OPAL Soil and Earthworm Survey

Group leader's survey support: planning, advice and ideas

Thank you for participating in the OPAL Soil and Earthworm survey. This document is intended to provide participating schools and group leaders with a guide to help prepare for the survey, run the survey, and then participate in post-survey activities. The following three sections provide a list of items to be considered for each of these stages, but it is not exhaustive. Please add or customise the lists as is appropriate to you.

Pre-survey

1. Background information

Soil is a mixture of mineral particles and organic matter. It has many critical functions. It plays a primary role in food production, mining and construction, waste management, bio- fuels, and in ecosystem functioning. Soil provides minerals and water to plants; absorbs rainwater and releases it later, preventing floods and drought; and it cleans water as it percolates through the soil profile. Soils are also home to a high diversity of organisms, many of which are involved in the decomposition of dead plant material and nutrient recycling.

An important soil organism is the earthworm. Although they can't see or hear, they react to light and have chemo-receptors on their bodies to detect harsh substances in the environment. Earthworms are known as 'nature's plough' because they burrow into the soil and consume large amounts of fresh or partially decomposed organic matter from the soil surface. This improves the structure, water infiltration and aeration of the soil. They deposit nutrient rich worm casts (faecal matter) throughout the soil and on the topsoil. As they travel through the soil they mix the soil from the different layers with material from the soil surface. This mixing means that more nutrients are available for plant growth which helps to create a better soil habitat for all soil organisms. Since earthworms are very sensitive to the environment, looking at their distributions alongside soil properties will give a useful insight as to whether earthworms can be used as bio-indicators for soil quality.

2. Aims of the survey

The main aims of the survey are to investigate links between soil characteristics and earthworm population distribution across the UK. It is also aiming to highlight the importance of soil and its quality by demonstrating the effect of soil type and condition on the biodiversity or living organisms within the soil. It is hoped that a positive side-effect of this will be to renew interest in the natural environment, and help create a new generation of environmentalists.

3. Survey structure

The survey is divided into six sections, each one designed to lead on to the next. Section 'A' asks participants to choose a location and to record characteristics about the site itself, including its location, proximity to roads, weather and other features. Then, Section 'B' provides details for digging a small sample pit, and collecting and separating earthworms for later identification. Section 'C' focuses on the main soil properties to be investigated, and Section 'D' asks participants to attempt to identify adult earthworms using the Earthworm Identification Key provided overleaf. The key is also intended to be used as an independent resource at any time. Section 'E' allows participants to look for earthworms in other locations (microhabitats), as well as noting other creatures they may have encountered during excavation of the pit. Finally, Section 'F' provides the contact details for submitting data to the OPAL website www.opalexplorenature.org

4. How long will the survey take?

The survey will take around one hour to complete. Please ensure you allow sufficient time to complete the survey; this includes preparation time, travelling to the survey site and completion of the tests within a reasonable time, and then returning home after the survey (particularly relevant if done late in the day with fading light). In addition to the survey time, it is also advisable to allocate time for a pre-survey session to introduce the survey and for a post-survey data submission session. If the survey cannot be completed in the time available the earthworm identification could be carried out during a later session. If taking earthworms off site, it is important to keep them in plenty of soil and leaf litter in a container with air holes to allow them to breathe.

Even if you are unable to complete the survey, all results are useful and should be entered on the OPAL website. It would be useful for group leaders to run a pre-survey session, where group leaders are able to brief participants as to the purpose, intended location and content of the survey. This will save time during the survey as participants will know the main survey steps and be aware of the main earthworm identification features.

5. Choosing the sample site

Please consider practical and safety issues when considering a location for your tests. Do not sample anywhere where you may place yourself or others in potential danger to local hazards (river banks, steep slopes, adjacent to transport routes or systems, chemical or waste disposal outlets etc.). Consider the time it will take to reach your site and if this is feasible in the time available. For the purposes of the survey, your location should contain a suitable position for your sampling pit, and for checking other possible earthworm microhabitats within a 5m radius of the pit. Always obtain permission from the landowner before venturing onto the land for the purposes of carrying out the survey.

6. Health and safety

As the group leader you are responsible for carrying out a risk assessment for the sample site. You should make a preliminary visit to the site and identify potential hazards in advance of any field work, and become familiar with local conditions. A first aid kit should be taken out to the site along with a mobile phone. A map is also useful especially if using a more remote area for your site.

7. Resources

In addition to the survey pack you will also need two 750ml bottles of water, a trowel, a small shovel or a spade, protective gloves and a bin bag. A list of essential and useful items can be found on Page 3 of the accompanying workbook. There are enough materials provided in the pack to perform two tests. If two locations are to be tested, it may also be necessary to photocopy pages 6, 7 and 8 of the workbook, to provide enough space for recording two sets of answers (these can also be downloaded from the OPAL website).

