When monitoring earthworm populations they are measured in number/sq foot. A goal for agricultural fields is 10 earthworms/sq. foot. Earthworms are classified into three groups based on their habitat:

- Litter-dwellers live on the soil surface, ingesting plant residues. They may be absent in plowed, litter-free soil.
- Shallow soil-dwellers live in topsoil that is rich in organic matter. They burrow narrow channels and eat a mixture of soil and plant residues.
- Deep soil-burrowers (night crawlers) dig long, large burrows into deep soil layers. They pull down residue from the soil's surface as a food source. Earthworms are crucial to soil and plant health because they contribute nutrients to the soil and improve porosity, tilth and root development.

Seasonal and climate variations affect earthworm abundance, distribution and activity. They are most active in the spring and fall, when temperatures range between 32 and 86 F. Stable aggregates contain organic matter and improve porosity, consequently improving air circulation, drainage and infiltration, which favor earthworm establishment.

**IMPROVING EARTHWORM POPULATIONS**

A large supply of quality plant residues, which provide food and mulch for habitat, is key for healthy and abundant earthworm populations. Mulch helps maintain soil moisture and moderate soil microclimates--providing adequate time for earthworms to migrate and escape high or freezing temperatures. No-till farming creates ideal conditions for earthworms by increasing plant residues and improving soil structure.

Litter-dwelling earthworms and night crawlers may drop and even vanish in conventional tillage systems because tillage destroys their burrows and depletes surface residues. Legumes, alone or in a rotation, seem to be preferred by earthworms because of the quality of food they provide. Earthworm populations are generally high and active in grassland due to the thick surface cover and continuous supply of food from residues and animal wastes.

**RELATIONSHIP TO SOIL FUNCTION**

There is evidence that earthworms contribute to crop production. They play a key role in modifying the physical structure of soils by producing new aggregates and pores, which improves soil tilth, aeration, infiltration and drainage.

They improve soil porosity by burrowing and mixing soil. As they feed, earthworms contribute to plant residue decomposition, nutrient cycling and redistribution of nutrients in the soil profile. Their casts, as well as dead or decaying earthworms, are a source of nutrients. These beneficial effects stimulate root growth and proliferation deep into the soil to satisfy nutrient and water requirements. Roots often follow earthworm burrows and uptake available nutrients associated with casts.
**How to Count Earthworms**

When examining the soil for earthworms, avoid places where their populations might be affected, such as near mulch or compost piles. Count earthworms several times during a season and use the average to gauge changes from year-to-year. We recommend counting earthworms in May and June, after planting.

**Materials needed for counting earthworms:**
- tap water (2 L)
- hand trowel or shovel
- optional mustard solution (2 T mustard powder in 2 L of tap water)

**Step 1**
**Dig Plot:** Measure a square-foot plot and dig down 12 inches with the hand trowel or shovel. Try to minimize the number of cuts with the shovel to avoid damage to earthworms.

**Step 2**
Count the number of earthworms. Separate and count the number of earthworms.

**Step 3**
Add mustard solution (optional): to facilitate extraction of deep burrowing earthworms, add two liters of mustard solution to the hole. First, make sure the bottom of the hole is level. The deep burrowing worms should appear within five minutes. Count the number of worms.

**Step 4**
Record the total number of earthworms: Write down your earthworm count totals and keep with your farm management records. Make sure to record both the earthworms found in the hole and after adding the mustard solution. (The mustard solution will not harm the worms. Rinse them with water before returning them to the soil.)

**Record Your Count**

<table>
<thead>
<tr>
<th>Date</th>
<th>Surface Dwelling Earthworms</th>
<th>Deep Dwelling Earthworms</th>
<th>Total Number Per Square Foot</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>