Assessing peatland condition, depth, age and carbon content

Peatlands store vast amounts of carbon and act as a natural carbon sink, helping to mitigate climate change. How effective is the peatland you are visiting at storing carbon? Is it a carbon sink or a carbon emitter?

Health and safety!

Peatlands are fascinating but often isolated places. In good condition, the habitat is characterised by being very wet underfoot with saturated soils and areas of open water which can be deceptively deep. Stick to the designated paths (unless told otherwise), and always follow your leader's instructions.

Tasks

Under the supervision of your group leader, stop in a minimum of five locations to assess the peatland condition, depth, age and carbon content. At each sample location, complete the following tasks and use the table provided to record your results.

Location and condition

Task 1 – Location

Find out and note the location of each of your sampling points. This will allow you to plot the data gathered on a map later if required. Provide a grid reference for each location.

Task 2a and 2b – Site observation

Complete an on-site visual peatland condition assessment by identifying the plants on the surface and assessing the land condition.

Using a quadrat, and our 'Visual assessment of peatland condition guide', look for plant indicators. What species are present? Assess the land condition and note any evidence of erosion.

Task 3 – Site assessment

Is the peatland in your sample area actively growing, is it degraded or is it actively eroding? Make an assessment.

Healthy peatlands absorb carbon at a higher rate than peatlands in poor condition. Damaged peatlands can emit carbon in the form of CO_2.

Investigate how deep the accumulation of peat is at a minimum of five locations across the site. Peat accumulation is rarely uniform, therefore, to get an indication of the depth across the whole site an average measurement can be made using the depth of the peat measured at each sample location.

Representation of a m^3 column

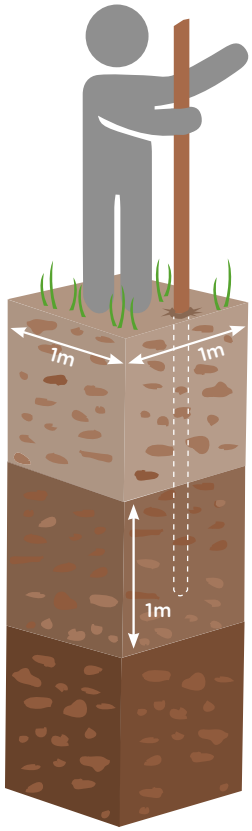


Figure 1

Visual assessment of peatland condition guide

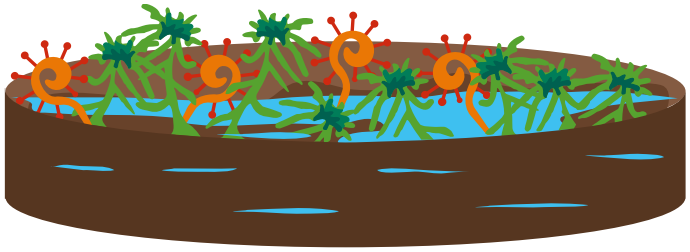
Peatland status	Plant indicators	Land condition
Actively growing – Good condition.	• Species such as sphagnum moss, cotton grass and sundew, which can tolerate the wet growing conditions, dominate and carpet the peatland surface.	• The ground underfoot is wet and squelchy. The water table is stable and high, lying close to the ground's surface. Wellies are required or you risk getting damp feet. • Well-managed grazing. Little to no evidence of grazing animals e.g. faeces, nibbling and/or trampling. • No areas of bare peat are visible.

Sundew © Drew Buckley Photography

Cotton grass © Drew Buckley Photography

Sphagnum

Actively growing peatland in good condition

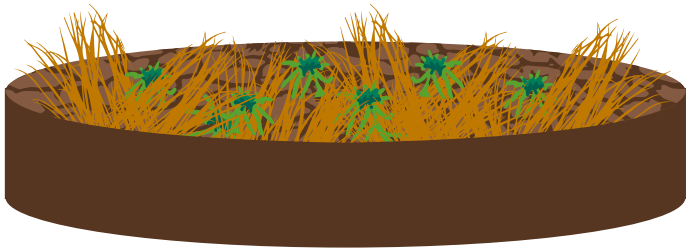


Visual assessment of peatland condition guide

Peatland status	Plant indicators	Land condition
Degraded – The peatland has been disturbed and damaged.	• Some evidence of non-desirable vegetation e.g. dense clumps of heather and purple moor-grass. • Some trees and shrubs growing which dry out the peatland.	• The ground underfoot is damp and muddy. Walking boots suffice. • Dry, cracked and small areas of exposed, compacted peat can be seen. • Some evidence of grazing animals e.g. faeces, nibbling and/or trampling.

