

Soil sampling for habitat recreation and restoration

When considering re-creation or restoration of Biodiversity Action Plan habitats such as grassland and heathland, detailed information on soils is necessary to help determine whether a site is suitable, and, if it is, the most appropriate target community to aim for. Soil analysis provides information on the nutrient status and pH of a soil. However, the reliability of the results depends on the accuracy of the sampling. This Technical Information Note gives guidance on sampling methodology. Other information notes give advice on soil texture, soil analysis, assessing site suitability for restoration, methods of re-creation and restoration and details of appropriate species to encourage. Soil sampling and analysis is a requirement for some of the restoration and re-creation Higher Level Stewardship options available under Environmental Stewardship.

Context

In addition to assessing the potential of a particular site for restoration or re-creation of botanically rich grassland, knowledge of the soil nutrient status provides a valuable baseline against which trends can be judged and problems diagnosed. The data collected will also be used to develop a National Agri-environment Soils Database.

Soil texture also affects whether land is suitable for a particular habitat, because it affects drainage, water retention and nutrient retention. Like nutrients, soil texture can change across a field and it may be appropriate to hand texture in the field. See TIN037 *Soil texture* for more information.

Sampling methodology

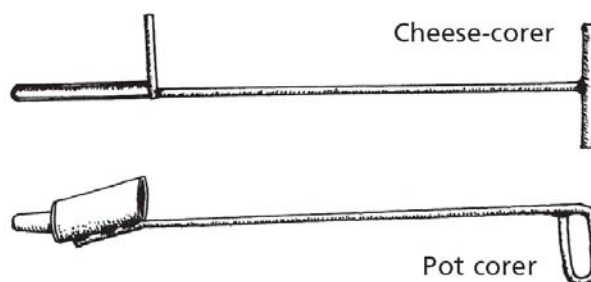
Soil sampling requires care; if insufficient time is allowed to take samples properly the reliability of the results will be compromised.

For reliable results follow the rules given below:

Do use the correct sampling tool

On arable land, short-term leys or permanent grass to be ploughed (ie where you need to

represent the whole plough layer) use a cheese-corer or screw auger. On permanent grassland use a pot corer.



Do take the correct number of sub-samples

There can be no precise instructions on how to split up a field for sampling and how many hectares can be represented by one sample. To obtain a good representation of an area of land at least 25 individual cores should be taken and bulked together to give a single soil sample for analysis of half to one kilogram in weight. These cores should be taken by walking the field in a 'W' or other representative pattern and taking cores from equally spaced sampling points, the distance apart depending on the field size (see diagram of sampling pattern). Remember that it is important to spread the sampling points evenly over the

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sampling area. As a 'rule of thumb', if the field is about four hectares, 25 m spacing is about right. Samples should always be put in clean polythene bags to avoid contamination and labelled as soon as taken.

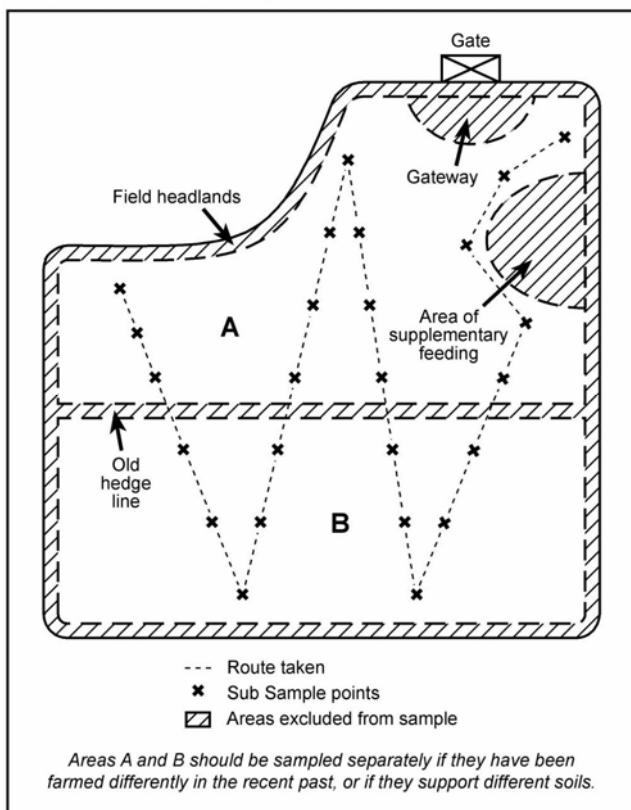


Diagram of sampling pattern

Do not take several samples and then try to remember which came from which field.

