



# Assessing soil health: A guide for land managers



## Overview

- **Healthy soils are integral to food production and to environmental protection and services**
- **A 'soil-up' approach to land management is recommended**
- **Assessing soil health is different to soil nutrient testing**
- **Assessing soil health does not need to be complex or difficult**
- **Four simple surveys can help assess soil health and guide management**
- **The AONB Partnership can offer help with soil health assessments if needed**

This guidance is for land managers within the High Weald AONB who would like to assess their soil health but do not know where to start. The soil may be under arable, grassland, woodland, wetland, or any other piece of land which is not covered by a man-made structure.

The new Environmental Land Management Scheme (ELMS) will have a strong emphasis on soil and will have various soil-related requirements<sup>1</sup>. You can view the requirements being trialled here: [Sustainable Farming Incentive pilot - GOV.UK \(www.gov.uk\)](https://www.gov.uk/sustainable-farming-incentive-pilot). Being able to undertake soil assessments of your holding and produce soil management plans is therefore increasingly important.

## The High Weald's soil types

Soil, particularly its mineral content, is influenced by the underlying geology. In the High Weald most of the bedrock is made-up of sedimentary rocks of predominantly clays and sandstones. There are many soil types across the High Weald although two dominate<sup>2</sup>:

- Soils over clays which tend to be heavy and wet because of high ground water levels. They are often poorly draining.
- Soils over sandstone which tend to be free draining, light and coarse in texture. These soils are also known as acidic soils and can be naturally shallow and of low fertility. Acidic soil is relatively rare in England and is associated with habitats with rare wildlife.

The High Weald is a very distinct area when viewed on soil maps such as the [Soilscapes soil types map](#) produced by the Cranfield Soil and Agrifood Institute. This map gives a good overview of soil type in particular areas of the High Weald, but soil health is independent of the soil type.

## Why assess soil health?

A healthy soil will help sustain crop and livestock production as well as recycling nutrients, store carbon, and support above and below ground biodiversity.

A soil health survey will provide an understanding of the current state of the soil health, highlighting areas for improvement.

A soil health 'baseline' helps set targets and monitor change.

Within the High Weald, soil type, slope and drainage can be highly variable even over a short distance, meaning that assessments are needed on a field-by-field basis.

It is not possible to assess soil health from a walkover of the field. Assessing soil health is different from soil nutrient testing for N, P, K as to inform the application of manure and fertilizers (required by the Farming Rules for Water), and other standard soil tests.

## Threats to soil health

In the High Weald the top threats to healthy soils are<sup>2</sup>:

- Erosion of topsoil and organic matter, especially on steeper slopes
- Compaction from over-stocking and vehicle and machinery use, particularly in wet conditions
- Waterlogging, especially in soils which sit over clays
- Variable soil conditions within short distances, leading to increased risk of inappropriate application of fertilizer.
- Mineral soils with low levels of soil organic matter which are more susceptible to losses through erosion.

## Soil surveys

There are several easy to do soil health surveys. They require no specialist equipment - a spade and a few other everyday tools often suffice. They cost nothing except a little time. These also give results relatively quickly, so that an assessment can be made straight away.

A soil health survey focuses on four key areas:

1. soil structure
2. soil stability
3. water infiltration
4. biodiversity.

All of these surveys can be used as proxy for measuring soil organic matter (SOM).

You may wish to use an app to aid soil surveying. The Soilmentor app has been developed by farmers for farmers [Soil Monitoring Guide – Soilmentor](#). It provides information on a range of

soil metrics and tests, gives advice on how to do each test, aids repeat testing in the same location through mapping, and provides a hub to record data.

The following are widely recommended by soil and farming organisations as the best tests to understanding soil health<sup>3,4,5</sup>.

- **Soil structure**

Soil is made up of minerals, organic matter, and water. Soil structure refers to how these elements bond together into aggregates and, importantly, the ratio of soil aggregate to gaps or pores which are key to allowing water and gases to move through the soil.

Soil structure can be assessed through a **Visual Evaluation of Soil Structure (VESS)** which scores soil on a five-point scale, from friable to heavily compacted. The VESS score sheet can be downloaded from sites such as [VESS score sheet \(swarmhub.co.uk\)](https://www.swarmhub.co.uk). The VESS requires a soil sample to be dug out and then systematically compared to the score sheet. Check out a YouTube video such as [VESS Demonstration Film](#) to see how straightforward a VESS is.

- **Soil stability**

Stable soil takes up water into its pores or air pockets without disintegrating and resists erosion from heavy rain and flooding. Soils with higher levels of organic matter will hold together better than soil with low organic matter. **This test can also be a proxy for soil carbon content, as the higher the soil organic matter (SOM) the higher the soil carbon stores.**

The **slake test** is another simple to run test with an easy-to-use scoring system, which involves submerging lumps of topsoil in water and observing how much soil ‘slakes’ off over a given time. This quick video gives all the information needed on conducting a slake test [How to Conduct the Field Slake Test - YouTube](#).

- **Water infiltration**

How well soil can soak away water (and respond to heavy rainfall) is a great indication of health. The soil’s ability to do this is strongly related to soil structure (see above). If the soil has a good structure (lots of pore spaces) it should soak up the water quickly. Healthy soil is less likely to result in water pooling on the surface.

Assessing the speed at which soil absorbs water can easily be done through a **Soil Infiltration Test**. The basics involve inserting a piece of piping into the soil and timing how long it takes for water poured into the piping to drain away. Different soil types have different ideal drainage rates (important to note given the clay soils of the High Weald often have impeded drainage). There are a few slightly different methods for this test. Check out these two examples for instructions on infiltration tests [Infiltration Rate – Soilmentor \(vidacycle.com\)](#) or [Infiltration rate and infiltration test \(fao.org\)](#).