Purple moor-grass

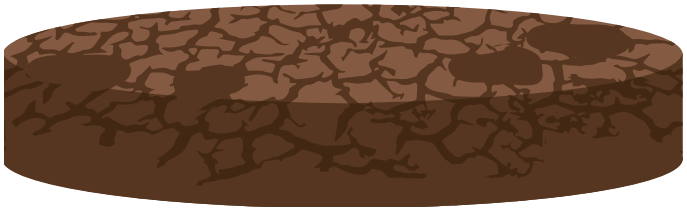
Degraded peatland



Visual assessment of peatland condition guide

Peatland status	Plant indicators	Land condition
Actively eroding – Poor condition.	• Non-desirable vegetation dominates e.g. heather and purple moor-grass. • A large number of trees and shrubs are growing, accelerating the drying out of the peatland.	• The ground underfoot is firm and dry. • Large areas of bare, exposed and compacted peat can be seen. • Evidence of burning or peat excavation visible. • Evidence of over-grazing is evident, e.g. lots of animal faeces and/or trampling, which damages the bog vegetation and can create access points for erosion.

Eroding peat © John Illingworth Geograph.org.uk



Task 4a - Estimate

On average healthy peat has a growth rate of 1mm of peat per year, so 1 metre of peat can take up to 1,000 years to form. Before you begin to measure the peat depth, estimate how long you think peat has been accumulating at the site. Note your estimation on the Peatland assessment form (below).

Task 4b - Actual

Peat depth can be measured at regular intervals across the site by pushing narrow, extendable probing rods into the peat until they can be pushed no deeper (see Figure 1).

When you can push no deeper, carefully remove the rods and lay them out on the ground. Measure the combined length of the poles used and therefore, the depth of the peat.

The depth to which the combined rods sunk, indicates the probable peat depth. Record your results on the worksheet.

Top tip - Measure the length of one individual probing rod, this will speed up the measuring process!

Task 4c – Average site depth

Once you have measured the depth of the peat at a minimum of five different locations, use your results to calculate an average peat depth for the site.

$$\frac{\text{Peat depth (m) at each location (L1 + L2 + L3 + L4 + L5)}}{\text{Number of locations sampled (5)}} = \text{Average peat depth (m) for the site}$$

Task 5a – Accumulation time at each location

Once you have measured the peat depth at each location it's possible to work out the length of time, in years, that peat has been accumulating by using the average peat growth rate of 1mm a year.

$$\frac{\text{Depth of peat (m) at sample location}}{\text{Growth rate 0.001m/yr}} = \text{Number of years peat has been accumulating}$$

For example: The example location in the table has a peat depth recorded of 6.23 metres.

$$\frac{\text{6.23 metres}}{\text{0.001m}} = \text{6,230 years of peat accumulation}$$

Task 5b – Average site accumulation time

Once you've worked out the length of time that peat has been accumulating at a number of locations, it's possible to attain an indication of how long peat has been accumulating across the site.

$$\frac{\text{Number of years at each location (L1 + L2 + etc.)}}{\text{Number of locations sampled}} = \text{Average number of years peat has been accumulating across the site}$$

Task 5c – When did the peat begin to accumulate?

Using your calculation of average length of time peat has been accumulating at the site, work backwards. In what year did the peat begin to accumulate?

Amount of carbon stored in the peat

Task 6a – Carbon stored at each location

Knowing the depth of peat accumulation in a location enables you to attain an indication of the amount of carbon stored in kilograms, within a metre cubed column at that location (see Figure 1).

Using our 'Carbon storing capacity of peat' graph find the peat depth for each sample location along the 'x' axis. Draw a straight line up to the line on the graph and read across to the y axis and note the total amount of carbon stored at the sample location in kilograms.

Task 6b – Average carbon stored across the sample locations

Once you have calculated the carbon stored at each sample location, calculate the average carbon stored across the sampled locations.

$$\frac{\text{Carbon in kilograms at each location (L1 + L2 + etc.)}}{\text{Number of locations sampled}} = \text{Average amount of carbon stored across sample locations in kilograms}$$