Do sample to the correct depth

On arable land that is regularly ploughed samples should be taken to a depth of 0-20 cm, ie the depth of the Defra cheese-corer.

Occasionally ploughed fields (eg arable fields normally direct drilled or shallow cultivated but ploughed occasionally) must be sampled to the full plough depth or anticipated plough depth. This may be deeper than 0-20 cm. This also applies to long leys and permanent grassland about to be ploughed and reseeded.

Long term leys (less than ten years) and permanent pasture samples should be taken to

a depth of 0-7.5 cm, ie the depth of the Defra pot corer.

Benchmark values of pH and nutrient status have been set using the above standard depths. Your results will be misleading if sampled to other depths eg by using a spade or trowel.

For all topsoil sampling, it is important that the whole of the sampling depth is equally represented by each replicate core (on grass the pot corer should ensure this). Therefore if, on retrieval, part of the core is missing ie the bottom part is left in the ground (this often happens in dry or stony soils) or the top part falls off (because it is dry), discard this core and attempt to take a replacement close by. It often helps to firm up the soil surface at the sample point by treading on it before pushing the auger in.

Do include the top few centimetres of soil

There is often a different pH and/or concentration of soil nutrients (particularly phosphorus) at the surface in grassland and in direct drilled/shallow cultivated fields. It is therefore essential that the top few centimetres are included in the sample.

Do take account of variations within fields

In most cases the field (unless very large) will be the maximum size of the sampling unit. However, Advisers should discuss previous management with the landowner to identify any variations and the need for sub-divisions, eg areas of markedly different slope, cropping/past fertiliser use, past field amalgamation and/or significant variations in soil depth or texture (soil texture variations in particular affect pH). Remember that livestock tend to lie, and excrete, on more level ground particularly at the top of slopes. These areas can be much higher in nutrient status and should be sampled separately.

Don't sample atypical parts of fields

For example, sites of old bonfires, manure heaps, pylons and round trees and supplementary feeding areas or other areas where stock congregate such as gateways. Avoid headlands, the nearest you should sample

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to the field edge is equivalent to the distance between sample points. Quite a wide headland width may be different from the rest of the field. The reasons include enrichment with leaf litter from hedges and trees and previous different cropping of the headland (eg game cover, cereal on headland round sugar beet field). A lot more trafficking occurs on headlands, and possible double or missed applications of fertilisers.

Don't sample immediately after fertiliser or organic manure applications

If a sample is taken soon after fertiliser, lime or organic manure applications, the analysis will be higher than if left long enough for the fertiliser or other input to react with the soil. Always check with the landowner before taking the sample. If an application has been made it is advised that the sample be delayed for two to three months.

Take care when taking soil samples

When using a cheese-corer auger it can be difficult to remove the soil from the corer. Use a spatula type tool to do this, which should ideally have a blade about 2 cm wide and a rounded end.

New augers can have sharp corners at the top end of the gouge. These should be rounded off with a file before the auger is used. At the same time, it is worth sharpening the cutting edge of the corer tip.

Take care not to injure your back when removing the auger from the soil.

Watch the weight - half a dozen or more soil samples are heavy to carry. Ideally use a small rucksack, and plan your work to minimise carrying.

Historic sites

On sites containing historic features or Scheduled Monuments advice must be sought from a Natural England Historic Environment Adviser before taking soil samples.

Soil analysis

Soil samples should be despatched for analysis as soon as possible after sampling. If there is a delay of a few days the samples should be stored in a cool dark environment until they can be sent to the laboratory.

The laboratory analysis should include:

- pH (water)
- available phosphorus (P) using the Olsen method
- available potassium (K)
- available magnesium (Mg)
- total nitrogen (N) using the Dumas method
- a hand soil texture
- the P, K and Mg results should be quoted in milligrams/litre.

Further information

Natural England Technical Information Notes are available to download from the Natural England website: www.naturalengland.org.uk. In particular:

- *Soils and agri-environment schemes: interpretation of soil analysis* TIN036
- *Soil texture* TIN037

Further advice and interpretation of the soil analysis results may be obtained from a Natural England Soils Specialist.

For further information contact the Natural England Enquiry Service on 0845 600 3078 or e-mail enquiries@naturalengland.org.uk.

Author and contributors

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