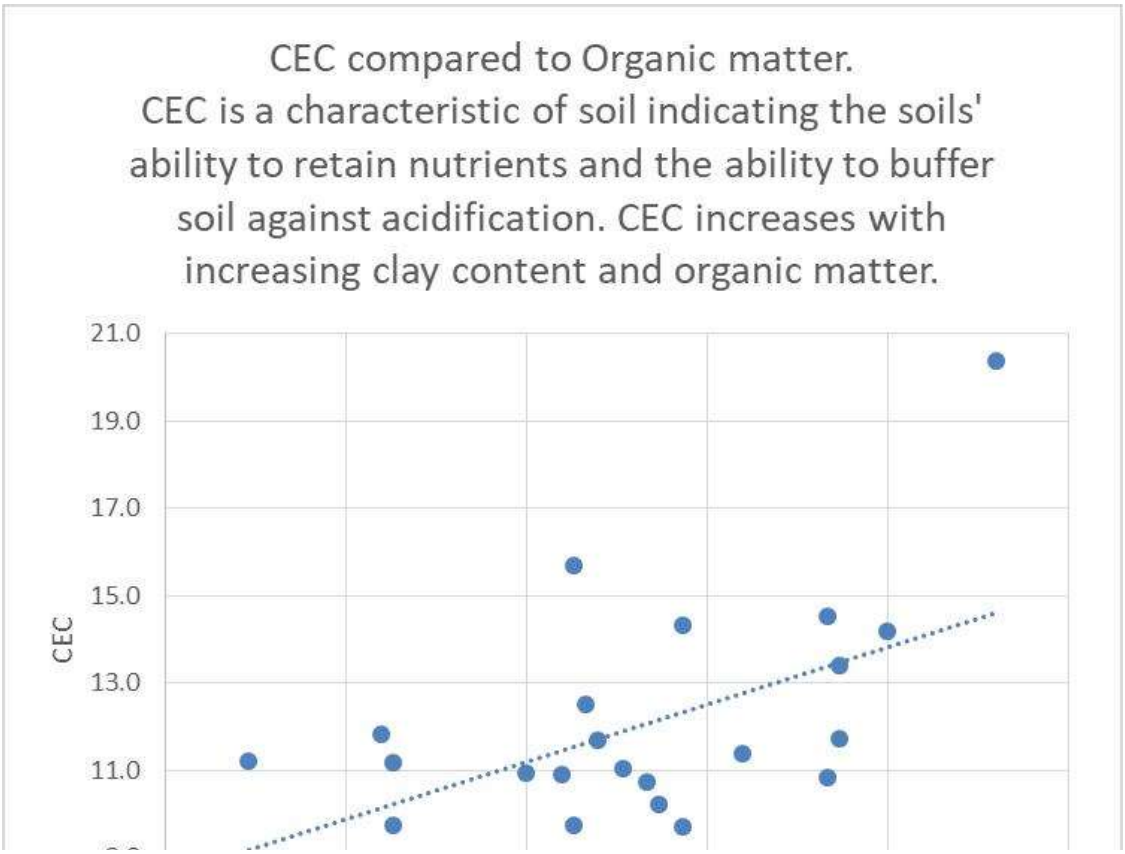
Soil Enzymes: Enzymes are proteins produced by living organisms, soil microorganisms included, that