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Peatland assessment form

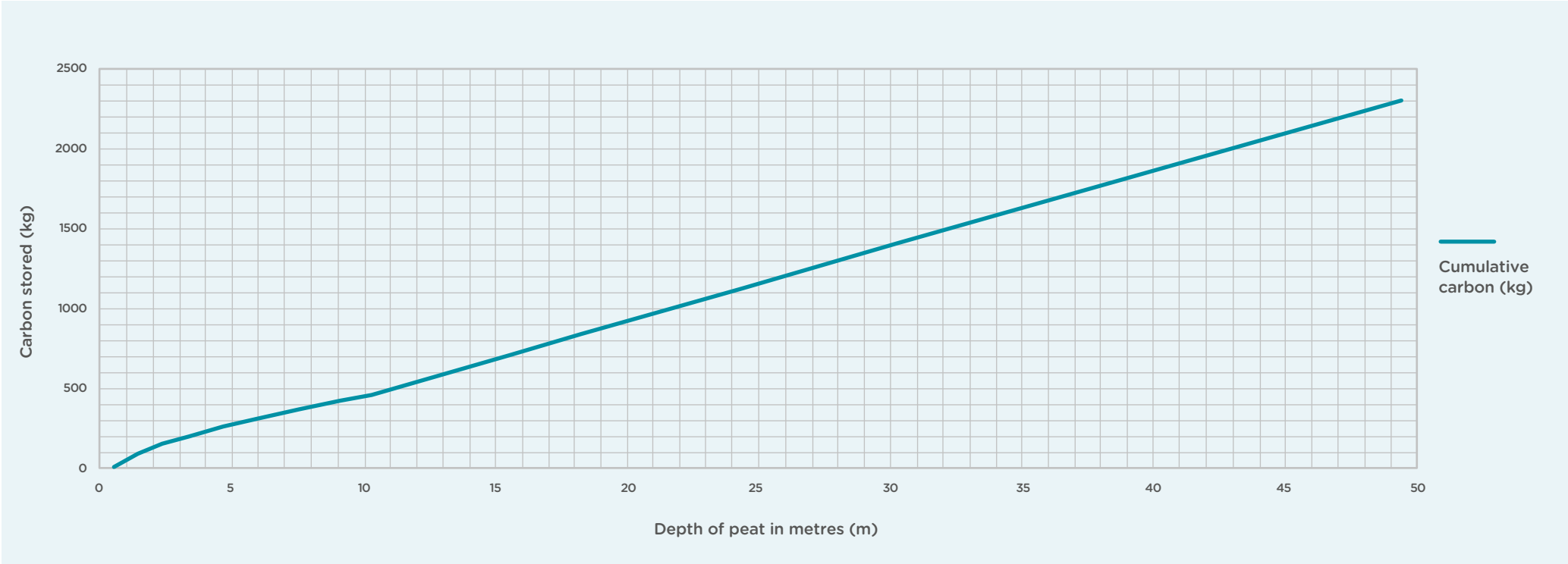
Name of site: _____ **Date visited:** _____

		Calculations/instructions	Example	Location 1	Location 2	Location 3	Location 4	Location 5
	Location assessment							
Task 1	Grid reference	Find out and note the location of each of your sampling points. This will allow you to plot the data gathered on a map later if required.	SJ415891					
Task 2a	What key indicator species can you see at each sample location?	Using a quadrat, and our 'Visual assessment of peatland condition guide', look for plant indicators.	Sphagnum moss dominates, land is waterlogged.					
Task 2b	What condition is the land in?	Assess the land condition and spot any evidence of erosion.	Squelchy underfoot, no sign of animal waste or bare peat.					
Task 3	From your observations, make an assessment.	Is the peatland in your sample area: • Actively growing • Degraded • Actively eroding	Actively growing – Good condition.					

		Calculations/instructions	Example	Location 1	Location 2	Location 3	Location 4	Location 5
	Location assessment							
Task 4a	Estimated peat depth at each location.	Peat depth can be measured by pushing narrow, extendable probing rods into the peat at regular intervals, across the site until they can be pushed no deeper (see Figure 1).	5.5 metres					
Task 4b	Actual peat depth at each location.	The depth to which the combined rods sink, indicates the probable peat depth.	6.23 metres					
Task 5a	Number of years peat has been accumulating at each location.	Depth of peat (m) at sample location/Growth rate of 0.001m.	6,000 years old					
Task 6a	Amount of carbon at each location in kilograms.	Use the depth from Task 4b and the 'Carbon storing capacity of peat' graph to read off the results for each location.						

		Calculations/ instructions	Answer
	OVERALL SITE ASSESSMENT		
Task 4c	Average peat depth of the overall site in metres.	Peat depth at (L1 + L2 + L3 + L4 + L5) / number of locations.	
Task 5b	Average site peat accumulation time in years.	Number of years (L1 + L2 + L3 + L4 + L5) / number of locations.	
Task 5c	In what year did the peat begin to accumulate.	Use the answer from 5b to work backwards.	
Task 6b	Average amount of carbon stored across the sample locations.	Amount of carbon in kilograms at (L1 + L2 + L3 + L4 + L5) / number of locations.	

