

## SOIL CONDITIONING BY EARTHWORMS

Earthworms have had an inestimable impact on the development of earth's soil. For the past 100 million years, earthworms have evolved with deciduous vegetation. Leaf fall and the death of land plants have provided a massive food source for earthworms and other soil-inhabiting organisms. The excrement, death, and decay of these soil organisms build the organic constituents of soils, and earthworm burrowing aerates the soil and improves drainage.

In typical grassland and woodland soils, earthworms reach populations of hundreds of animals per square meter. They often dominate the invertebrate biomass (the total mass of invertebrate animals) in a region. Earthworms ingest soil as they feed on organic matter and as they burrow through the soil. Charles Darwin estimated that 15 tons of soil per acre per year passed through earthworm bodies. Recent, more accurate estimates of earthworm populations give even more impressive tillage figures of nearly 40 tons per acre per year!

Earthworms are surface feeders that pull leaf fragments and other plant debris into their burrows at night. Of the plant matter that earthworms ingest, less than 10% is incorporated into worm tissues. The rest passes through the digestive tract, is incorporated into castings (fecal material and soil), and is released deeper in the soil. Earthworm castings are also rich in ammonia, which is a form of nitrogen that some plants can use.

Earthworms are vegetation shredders in soils. Shredding vegetation and incorporating it into fecal material increases the surface area of plant matter by several orders of magnitude and hastens its eventual decomposition by bacteria and fungi. Researchers have demonstrated the role of shredders in the breakdown of plant litter by soil animals. Leaf-filled nylon bags were buried in the soil. Some bags had a 0.5 mm mesh size, which excluded all earthworms and other large invertebrates. Other bags had a mesh size of 7 mm, which allowed all invertebrates to enter. The rate of breakdown of leaf litter was reduced by approximately two-thirds in the small-mesh bags.