Exploring biochemistry:
Decay timeline and detritivorous organisms

Summary:
The existence of organic matter is commonly taught and indeed its role in many ecosystems are made apparent, but we rarely explore how organic matter is generated in a soil. This series of practical exercises encourages participants to look at the materials that go to makeup organic matter in the environment as they currently experience it, so predicting the formation of future soils. We explore this further by examining the biological breakdown of organic matter in relation to above and below ground organism.

This can be further extended with chemical breakdown of substances such as lignin and cellulose.

Leanring Objectives:
- The existence of organic matter is commonly taught and indeed its role in many ecosystems are made apparent, but we rarely explore how organic matter is generated in a soil. This series of practical exercises encourages participants to look at the materials that go to makeup organic matter in the environment as they currently experience it, so predicting the formation of future soils. We explore this further by examining the biological breakdown of organic matter in relation to above and below ground organism.

This can be further extended with chemical breakdown of substances such as lignin and cellulose.

This can be coupled with the different types of worms and their variance in use of the soil habitat.

Equipment:
- ~20x sandwich bags for collection

- A 1 metre+ clear table space or floor space

- Pens and paper (~A5 size)

- Large bowl

- Clear water

- Saline solution

- Battery powered milk whisk (if indoors can use a plug in whisk)

- Sieve

Preparation:

Estimated time 15 minutes.
Mix saline in advance, dissolve ~100g of salt into 0.5l of hot water or as much as will dissolve
If wanting to cut down on delivery time, you can provide samples of pre-dug out soil for large organic matter and inter-aggregate OM extraction
Additionally, if solely classroom based you can gather materials and bring them into the classroom

Time Required:

Introduction 5 minutes, outline activities
5 minutes, preparatory information for gathering materials and distribute collection bags
10 minutes for gathering materials
10 minutes to order collected material in a line and discussion
5 minutes to float off OM from in water
5 minutes to separate inter-aggregate from soil in saline
10 minutes to draw a collection detritivore organisms
5 minutes to place along the line of OM based on their habitat/food source

Total timing ~45 minutes.

Background Leanring Needs:

An introduction to soil fauna is extremely beneficial for participants
An understanding of food webs and trophic levels
A basic understanding soil composition

Risk Assessment:

Hazard	Liklihood	Severity	Mitigation
Illness from ingestion of natural materials and soil	Low	Medium	Use gloves where necessary
Site/local specific risks	Unknown	Unknown	Anyone running this activity is advised to conduct a risk assessment for the specific site and conditions

Description of Activities:

1. Ask participants to gather a selection of organic materials within the environment where the theoretical soil will be formed. This can include an array of both green and brown materials, commonly selected are plant stems, flower heads, twigs, bark, leaf litter etc. Place these into bags and bring inside.
2. Gather a sample of soil for separating the OM, place in a bag.
3. Get participants to create, in small groups, a line of decay with the objects they found, nothing organic should be not included, so this might include feathers or old bits of cotton rag. Lay these in a line with the freshest i.e. most alive sam-

ples on the far most left and the most rotten i.e. dark brown and crumbly to the furthest right, creating a gradient in the centre.
4. As a group examine and discuss the very end (right) of the line, discuss what the next stage will look like.
5. Examine the soil that was collected, discuss the OM present, identify it and talk about soil structure and composition.
Place the soil in a bowl and gently pour water over it, until the bowl is ~¾ full. Stir with a spoon or stick and leave to rest for a while.
6. Using the pens and paper draw a number of organisms (reference material may be needed) and label them. Typically used for adult level is macrofauna (snails, woodlice, beetle larvae, millipede), mesofauna (nematodes, potworms, mites, springtails), worms (categorized by composters, epigeic (surface), endogeic (horizontal burrows) and anecic (vertical burrowers)- need help?) and others such as fungi.
7. The material that has floated to the surface of the bowl of wet soil, as a result of step 6, is the large OM. Scrape this off and add it to the right end of the time line.
8. Pour the water off the remaining soil off (through a sieve is easiest) and add 2-3 handfuls of the soil into a clean bowl with the saline solution. Use the whisk to blend the soil and saline solution together for 3-4 minutes, allow to settle.
9. As a group place the drawing of the organisms along the line based on where their food would be in this matter. For some this will encompass the whole line and others it will be very specific areas.
10. Finally, scrape off the OM that has settled on the surface of the saline solution and add this to the right of the line. This is the inter-aggregate OM, locked within soil by structure and aggregates often produced by detritivorous organisms.
11. Place the baskets into the pint glasses at the same time and watch the soil particles begin to drop to the bottom of the glass.

Extension:

Chemical composition can be explored in the breakdown of complex chemical structures such as biopolymers such as lignin, via biological action of detritivores into simpler chemical structures and indeed the nutrients in a simplified chemical formula that plants can they absorb and utilises in their physiological processes.