

1. Liquid Extraction

In this method you pour a solution of mustard water on the soil allowing it to percolate down. The mustard solution irritates the skin of earthworms and they come to the surface to avoid it, where they can be collected, preserved and identified. To make the solution, mix 4 liters (~1 gallon) of water with 40 grams (~1/3rd cup) ground yellow mustard seed. This is the same powdered yellow mustard you will find in the spice rack in any grocery store. However, if you plan on doing this a lot it is MUCH cheaper to buy it in bulk at the local food coop.

A 4L jug of mustard solution is enough to sample a 35cm x 35 cm (1 square foot) sample plot. Clear away the dry surface litter in your



sample area (if the litter is wet you may have to search it by hand for errant earthworms). Slowly pour about half of the jug of mustard solution over the area allowing it to soak in as much as possible. If

worms are present and active they should begin coming up almost immediately. If they don't come up immediately, wait 2 minutes or so and then pour again. A forceps is handy for picking the earthworms up off the surface. Have a collection tray to put them in until you're done, since they can come up in rapid succession and if you are collecting and preserving your earthworms, put some alcohol (isopropyl or rubbing alcohol) in the collection tray to anesthetize the earthworms as they surface. When picking up the surfacing earthworms, WAIT until they come all the way up and out of the soil before you grab them or they will try to go back down and you will most often get an earthworm piece, rather than a whole earthworm. After a few minutes, and the initial flush of earthworms slows down, pour more of the solution over the sample area. You will probably get another flush of

earthworms coming to the surface. Continue this until the whole gallon is used up (2 or 3 pourings). Deeper dwelling species take longer to surface than those close to the surface so don't be too impatient. Total sample time is usually 5-10 minutes.

This technique works well for all species of earthworms but only when the earthworms are active. If it has been very dry, very hot or very cold in the week(s) prior to sampling they may not respond as well since they may be in aestivation (earthworm version of hibernation). In contrast, if air temperatures have been moderate and it has rained recently they are likely to be active and respond well to the liquid extraction. AN EXCEPTION – if the soil is very compacted and/or has a poor structure (heavy clay, fields, roads, etc.) the extractant doesn't move well through the soil and the earthworms will not respond because the liquid doesn't reach them. BUT, in most hardwood forests of our region the liquid extraction method works very well. Try it, it's fun!

If you are only interested in generating a species list for your site, then you can choose to sample here and there across your site. However, if you want to measure relative abundance of different earthworms for your site then use a plot sampling scheme (see study design).

Types of data you can collect using this method:

- A complete list of the species and/or ecological groups present
- Relative abundance of different species or ecological groups
- Density of earthworms on an area basis (i.e. number of earthworms per m²)
- Biomass on an area basis (i.e. grams of earthworm biomass per m²)

Types of data you cannot collect with this method alone:

- Relative depth of different earthworm species in the upper soil horizons