



pH pHun!

LEARNING INTENTIONS

(pupils should be taught...)

- That soils have different pH values dependent on the location (pre-visit activity)
- Risk assessments for working in Clouts Wood (pre-visit activity) and based upon the Risk Assessment activity to be found at: www.countrysideaccess.gov.uk
Go to the site and under Countryside Code, click on learning resource centre.
- Risk assessments for working with pH kit (pre-visit activity)
- Sampling techniques, e.g. systematic, stratified, random (pre-visit activity/on-site activity)
- The method for determining the pH of soils (on-site activity)

LEARNING OUTCOMES

(pupils will have learnt...)

- How to follow and replicate experimental procedures
- How to choose an appropriate sampling technique
- How to determine the pH soil
- How to construct graphs to show the changing pH down a slope
- How to produce and implement simple risk assessments

KEY WORDS

TRANSECT BAR CHART SAMPLING TECHNIQUE

CARE FOR OURSELVES (our health and well-being)

- Pre-visit risk assessment undertaken by learners
- Appropriate clothing

CARE FOR OTHERS (across cultures, distances and generations)

- Provide opportunities for learners to discuss/question the use of this local wood.
Who uses it and why?

CARE FOR THE PLANET (both locally and globally)

- Provide opportunities for discussion of the Countryside Code and the wider importance of woods in the landscape. Its role in sustainable communities.
- The effects of humans on soils.

Resources:

- Trowels
- pH measuring kit / probe
- Clipboards
- Ruler for measuring depth of soil to take sample from.

ECM Outcomes:

- Be Healthy
- Stay Safe
- Enjoy & Achieve
- Make a Positive Contribution
- Economic Well-Being



Teaching & Learning Activities

INTRODUCTION

- Make the learning intentions and outcomes clear to the learners and re-cap lesson on soil pH.
- To set boundaries to behaviour and range in woods and as appropriate to age group, e.g. no trampling on or picking flowers, disturbing nesting birds.
- Provide map of woods with areas chosen to undertake session as appropriate to age group.

MAIN ACTIVITIES

Learners to discuss best sampling techniques for determining pH of the soil up the slope and the best depth from which to take the samples (5 cm depth is acceptable) or best depth to insert probe (follow manufacturers guidelines), dependent on pH kit available. Learners are provided with the resources/equipment and reminded/shown how to use them. Discussion takes place as to a suitable and representative number of samples to take up the slope.

The learners are sent in pairs with the equipment to find a suitable start location at the base of the slope (some guidance may be required). The learners then follow the procedures on the Activity Sheet to a point when they have at least completed one full slope transect.

Learners can then proceed with the questions on the Activity Sheet

PLENARY

Learners to reconvene and asked to reflect on the activity. Learners to evaluate experiment and discuss any problems with implementing the procedure. Learners to comment on any apparently anomalous results.

HOMEWORK

Plot results on graph paper (using the exemplar graph as a guide) and answer the three questions.

ADDITIONAL ACTIVITIES:

Complete the Prediction Box. If completed, also undertake the experiment next to the stream (not too close) and answer the questions in the Prediction Box with respect to this experiment.

MOST LEARNERS:

Can use the equipment to determine soil pH, will have undertaken one complete transect and will have answered questions 1,2 and 3.

