

Of all the members of the soil food web,  
earthworms need the least introduction

Charles Darwin wrote: "It may be doubted whether there are many other animals which have played so important a part in the history of the world, as have these lowly organized creatures."

# Earthworms

By

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# Where and how many?

Count and Sort

Dig a hole  
1' X 1' x 1'



**Add Mustard Solution (optional):**  
about 1/2 cup of mustard to 3 or 4 gallons  
of water. Stir well so that the solution is  
thoroughly mixed. Pour into the hole.

# Interpretation of earthworms



Earthworm populations may vary with site characteristics (food availability and soil conditions), season, and species.

Note: About 10 earthworms per square foot of soil (100 worms/m<sup>2</sup>) is generally considered a good, higher counts are better.

# Earthworms - reproduction

- Earthworms are hermaphrodites, meaning that they exhibit both male and female characteristics.
- But you still need two to start a colony.



# Earthworm Cocooning



Young worms hatch from their cocoons in three weeks to five months as the gestation period varies for different species of worms. Conditions like temperature and soil moisture factor in here...if conditions are not great then hatching is delayed

The ideal temperature is around fifty-five degrees, allowing earthworms to mate in the spring or fall.

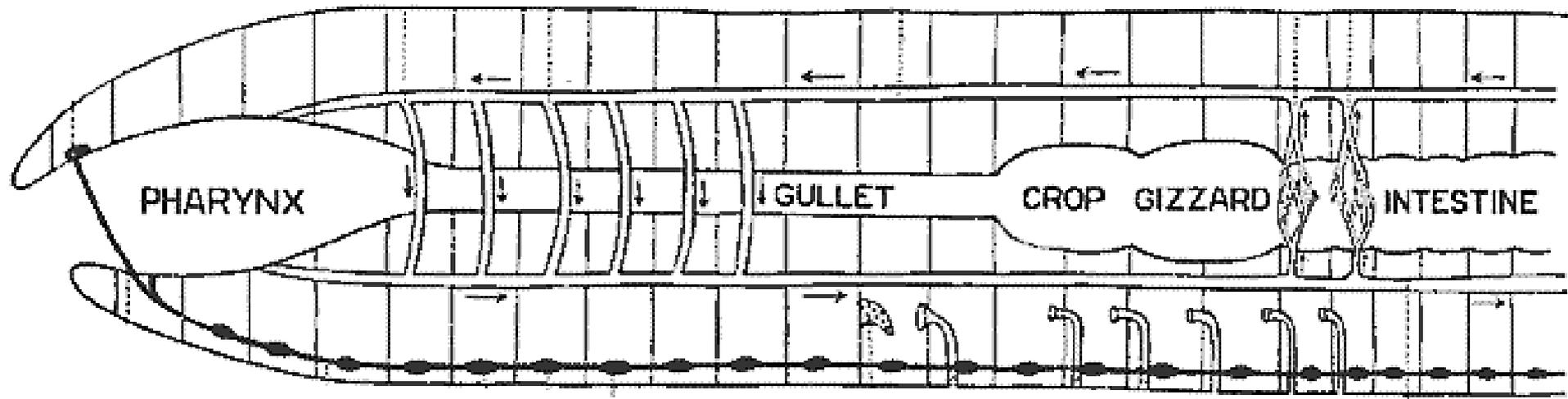
# Earthworms - decomposers

Earthworms derive their nutrition from dead and decomposing organic matter. Things like decaying roots and leaves, and living organisms such as nematodes, protozoan's, rotifers, bacteria, fungi.

They fragment organic matter and make major contributions to recycling the nutrients it contains.



# Earthworm Cross-section



The earthworm is an eating and composting machine.

It literally eats the earth as it burrows through it, either pushing aside the earth or taking it into its mouth.

A worm can ingest  $\frac{1}{3}$  of its own weight in earth, minerals, and organic matter each day, thus requiring an impressive digestive system.

# Earthworm Castings

- Increases the availability of nutrients. "Available plant nutrients (N, P, & K) tend to be 8 times higher in fresh earthworm casts than in the bulk soil." [Edwards et al., 1995]



# What do they do ?

- Earthworms dramatically alter soil structure, water movement, nutrient dynamics, and plant growth.
- Their presence is usually an indicator of a healthy system.



# Earthworm – Soil Health



- Stimulate microbial activity.
- Improve water-holding capacity.
- Mix and aggregate soil.
- Provide channels for root growth.
- Increase infiltration.
- Bury and shred plant residue.

# The following practices boost earthworm populations:



- Tillage Management (no-till, strip till, ridge till)
- Crop Rotation (with legumes) and Cover Crops
- Manure & Organic By-product Application
- Pasture & Hayland Management
- Irrigation or Drainage

Menoken Farm  
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# Pesticides Toxicity to Earthworms

Table 1.

## Earthworm Populations Reduced by Pesticides

Pesticide	Toxicity to Earthworms	Reduction
Sevin (carbaryl) insecticide	Severe	76-100%
Diazinon insecticide	Moderate	26-50%
2,4D herbicide	Low	0-25%

Source: University of Kentucky, Dept. of Entomology

# Source

- ATTRA, Sustainable Soil Systems
- <http://soilquality.org/indicators/earthworms.html>
- [http://soils.usda.gov/sqi/concepts/soil\\_biology/earthworms.html](http://soils.usda.gov/sqi/concepts/soil_biology/earthworms.html)
- [http://www.soils.usda.gov/sqi/assessment/test\\_kit.html](http://www.soils.usda.gov/sqi/assessment/test_kit.html)

## References:

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- Brady CN and RR Weil. 1996. The Nature and Properties of Soils. Prentice-Hall.
- Edwards CA and CI Bohlen. 1996. Biology and Ecology of Earthworms. Chapman & Hall, NY.
- Hubbard VC, et al. 1999. Earthworm response to rotation and tillage in Missouri claypan soil. Biol Fertil Soils 29:343-7.

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Natural Resources Conservation Service

or

Soil and Water Conservation District



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