8. How is the activity linked to the curriculum?

In addition to encouraging pupils to engage with their local environment this survey will:

A. highlight 'how science works' in the real world
B. provide an opportunity for pupils to develop their fieldwork and classification skills
C. enable pupils to work collaboratively with their classmates and the wider scientific community.

9. Support

Group leaders should familiarise themselves with the survey and its contents in advance of a larger group or class session. This is to enable them to answer simple queries that may come up during the course of the field tests. We recommend that group leaders read as much of the supporting literature as is possible, and look through the OPAL website for further information. The OPAL website also provides links to other useful websites.

The survey

Things to consider:

1. Safety talk

Participants should be given a safety talk before the activity to run through the main health and safety aspects and behaviour expectations.

2. Working in pairs

We recommend that wherever possible, participants work in pairs. This has obvious health and safety benefits and also allows participants to swap over between the two tests, so that each experiences both the practical and data recording aspects of the work. We also recommend informing others of your chosen sampling location, time on site, and expected time of return.

3. Arriving on site

Place all equipment in one area so that this can be the base that pupils can return to if they need anything or require assistance. Pupils should collect all equipment they need and take it to their chosen sample site.

4. Collecting earthworms

Great care should be taken when handling earthworms at any time. Earthworms 'breathe' through their skin, and keeping them moist will enable them to do so. It is good practice to keep them stored in a ventilated container in soil taken from their sampling pit, either for identification in the field during the survey tests, or in a classroom post-survey. Remember to count and release the immature earthworms back into the soil close to the pit. When the adult earthworms have been identified or photographed, carefully return them to the soil as close to the original site as is possible. Remember also that although the mustard water solution is not toxic to the earthworms, it is a mild irritant to them, so rinsing them with fresh water immediately after their extraction will prevent unnecessary discomfort. It is also necessary to rinse all earthworms, in order to remove soil and dirt, prior to attempting their identification.

5. Taking pictures

Participants may like to record site characteristics and adult earthworms with a camera. Photographs are extremely useful if a worm that is found cannot be identified. It may be possible for the project support team to identify a worm from a clear high resolution image of the worm, although this cannot be guaranteed. Capturing images of the test may also allow participants to compile their own 'scrapbook' of the field tests for personal or practical reasons.

6. Weather

Even with modern forecasting technology and methods, the weather can be unpredictable. Please try to anticipate the weather in advance of your field work, and always carry enough clothing to put on extra layers should conditions deteriorate. We recommend strong footwear, warm layers, and waterproof outer layers where possible. If the weather conditions are hazardous it is advisable to cancel the fieldwork activity.

7. Data submission

After completing the survey, you are asked to submit your results online using a specially developed data submission form. This can be found on the OPAL website. Participants do not need to create an OPAL account to enter survey data; however it is recommended that they do. OPAL account holders will be able to view all of their previous survey submissions and they will receive a regular newsletter about OPAL.

Post-survey ideas

After the survey has been completed and data uploaded to the OPAL website, it is possible that some participants may wish to follow up with other related activities, so we have included a few ideas below. Please feel free to expand on this with ideas of your own.

1. **Looking at results**
   The OPAL website allows users to view both their own results, and those of other participants on interactive maps with the data points plotted on them. Participants are encouraged to return to the site after submitting their data to monitor the development of earthworm and soil type distribution maps, to help put their own submission into a national context. Over 4,500 surveys have been completed and uploaded on the OPAL website.
   The OPAL Community Environment Report also contains results from the survey (page 47).

2. **Build a wormery**
   for those who may be interested to continue studies of soil and/or earthworms, it may be possible to set up wormeries or compost heaps to breed earthworms to study their life-cycles. In this case, it is worth researching into the care and maintenance of earthworms and to refer to textbooks on the subject such as *Earthworms* (Sims and Gerard, 1999). Links to other organisations can be found on the OPAL website.

3. **Habitat survey**
   Search for earthworms in a variety of different habitats and compare the results. The school grounds could be compared to a garden or local woodland. Deciduous and coniferous woodland could also be compared.

4. **Soil communities**
   The soil organisms could be looked at in more detail, comparing the soil communities in two different habitats.

5. **Look at how worms mix the soil**
   Set up a measuring cylinder with layers of sand, two distinct types of soil and plant litter. Add five worms and place a lid on the top leaving air holes. Leave for a few days and then look at the result. The worms should have mixed the 2 distinct bands together demonstrating how they mix the soil effectively.

6. **Paint with soil**
   Use the Painting with Soil activity sheet in the learning section of the OPAL website.

About OPAL

The Open Air Laboratories (OPAL) network, led by Imperial College London, is a UK-wide partnership initiative that inspires communities to discover, enjoy and protect their local environments through citizen science-based activities. OPAL began in 2007, operating across England and funded by a Big Lottery Fund – Changing Spaces grant. Since January 2014, the programme has expanded to Scotland, Wales and Northern Ireland thanks to a further award from the Big Lottery Fund's Supporting UK-wide Great Ideas programme. For more information, please visit www.opalexplorenature.org or follow us on Twitter @OPALNature

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