

Make a Worm Observatory!!!

Materials Needed

1. The container

5 gallon aquarium, recommended.

(anything larger gets very heavy once you fill it with soil)

A tank divider made of Plexiglas, a scrap piece of wood, rigid insulation (my preference) or some other impenetrable material, cut to fit snugly.

Silicone caulk, epoxy or some other material used to seal around the divider.

A fitted lid of some kind, a snap on screen lid for an aquarium works great.

2. The soil layers

Sand – bottom 2 inches or so (solely for drainage)

Soil – about a 4-6 inch layer of a light colored loamy soil (beige, red, any other color but black so the change to black worm cast material is evident) A very dark color indicates that the soil contains lots of organic compounds, that's why worm cast material is black.

Leaf Litter – on top put about a 3 inch layer of crushed, dried leaves.

Hardwood tree litter is best. Maple, Aspen, Birch or Basswood leaves are best, use Oak only as a last resort since they are less palatable to worms. Last years dried leaves work the best. If you collect fresh leaves, dry them completely until they crumble easily. Crush the leaves by hand until they are broken into small bits (1/8 – 1/2 inch) but not powdery. Some larger bits are fine too.

Note: All of the soil and litter components must be completely worm free. Sift soil to get rid of any worms that may be there. Use only very dry leaf litter since wet litter often contains worms. If you can spread the soil and litter out on a tarp in a thin layer, in the blazing sun for a few days or a week to really cook it, this will kill or drive off any tiny worms present.

A related math exercise: have the kids calculate how much of each material you will need based on the volume of the container and the desired thickness of each layer.

3. The Worms

Any kind of worm will work. Different species of worms will have different affects due to their ecology and feeding habits (see "worm type" handout). Some live only in the litter (small-bodied red worms), some live only in the soil (larger whitish - gray worms) but the night crawler (large-bodied red worm) goes everywhere and, being so large, they eat a lot. For the fastest and most dramatic results, use either leaf worms (*Lumbricus rubellus*) or night crawlers (*Lumbricus terrestris*), both of which can be found in local bait shops. If you choose to dig you own worms and see what you think may be several different types of worms, just pick one of the types and use it.

For one side of the container (remember you are leaving one side worm free!) use enough worms to equal 200-400 individuals per

square meter...

- Leaf worms (*L. rubellus*) about 15-20 worms
- Night crawlers (*L. terrestris*) about 6-10 worms
- Red-Wigglers (*Eisenia fetida*) or Angle worms (*Aporrectodea* species) about 10-15 worms

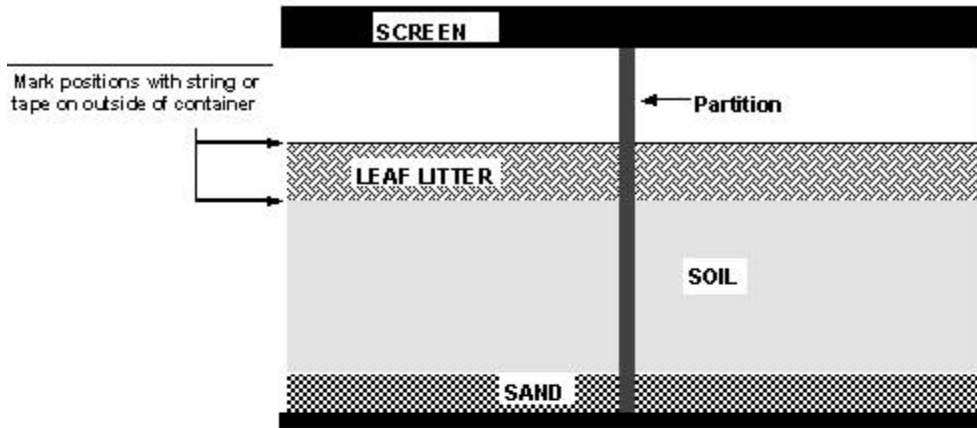
A related math exercise: have students calculate how many worms you would need for the container to achieve the desired density of worms.

Assembling Everything

1. Divide the tank into two equal halves. Be sure the divider is tightly fitted and sealed (silicone caulk, epoxy glue, etc.) to prevent movement of worms from one side to the other. Tiny juvenile worms can move through any fine mesh and even big worms can get through very tiny spaces. Be sure the lid fits snugly down on the divider to prevent worms from crawling over (yes, they will do this!). If you are using a screen lid be sure the divider fits snugly to the screen.
2. Build the layers of soil from the bottom up...smoothing each as you go so they are level and equal on both sides.
 - Sand goes on the bottom. This is primarily for drainage so the upper layers do not get overly saturated.
 - Loamy soil simulates the thickest and deepest layer of soil generally found in rich, mesic hardwood forests. This layer is often called the "mineral soil."
 - Leaf litter simulates the forest floor or "duff" layer of worm-free hardwood forests. In a natural forest, this layer would be full of insects, roots, fungal hyphae and hordes of other organisms. But for our purposes, this simulated duff layer does a great job.
3. If the soil and litter are very dry, sprinkle water slowly over the whole demonstration to moisten the upper layers with a minimal amount of flow through to the sand. Maintain moisture levels throughout the run of the experiment since earthworms will become inactive when conditions are to extreme (to dry, hot or cold). They can live in saturated conditions but they do not prefer it. FYI-worms do not come up during rainstorms to avoid drowning. They do so because it is an opportunity to disperse when surface conditions are moist and cool.
4. Use tape or string to mark the top of each layer on the outside of the aquarium (these will change during the demonstration and if you don't mark them it's not as obvious).
5. Add worms. They will find their way down, no need to bury them, just throw them in on top of everything! Be sure to make note of how many you put in and the date.
6. Wait, keep observations. If you used night crawlers, you should see obvious activity on that side within a few days or weeks. After a month or more, the differences between the worm-free and the worm populated sides will be obvious. Some suggestions on observations...a) measure changes in the thickness and height of the different layers using the reference markings you placed on the outside.b) note changes in color or texture to each layer.c) note which layers you see

the earthworms in (they should move along the glass every once in a while, leaving burrows, so you can see where they have been.

Worm-free conditions on both sides at the beginning of demonstration



Worm-free conditions on left side, worm-worked on right, at the end of demonstration