Carbon storing capacity of peat



Please Note: The amount of carbon stored in peat is related to peat composition, which has many variables such as its bulk density (the amount of peat dry matter per unit volume). To generate this graph, we have based the calculations on a scientific formula to 10m and then from 10m and deeper an average carbon storage figure has been used. Therefore, this graph isn't meant to be used as a scientific tool for mega depths of peat greater than 10m, but more as an educational tool to relate a carbon footprint to a volume of peat.

For more information see: Information note - Peatland: How carbon sinks can turn into carbon emitters.

Offsetting your carbon footprint

Task 7 – Carbon footprint

If prior to your visit you have calculated your annual carbon footprint using our 'Peatland Carbon Calculator Worksheet', what area of peat on the site would you need to offset your carbon footprint?

If the average peat depth (based on a surface area of $1m^2$) of the overall site (Task 4c) isn't deep enough to offset your carbon footprint, using the table on the next page, calculate how many m^2 of land at the site would be required to absorb your annual carbon emissions.

If, for example, your annual carbon footprint is 1432.4kg reading from the graph you would need a m^3 column of peat that is 31.1m deep to offset you carbon emissions! Taking thousands of years to develop, most peatlands are nowhere near that deep. If the peatland at our imaginary site is only 4.8m deep they would actually need a $6.48m^2$ area of peat to offset their annual carbon footprint – see Figure 2.

Marking these areas out with string (per group) may help you visualise the scale of the amount required.

Even if the peat on site is adequate to offset your annual carbon footprint for this exercise, imagine how many m^2 and depth of peat will be needed to absorb your carbon emissions over your lifetime. You still need to consider your carbon emissions as part of an overall global issue and make every effort to reduce them. Use the box at the end of the sheet to record your commitment.

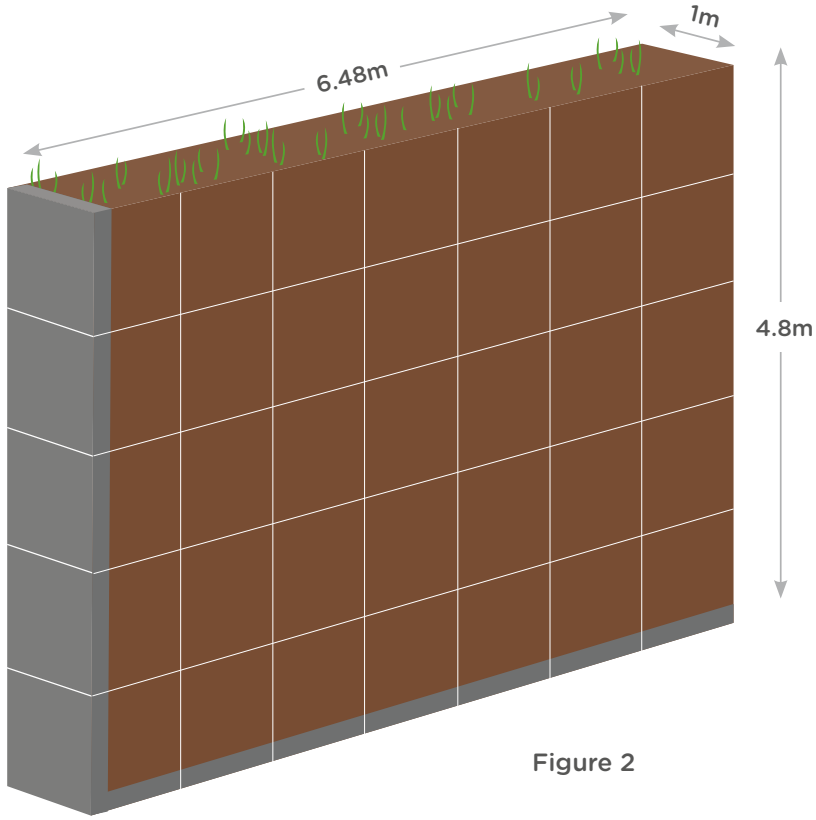


Figure 2

Description	Example	Answer
My annual carbon footprint in kilograms of carbon per year (A).	1432.4kg	
Average depth of peat across the site (from Task 4c) (B).	4.8m	
Average carbon stored across the locations in kilograms (from Task 6b) now visualized as a m^3 (C).	46kg/m^3	
Number of m^3 required = (A)/(C) = (D).	1432.4kg/46kgm^3= 31.1m^3	
Surface area of peat required to offset my annual footprint = (D)/(B).	31.1m^3/4.8m = 6.48m^2	

You now know your annual carbon emissions can be absorbed _____ by m^3 of peat on the peatland you have sampled.
Imagine how m^3 of peat will be needed to absorb your carbon emissions over your lifetime.
What can you do to reduce your carbon footprint?

I will reduce my carbon footprint by: