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Title: Life in the Soil

Synopsis

This activity will introduce visitors to the ecology of soil-dwelling invertebrates. Soil-dwelling animals are collected before the activity, and then presented for examination by visitors, through the use of dissecting scopes or, preferably, computer displayed microscopes like ProScopes. The goals of this activity are to introduce soil ecology, familiarize visitors with organism morphology, and inspire an interest in “backyard science.”

Audience

This activity can be easily adapted for a wider audience, but the target is 3rd through 6th grade. One of the goals in this activity is to spark interest and excitement in scientific learning by introducing visitors to the vast, but nearly invisible world of soil ecosystems (Strand 1, *Learning Science in Informal Environments*). The great thing about soil habitats is that thriving communities of organisms are living right in people's back yards. This will especially appeal to younger, grade school age students, and will hopefully help them become more cognizant of the natural world around them. It would be helpful if visitors have some background knowledge of food chains, as well as basic knowledge of invertebrate taxa, for example being able to distinguish millipedes from worms, etc. The activity could easily be expanded to include visitors with more background knowledge of the subject. For example, if visitors have some knowledge of nitrogen cycling, the activity could be used to show the key part soil animals play in the nitrogen cycle.

Learning Goals

- Stimulate interest in ecologically evaluating one’s immediate surroundings
- Awareness of communities of organisms available in their back yards, and which ecologically important processes each organism performs
- Identification of different major types of soil-dwelling organisms
- How to construct their own Berlese funnel



Concepts

This activity will address concepts such as ecological functions (nitrogen and carbon cycles, decomposition) as well as morphological adaptations and evolution (convergent evolution; *form follows function*). After the activity I would like visitors to have a better appreciation for soil dwelling organisms, and the role they play in the environment.

Materials

Berlese Funnel:

- two-liter soda bottle
- lamp
- piece of screen
- collection container, such as a jar or petri dish.

Assuming that the presenter has access to a desk lamp and a recycle bin, the only cost would probably be the screen, which can be purchased in bulk at any home improvement center for about 10¢/ft. The best containers to display the organisms in are plastic petri dishes filled with water, but any clear container will work. This activity also requires access to hand-held ProScopes® or a dissecting scope, which would probably have to be provided by the outreach sponsor. Directions for the construction of a Berlese Funnel can be found here:

<http://email.ctic.purdue.edu/CTIC/Berlese.html>

Preparation and Set-up

In order to have a collection of organisms to display, the presenter should use a Berlese funnel to collect some organisms beforehand. This should be started at least 24 hours in advance to ensure there is enough time for the collection to take place. The ProScopes can be used to take pictures of some organisms ahead of time, which can be displayed from the table. Once the activity is set up, find some organisms before your visitors arrive so you can help them find things.



Guiding Questions

- “Want to look at bugs under a microscope?” – engage
- “Can you find anything in this dish?” – engage
- “How many legs does that animal have?” – check prior knowledge
- “What percentage of animals do you think live in the soil?” – check prior knowledge
- “Where do you think I collected these soil samples?” – encourage discussion
- “What do you think this animal eats?” – encourage discussion/check understanding
- “How deep in the soil do you think this animal lives?” – encourage discussion/check understanding
- “Do you think these animals live in your yard?” – extend

Activity Description

My activity will consist of several petri dishes containing soil dwelling animals. The animals will be roughly separated by the depth of their natural soil habitat. Visitors can look at the animals using the computer displayed hand held microscopes (ProScopes) or dissecting scopes. The presenter will give some basic verbal information on soil organisms (e.g., they compose 95-99% of all forest animals) and then give some specific information on depth-determined morphological differences. Visitors will then be asked if they can identify individual organism's preferred soil depth (probably dichotomously; either shallow or deep) based on morphology such as antennae length, presence or absence of pigmentation, eye size, etc. Learning will be assessed by visitors' ability to correctly determine species habitat. Visitors will then be shown how to make their own Berlese funnel so they can collect soil animals on their own.

Teaching Strategies

This activity will focus on the *explore* phase of the 5S learning cycle, and then lead into the *explain* phase. I'm hoping visitors will at first simply be interested in simply looking at tiny organisms under a microscope, and help them remember vocabulary. Next I hope to encourage visitors to think about what ecological processes the organisms could be performing, rather than remain preoccupied with organisms' morphology or name.



Vocabulary

- Arthropod – an invertebrate with jointed legs. Includes arachnids, insects and crustaceans.
- Detritus – organic waste and debris
- Mite – a small arthropod
- Nematode – a round worm
- Nutrient – a substance that is essential for life
- Springtail – insect-like arthropods, also called snow fleas
- Soil – a mixture of sand, silt, clay, gas, liquid, organic matter and living organisms

Science Content Background and Additional Resources

The presenter should have a basic understanding of the types of organisms likely to be observed, and know how to tell them apart, e.g., mites vs. springtails or beetle larvae vs. nematodes. The presenter should also have some knowledge of the distribution of the organisms and their ecological functions

Nardi, J. B. (2007). *Life in the soil: A guide for naturalists and gardeners*. Chicago: University of Chicago Press.

Life Under Your Feet. Online. <http://lifeunderyourfeet.org/en/>

The Living Soil, Colorado State University. Online.

<http://www.ext.colostate.edu/mg/Gardennotes/212.html>

The Soil Food Web. Online.

http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2_053868

Eisenbeis, G., & Wichard, W. (1987). *Atlas on the biology of soil arthropods*. Berlin: Springer-Verlag.

Soil is Alive... See it With a Berlese Funnel, Purdue University. Online.

<http://email.ctic.purdue.edu/CTIC/Berlese.html>

Homemade Berlese Funnel How to, Cary Institute. Online. <http://vimeo.com/51602161>