Raised bog and fen with Cobra SMARTsense

Biology | Ecology & environment | Soil examination

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	30 minutes

This content can also be found online at:

http://localhost:1337/c/5f44735e5eef7d00031fcb58

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Teacher information

Application

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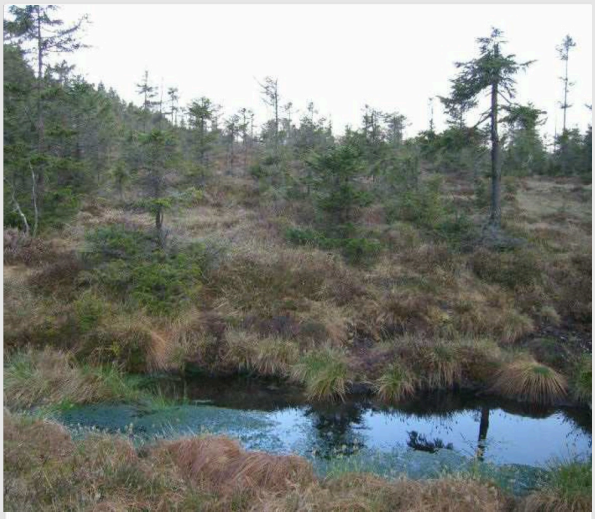

Raised bog (ground moor in the Hochharz)

Bogs are sites for plants that specialise in soils with a constant surplus of water. Apart from this common feature, peatlands are very different. For example, raised bogs and fens form different plant communities because of their different living conditions, which we will investigate in this experiment.

PHYWE

Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
www.phywe.de

Other teacher information (1/6)

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Prior knowledge

The students should know the most important differences between raised bogs and fens. Furthermore, the most important indicator plants of the respective moors should be known.

Scientific principle

The pupils measure the pH value and conductivity of different bogs and compare them with each other.

Other teacher information (2/6)

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Learning objective

The pupils should recognise that different environmental conditions prevail in the high and low moors and that different plants therefore occur in these moors.

Tasks

The students measure the pH value and conductivity of the fen and the raised bog and compare the two values. They also pay special attention to the vegetation and describe the differences.

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37079 Göttingen

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Other teacher information (3/6)

Evaluation

- **Conductivity** as a measure of the salt content: In the raised bog, water is supplied solely by rainwater. Rainwater has a conductivity value of less than 100 µS/cm. The raised bog is accordingly low in minerals. Low moors, on the other hand, are fed by groundwater, with a correspondingly good supply of nutrients, which is reflected in the high conductivity value in comparison to raised bogs.
- **pH**: The fen is a flood area. Therefore its pH-value corresponds to that of the surrounding mineral soil or the inflow and is usually high because of the high calcium content. In the raised bog, the pH is very low because rainwater on the weakly buffered peat soil has a pH-lowering effect and, in addition, the predominant plant species, the peat mosses, acidify their habitat through the exchange of ions: mineral ions are selectively taken up from the surrounding water and incorporated into the cell walls of the peat mosses, releasing hydrogen ions in return. The more hydrogen ions there are in the water, the higher its acidity.

Other teacher information (4/6)

Pointer plants

Raised bog: The peat moss species, which make up the main part of the vegetation in the raised bog, can feed solely on the minerals found in rainwater, and in return they release hydrogen ions, which lowers the pH and suppresses the growth of other plant species. Only a few other plant species can develop: sedges (Carex sp.) and grass rushes (Trichophorum), cotton grass (Eriophorum sp.) and heather plants. Since the organic matter rots poorly due to the low pH value, the thickness of the peat layer increases continuously.

Peat moss (Sphagnum sp.)

PHYWE
Robert-Bosch-Breite 10
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Other teacher information (5/6)

Pointer plants

Fen: The Rispensegge indicates nutrient-rich and wet locations and belongs to the group of acid grasses. It is the indicator of the plant association of the Rispenseggen fen. The name "acid grasses" comes from the fact that these grasses have a high silica content and are therefore too "acidic" for the cattle to eat and are also spurned by the animals because of the sharp edges of their leaves. The leaves weather very badly due to their high silica content. A lack of decomposition of the plant mass leads to the growth of the litter layer, as a result of which the fen is constantly increasing in thickness.