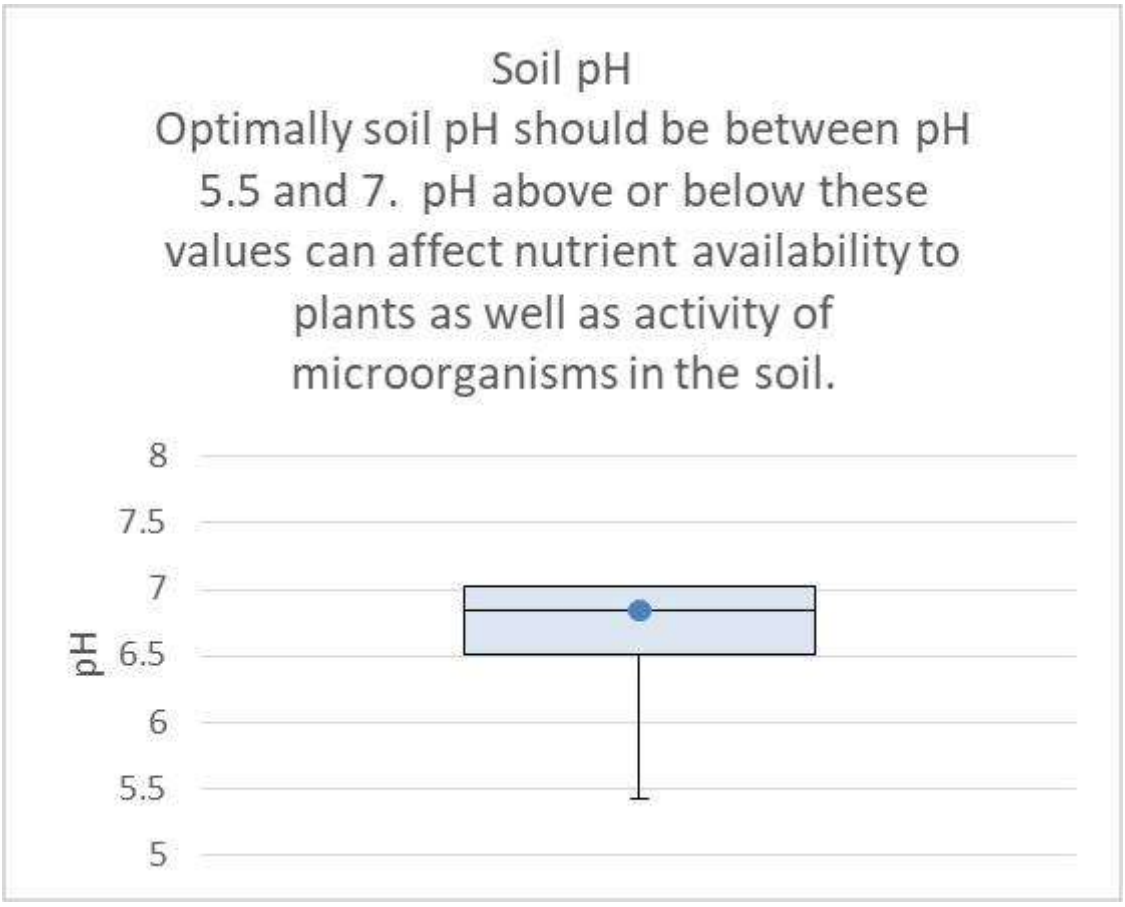
Soil Enzymes: Enzymes are proteins produced by living organisms, soil microorganisms included, that convert chemicals from one form to another. As microorganisms don't have a mouth, they produce extracellular enzymes that serve to pre-digest food and break down complex compounds into simpler molecules that can then be more readily used as a food source. Enzymes produced by microorganisms are the drivers for crop residues decompostion. Many different enzymes can be produced by soil microorganisms in response to their environment. Three of the enzymes we are measuring for this study are B-glucosidase (BD), phosphatase (PHOS) and N-acetyl-glucosaminidase (NAG). B-glucosidase is indicative of enzymes that degrade carbon-containing compounds and is important in organic matter turnover in soil. Phosphatases degrade phosphorus-containing substrates and NAG is an example of an enzyme that degrades compounds high in nitrogen content. PHOS and NAG enzymes are also examples of enzymes that can be associated with the presence of nutrients in soil since their activity measurement can be influenced by the presence of P or N in soil. Enzymes are 'expensive' for microorganisms to produce physiologically, so they are only produced when there is a need. Therefore, these enzymes can serve as indicators of soil health because the production of enzymes occurs quickly in response to environmental inputs such as residues, fertilizers and to environmental conditions like temperature and moisture availability. Put together, the analysis of these three enzymes' activities can be used to assess soil health and nutrient status.

Microbial respiration: Two different measurements of soil respiration are done in the laboratory. The first is basal respiration or how much do the soils "breathe". We place the soils into a closed container for 24 hours, then take a sample of the air inside the container and analyze the amount of carbon dioxide (CO_2) that the air sample contains. The other measurement we do is called substrate induced response (SIR). For this test, we again place the soil in a closed container and we feed the soils glucose (sugar) and then measure the amount of CO_2 they breathe after an hour and then 4 hours. This tells us something slightly different from the basal respiration. Basal respiration is akin to figuring out who in the container is alive. SIR lets us see how many of the organisms in the container are "awake", that is, active and able to respond quickly to an introduced food source. Many of microorganisms in soil exist in a somewhat dormant state since dormancy is a way for organisms to survive adverse conditions such as the absence of a food source. So, the part of the population that responds quickly can be different in size than the larger pool of microorganisms present in the soil sample. Soils that are healthy and contain readily available food source for microorganisms should have a higher basal respiration and a higher SIR respiration measurement since these soils contain populations that are adapted to the presence of a food source. These soils have been provided with food sources such as crop residues, organic fertilizers and cover crops (roots and plants). The roots of plants also provide a source of food to soil microorganisms via a process called root exudation where carbon compounds (sugars amino acids, organic acids and others) are secreted by the plants into the soil. These compounds are a source of food for microorganisms. Conversely, soils in poor health are expected to have more dormant populations.

Show me the data! What are the initial soil health tests showing?







Interested in learning more?

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