Immediate Release

June 1, 2020

James J. Hoorman
Hoorman Soil Health Services
Website: HoormanSoilHealth.com
Email: HoormanSoilHealthServices@gmail.com
Cell: 419-421-7255

Earthworms enhance soil tilth and fertility

Every farmer loves to see earthworms in their soil because it indicates good soil health and productivity. Earthworms, cover crops, and no-till together are a great way to improve your soil. After a 3 to 4-inch rain (more or less) last week, farmers should observe where water is standing and where it is not ponding. In healthy fields that had no-till, cover crops, and earthworms; there should be less standing water due to better soil tilth and cleaner water coming off the fields in the surface water or tile. Cover crop roots increase macro and micro-pores and the earthworms decompose and move the organic residue to form soil organic matter (SOM), to keep nutrients and soil in place.

Here are just a few things the earthworms do to improve our soil. They alter soil structure, improving water movement, enhancing nutrient dynamics and plant growth. They are a major soil health indicator, earthworms cannot tolerate poor soil for long periods of time, although they can improve it. Earthworms stimulate microbial activity by inoculating and distributing soil microbes in their casts (earthworm poop). Microbes in the earthworm gut breakdown organic nutrients into plant available forms for enhanced plant growth and worms secrete plant enhancing growth hormones. Earthworms turn over the top 6 inches of soil every 10-20 years, while enhancing it, adding SOM that create great soil structure (macroaggregates) for improved drainage. Nightcrawlers move SOM deep into the soil and consume about 1/3 of their weight daily. Red wigglers are slightly smaller, stir the top soil, and consume their weight daily in SOM.

Earthworms can greatly enhance water infiltration and overall soil porosity. In the late 1990's, researchers thought the earthworms might be contributing to phosphorus in Lake Erie. They misinterpreted the data. While earthworms move water and nutrients into the soil, it's the poor soil structure and lack of live roots that cause nutrients runoff. Adding live roots allows the water to infiltrate both horizontally and vertically, so that the water can then be cleaned and soluble nutrients can be absorbed before clean water exits via tile. Research was done only on no-till fields without a cover crop, so without live roots it failed to intercept and clean the water.

Earthworm burrows can survive for many years if left undisturbed, improving water infiltration and greatly increasing root penetration deep into the soil. The earthworm lines its burrow with castings and SOM, which greatly increases water holding capacity, and slows down the water. The SOM from the cast is high in plant available nutrients. Earthworm burrows are always chocked full of live roots because roots follow the path of least resistance and the roots can absorb the enriched plant nutrients held in the SOM lining the burrow. Mother Nature created this system to keep soluble nutrients in the soil.

Earthworm casts improve the cation exchange capacity (CEC) or how nutrients are stored by a factor of 3-4X, enhancing the SOM. Casts have 3X more phosphorus and potassium, 4.5X more calcium, and 2.5X more nitrogen while improving soil structural stability by a factor of 10X more than the average bulk soil. Earthworms are called soil engineers for this reason.

Tillage is a major deterrent to earthworms. Tillage destroys their burrows, kills some adults but desiccates earthworm eggs and wipes out future generations. Tillage makes earthworms work harder for food, because it buries residue and food sources. Nightcrawlers are top feeders not excavators. Less surface residue leads to abrupt changes in soil temperature due to less insulation. Tillage creates poor soil structure, compacted soils, and saturated soils, which are not healthy long-term for earthworm populations. Tillage also increases bird predation, making it easier for birds to feast on exposed worms.

To promote earthworms, here are conditions where they thrive. Soil temperature between 50-60^{O} F with pH 5.0 to 8.0, prefer pH near 7.0 or neutral. Moisture soils, not hot or too dry or over saturated and plenty of surface residue to moderate soil temperatures. Night crawlers like low carbon to nitrogen (C:N) ratio crop residue (like hay) and/or solid manure (low NH_4^+, ammonium) while red wigglers can consume higher C:N ratio with more lignin. Earthworms thrive in fields planted to perennial crops like hay, pasture, legumes or cover crops. Earthworms are a great natural resource and should be promoted and enhanced in agricultural fields (not woodland).