Risping harrow (Carex paniculata)

Other teacher information (6/6)

Further Information

This experiment can be used as an introduction to the topic of plant communities and vegetation ecology. There is a wealth of information on the subject of raised bogs and fens on the Internet. For this experiment it is conceivable to take measurements in the laboratory or in the classroom from samples that were previously taken in the wild. However, it is precisely this topic that lends itself to an excursion, as raised bog and fenland vegetation are prototypical plant communities, thus providing the student with an ideal introduction to the topic of vegetation ecology.

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Safety instructions

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- The general instructions for safe experimentation in science teaching apply to this experiment.

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Student Information

PHYWE

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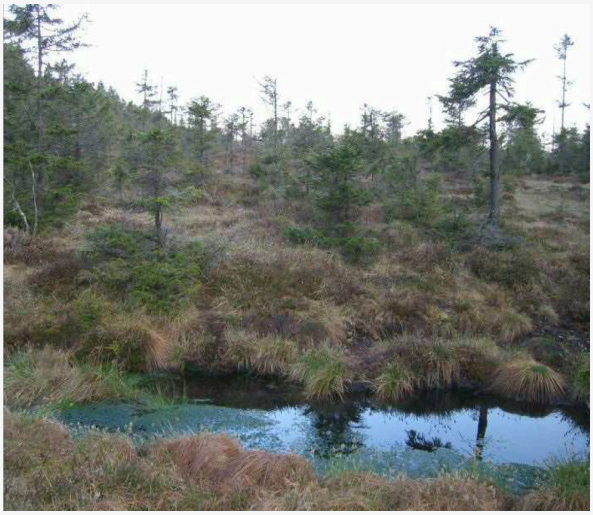
Motivation



Raised bog (ground moor in the Hochharz)

Bogs are sites for plants that specialise in soils with a constant surplus of water. Apart from this common feature, peatlands are very different. For example, raised bogs and fens form different plant communities because of their different living conditions, which we will investigate in this experiment.

Tasks

Peat moss (Sphagnum sp.) is a typical bog plant. But in which bog?

Measure the pH value and conductivity of water in a fen and a raised bog and compare the values with each other. Interpret your results and include the plants in your considerations.

PHYWE
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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - pH, 0 ... 14 (Bluetooth)	12921-00	1
2	Cobra SMARTsense - Conductivity, 0...20000 µS/cm, 0...100°C (Bluetooth)	12922-00	1
3	Standard solution 1413µS/cm(25°C), 460ml	47070-02	1
4	Buffer solution tablets pH4, 100	30281-10	1
5	Buffer solution tablets pH10, 100	30283-10	1
6	Beaker, 250 ml, plastic (PP)	36013-01	2
7	Wash bottle, plastic, 500 ml	33931-00	1
8	Water, distilled 5 l	31246-81	1
9	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

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Set-up

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- To measure conductivity, the Cobra SMARTsense 'Conductivity' is switched on by pressing the power button.
- To measure the pH value, the Cobra SMARTsense 'pH' is switched on by pressing the power button.
- Make sure that Bluetooth is enabled on the device.
- Open the PHYWE measure App and select the sensor "Conductivity" or the sensor "pH".
- Important information about pH electrode: The calibration of the pH electrode is best carried out in the laboratory with the buffer tablets before the field experiment is carried out. The electrode should also be stored in the protective sleeve 37651.15 for transport. **Under no circumstances store in distilled water!**

Procedure

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The measured values are obtained and recorded by immersing the sensors in the surface water (standing water as in the picture on the right or run-off water).

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Report

Task 1

Choose the right answer.

- In the raised bog, water is supplied solely by rainwater. Rainwater has a conductivity value of less than 100 µS/cm. The raised bog is accordingly low in minerals.
- In the raised bog, water is supplied solely by rainwater. Rainwater has a conductivity value of less than 100 µS/cm. The raised bog is accordingly rich in minerals.
- The conductivity in raised and lowland moors is the same. Both are fed by rainwater.
- None of the answers is correct.

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Task 2

The fen is a flood area. Therefore its pH-value corresponds to that of the surrounding mineral soil or the inflow and is usually high because of the high calcium content.

○ True ○ False

Check

In the raised bog, the pH value is very low because rainwater on the weakly buffered peat soil lowers the pH and the predominant plant species, the Sphagnum sp., acidifies its habitat through the exchange of ions

○ True ○ False

Check

Slide	Score / Total
Slide 17: raised bog	0/1
Slide 18: Multiple tasks	0/2

Total amount 0 / 3

Solutions Repeat

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