- **Soil biodiversity**

Most soil biodiversity (referred to as micro and meso fauna) is too small to see with the naked eye. Indeed, a single teaspoon of soil contains around 10,000 species and billions of individuals<sup>6</sup>. Earthworms however are easily observed. They help mix soils and improve soil structure. They are unable to survive in highly compacted soils. Earthworm populations are therefore good indicators of healthy soil.

**Earthworm counting** is a quick and easy way to assess soil health. More information on how to count and identify the three main groups of earthworm can be found here [How to count earthworms | AHDB](#).

- **Soil organic matter (SOM)**

Soil organic matter is the plant and animal matter which is breaking down, and the microbes which aid decomposition. It is the breakdown of matter that returns nutrients to the soil.

**All the assessments above could be used as proxies for SOM**, because SOM is key to good results in these tests. Friable soils are linked with higher levels of SOM, while soils with higher SOM hold together better in slake tests. Earthworms are decomposers of organic matter and require SOM as their food source. Soils with higher levels of organic matter are also more able to soak up water.

- **Other surveys**

There is a plethora of other surveys that can be undertaken to assess soil health.

Many people enjoy recording plants and animals, and some species are good indicators of soil health. For example, wax cap fungi indicate undisturbed grasslands (which are likely to have healthy soils). On fields with livestock, surveying dung quality, counting dung beetles and timing dung breakdown are worth investigating.

Other surveys record carbon stocks, rooting depth, and sward density. [Vidacycle.com](#) gives a comprehensive guide to over 25 soil health surveys.

## Other survey considerations

### Sample locations and numbers

- Be aware that a survey in one field may not reflect conditions in a neighbouring field. The High Weald is notorious for differing soil over short distances. You may need many samples to properly assess soils across your holding.
- Within any field, always survey in representative parts of that field, avoid gateways or tracks, and other areas that have high traffic whether vehicles or animals.
- Check the number of samples needed per field and for any pattern samples should be done in (e.g. in a W formation across a field).

- Be aware of areas which have contrasting vegetation as this can often indicate an area with different soils. You may need more samples to properly assess soils across these areas.

### Timing

- Soil surveying is best conducted between spring and autumn, and repeat tests should be conducted at the same time each subsequent year<sup>7</sup>.
- Avoid surveying after cultivation, soil testing should only be conducted once the soil has had a time to settle back down, ideally at least three months later<sup>7</sup>.
- Some surveys require specific conditions. For example, earthworm counts should, if possible, be done in the late spring or early autumn and ideally following mild conditions<sup>8</sup>.
- Soil infiltration test should not be conducted in very wet or dry conditions as this will bias the time it takes for water to drain away.

### Recording

- Always record results so that change can be compared over time.
- As well as keeping written records it can also be a good idea to keep a visual diary via photos of soil samples, because it can be easier to see changes in soil structure over time this way.

## Using and finding professionals

- Be aware that a traditional agronomist advises on crop yields and may recommend inputs that increase productivity but could be detrimental to soil biota and overall soil health. Productivity is only one marker of soil health.
- Many traditional soil tests focus on the available phosphate (P) potassium (K), and nitrogen (N), again with a view to increasing productivity. Note that if you are planning to create a wildflower meadow very low levels of P are important to success.

## What to do with soil survey results

Your first soil survey will form a baseline and inform you soil management plan. Subsequent surveys will indicate whether soil health is moving in the right direction, and management can be adjusted along the way. It is important to keep records so you can compare results and provide the information that may be required by the new Environmental Land Management Scheme.

Soil records can be useful for local (High Weald AONB Team's work) and national monitoring projects such as DUMP! – the national dung beetle monitoring project [Dung beetle UK Mapping Project](#) and the Natural History Museums Earthworm Watch [Earthworm Watch nhm.ac.uk](#).

Please share your records with the AONB team and others if possible.

## Help with soil surveys

The High Weald AONB Partnership may be able to offer support with soil survey equipment, soil survey app subscriptions and professional soil surveys through the Farming in Protected Landscapes (FiPL) scheme. Find out more [Farming in Protected Landscapes Programme \(highweald.org\)](https://www.highweald.org).

## References

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- 2 Natural England. (2013), National Character Area Profile: 122 High Weald, [NCA Profile:122 High Weald - NE508 \(naturalengland.org.uk\)](https://www.naturalengland.org.uk)
- 3 Agrcology. (2018), Know your soils #8: 3 key soil tests to understand your soil health [Know your soils #8: 3 key soil tests to understand your soil health | Agricology](https://www.agrcology.com)
- 4 Soil carbon project & Farm net zero (2021), Monitoring Soil Carbon: a Practical Field, Farm and Lab Guide, section 9: Soil health indicators [nlaf.uk](https://www.nlaf.uk)
- 5 Vidacycle. (2020), Building soil health: 5 Key Soil Tests to get you started [Building soil health: 5 Key Soil Tests to get you started – Soilmentor \(vidacycle.com\)](https://www.vidacycle.com)
- 6 Soil Association. (2015), Living soils a call to action [living-soils-a-call-to-action-2015.pdf \(soilassociation.org\)](https://www.soilassociation.org)
- 7 The National Libraries for Agri-food. (2021), Practical guide to monitoring soil carbon launched [NLAF - Technical and Business Information](https://www.nlaf.uk)
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