NCEA
Natural Capital and Ecosystem Assessment

England Peat Map: Peat Probe Guidance

May 2025

Natural England Research Report NERR149 Annex 3

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NATURAL ENGLAND

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Acknowledgements

This project is funded by the UK Government through Defra's Natural Capital and Ecosystem Assessment programme.

Citation

Miller, C.J. and Olewski, J. 2025. 'England Peat Map Peat Probe Guidance' in Kratz, C. and others. 2025. England Peat Map Project Final Report. Natural England Research Report NERR149. Natural England.

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1. Introduction

This guidance was provided to field surveyors for the EPM (England Peat Map) project, to assist with measurement of the depth of peaty soils.

Depth surveys were carried out as part of the EPM vegetation survey, the EPM soil survey, and at ad-hoc points on peaty soils across England.

2. Probe Choice

Anything can be a peat probe from a walking stick to a utility probe. However, experience has shown that not all probes are equal in providing you with accurate peat depth measurements.

For the best results you need a rigid, lightweight, inflexible probe which you can easily add extensions to. The tip of the probe should preferably be threaded to pick up some of the material at the end of the probe which can help verify if a mineral substrate, e.g. clay, underlying the peat has been reached. It should also be cone shaped to aid insertion.

Rigid/inflexible probes are preferred as they are more likely to follow a true path straight downwards and not be diverted off to one side if you encounter an obstruction e.g. a piece of wood buried in the peat.

Slightly narrower probes are better for pushing through dried out agricultural peat which can be quite hard, whereas wider diameter probes perform better in wetter and softer peat where it can be harder to tell where the peat/mineral soil interface is.

Smooth sided probes are preferred over textured probes as they are easier to push through the peat making it easier to feel the resistance caused by the probe entering a mineral soil.

Do not use bamboo canes as they can suddenly break and cause injury.

3. Measurement Units

For your depth data to be useful it is important you record which units you are using to measure peat depth; are you using metric or imperial, are you using millimetres or centimetres?

4. Accuracy Level

It is critically important that you record at what accuracy level you recorded a measurement. Did you record to the nearest 10 centimetres, 5 centimetres, centimetre?

5. Did you reach the bottom?

Another important piece of information to record alongside your readings is did you reach the bottom of the peat or did you run out of peat probe extensions.

6. Measurement Location

A measurement location needs to reflect the immediate area around it, and you need to be aware of factors which may influence the depth you record. If you are close to a drain, gully, or erosion feature, then the depth you record may be lower than elsewhere on site. Conversely vegetation hummocks or tussocks should be avoided as they can lead to overestimates if sampled from.

Where Sphagnum moss is present it can be difficult to ascertain where the Sphagnum ends, and the soil surface begins. In such cases a pragmatic approach can be taken by standing on the Sphagnum and taking the measurement from the base of your boot; whilst not 100% accurate, this approach will reduce overestimation of depth. Soil coring can increase accuracy but specialist corers which minimise compression of the soil need to be used alongside expert advice.

7. Taking a Measurement

If Sphagnum moss is present, stand next to the probe first to compress the Sphagnum and measure the distance from the base of your boot.

Push the tip of the probe into the soil, attaching further extensions as required, until you feel resistance increasing markedly over a short depth interval, which can be associated with texture change (e.g. sand grains rubbing against the probe can be felt or heard; stoneless clay gives a much more gradual increase in resistance with no grinding and the probe can still be pushed into it; or the probe getting stopped abruptly (peat on rock)). Note that completely resistant, hollow-sounding material may be woody material which can sometimes be penetrated with further pressure or by probing again close-by.

Photo 1. Measuring from the ground upwards to the end of the probe. © Natural England

Once you've reached the bottom of the organic layer use a retractable tape measure to measure from the ground upwards to the nearest joint or to the end of the probe. This is the above ground value. Next, carefully remove the probe from the ground. Use known lengths of the probes/joints to calculate the length of the probe to the joint you measured the above ground value to. Subtract the above ground value from that length to obtain the depth of the organic layer. Record the depth at that point.

Whilst not essential it may help develop your probing skills to record the feel of the probe upon refusal (resistance preventing inserting the probe deeper). Suggested "feel" categories to record include wood, rock, sand or gravel, clay, or 'base not reached'. The "feel" can be verified by soil augering down to the depth where refusal was felt.

8. Underestimate or Overestimate

Peat probing is not accurate 100% of the time as there are situations which can lead to under and overestimates of peat depth. It is important to understand what can cause an under or overestimate along with what you can do to improve accuracy. In general overestimates are more common than underestimates but both can happen.

8.1 Causes

Underestimates are caused by a large increase in resistance being felt through the probe before you have reached the bottom of the peat. Typical causes for this include hitting woody debris e.g. bog oaks or “drummy” peat - a very hard horizontally orientated layer of peat which once dry can be incredibly difficult to rewet; it is called drummy because you can tap it like a drum. Some deep peat soils that have been degraded through drainage can also be very hard to probe. They typically exhibit strong resistance to probing that gradually increases with depth.

Overestimates are typically caused by soft sediments/mineral soil beneath the peat which do not resist the probe or feel the same as the peat. Where soft sediments are present it can be challenging to determine accurately where the peat/mineral soil interface is.

8.2 Solutions

- Check the BGS geological maps and nearby borehole records to find out which substrate under the peat is expected, which can help with determining whether overestimations are likely (e.g. if you are dealing with clayey glacial till, lacustrine or alluvial clay). Other sources of information include paper and digital soil maps, soil survey memoirs, Soils Survey of England and Wales regional bulletins (series of books), and post-1988 Agricultural Land Classification survey reports (available for download where mapped on Defra’s MAGIC web map portal).
- Take multiple depth readings within 30 cm from the original point. You will get some variation in values, but it will give you a better idea as to whether you have under or over-estimated the peat depth.
- Where possible use a probe with threads on the end. The threads will pick up some of the soil you are probing through allowing you to check for signs of mineral soil.
- If your probe does not have threads check any part of the probe which protrudes slightly and is likely to have caught some of the soil it was pushed through. A good place to look is around the probe tip or where two sections join. Is there mineral soil there?

Photo 2. Soil collected on the join between two probe sections. © Natural England

- When the soil is wet or sticky, the smooth surfaces of the probe can also collect soil particles and may indicate the mineral/soil interface.
- Using a c. 2.5 cm diameter 1-metre-long gouge auger with extensions can be a good way of checking for over or underestimations by augering some of the probing points and comparing the results.
- If the probe is difficult to push in, DO NOT work the probe up and down in the hole as this can lead to significant over estimation of peat depth.
- Be aware:
    - In agricultural settings you may encounter a harder band of peat at the base of the plough layer (~40 cm) which could be confused with the peat/mineral soil interface.
    - The rooting system of some peatland plants e.g. Heather (*Calluna vulgaris*) can also provide resistance to probing so care should be taken in these circumstances.
- Use nearby drainage ditches to sense check your results. Often the peat/mineral interface will be exposed on the banks or base of drainage ditches allowing you to sense check your results and indicate the type of substrate you are likely to encounter under the peat. If there is a big discrepancy between your readings and what you can see in the nearby drainage ditch further investigation will be required.
- Use common sense: large variations e.g. metres difference in readings over short distances, without apparent causes, such as an abrupt change in ground level, can suggest that you may have either under or overestimated the peat depth.

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