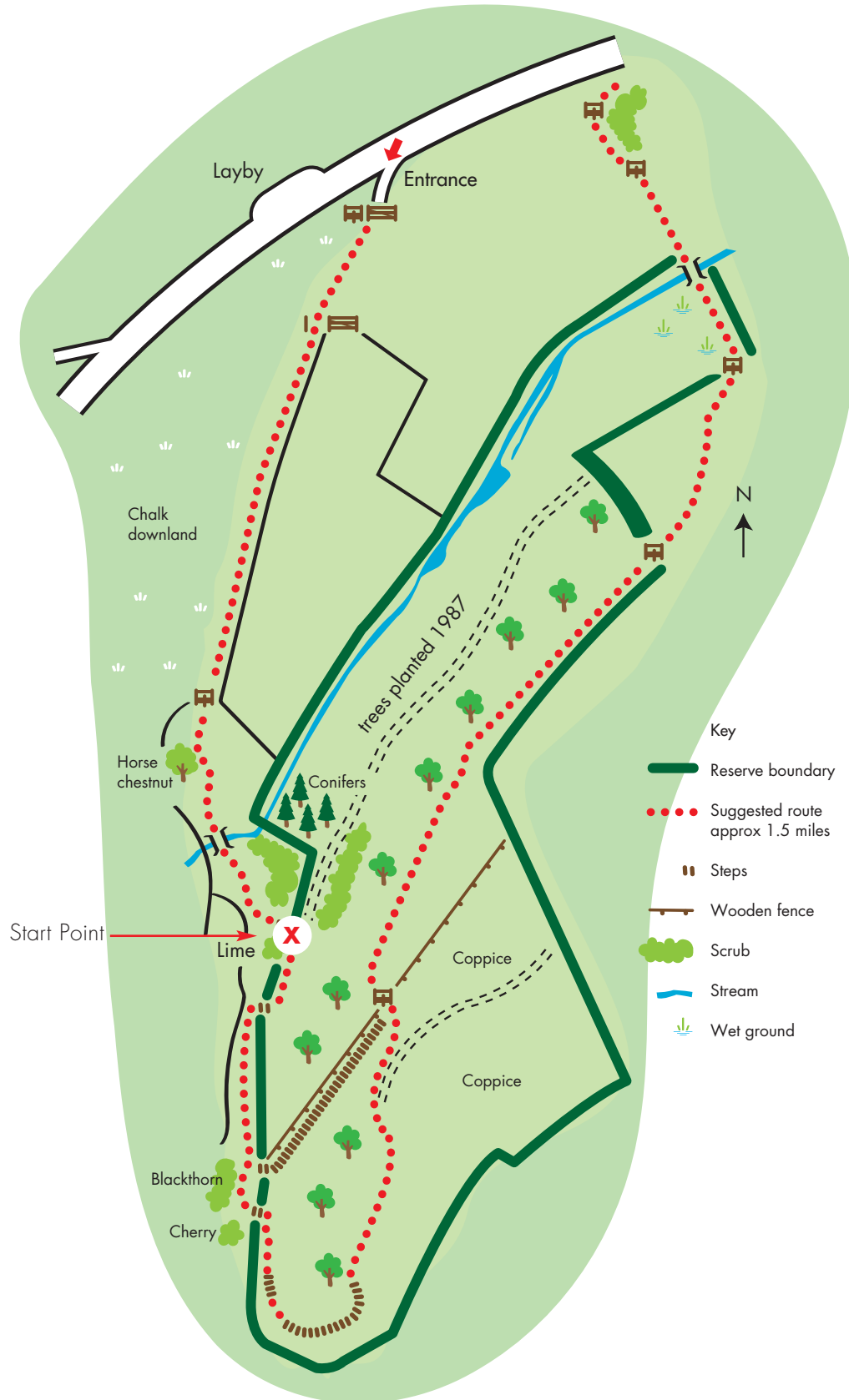
SOME LEARNERS HAVE NOT MADE SO MUCH PROGRESS AND:

Can use the equipment to determine infiltration rate and will have answered Question 1.

SOME LEARNERS HAVE PROGRESSED FURTHER AND:

Also have completed Questions 4, 5 and 6 and can explain their answers to the others.

Clouts Wood Nature Reserve Map



Activity Sheet

In pairs carry out the following experiment, record your answers and answer the questions:

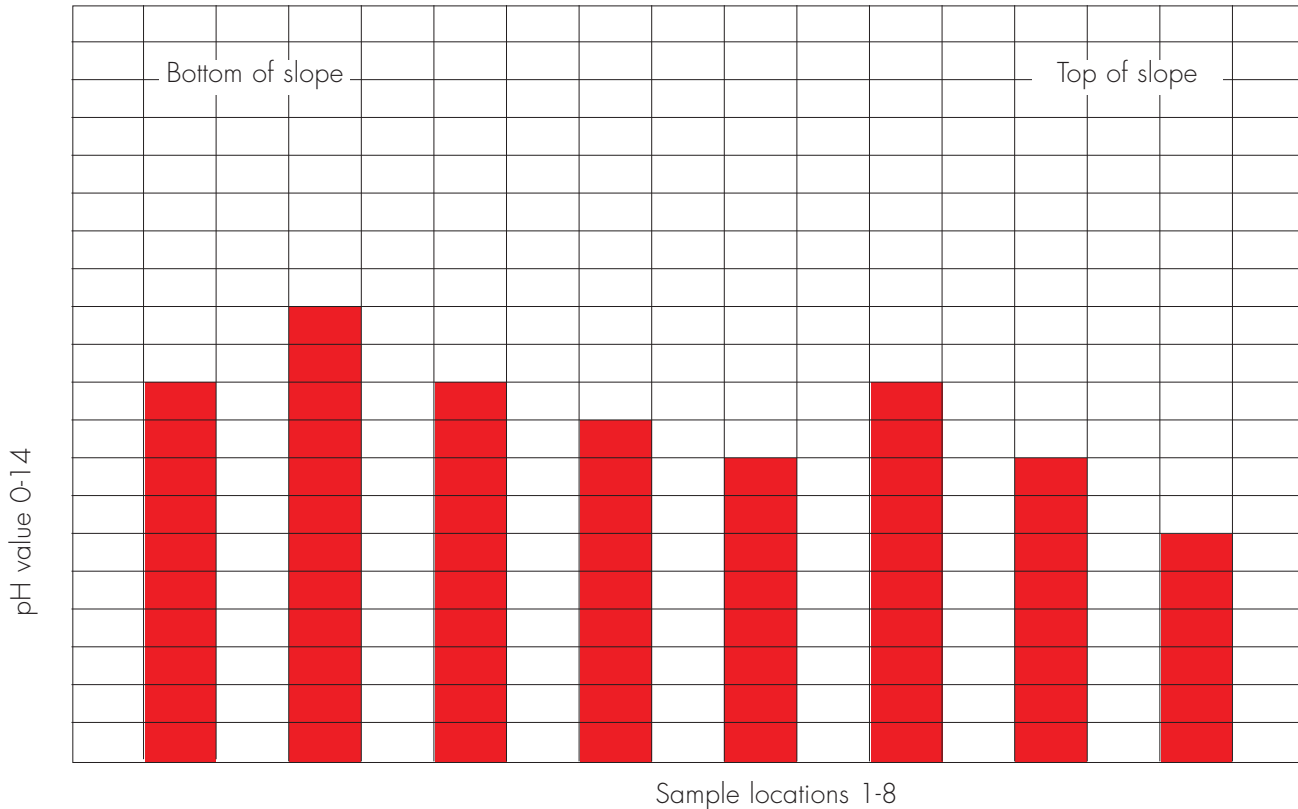
1. Stand at the bottom of the slope at the **red X** on the map. It is up this slope where you will be investigating the pH of soil
2. You should have already selected the most appropriate sampling technique. Having determined this, decide the spacing between your sample points.
3. Measure the entire length of the slope that you will be sampling and divide this length by the number of sample points. The answer will be your spacing (if you have decided on a transect).
4. Having determined the sampling technique/spacing, mark your sample points with twigs stuck in the ground (use twigs lying on the ground – **do not break any off trees.**)
5. When sampling the soil **do not trample on flowers/plants or damage any tree roots.**
6. Using the pH testing kit provided, and following the manufacturers guidelines, determine the pH of the soil at the depth discussed at the beginning of the session. If you need to dig a small hole with a trowel to sample the soil ensure that you fill the hole again. Record the result on the sheet below (you may not have as many samples as on the sheet).
7. At each sample location note down observations as to what the site is like and what is there, i.e. wet ground, moss, tree (and type if possible – coniferous, deciduous), stones or grass, for example.
8. If your pH testing kit contains **barium sulphate** and/or **universal indicator solution**, although not toxic in small quantities, ensure that you do not get the chemicals on your skin or in your respiratory system. Follow your teacher's guidelines and tell your teacher immediately if you there are any spillages.
9. Complete taking pH samples up the slope at your chosen sample sites and complete a data table using the format below.

Sample Number	pH value	Observations
1		
2		

Science/Geography

Part 2

You can now plot the two sets of data against each other on the graph paper provided, and using the layout on the grid below. It will not necessarily look like the one below; you may have more sample locations and your pH values should be different.



QUESTIONS RELATING TO GRAPH

- Describe the pattern of your graph. Is there a uniform change up the slope or does it vary?
- Why is your graph the shape it is? What does it tell you about the pH of the soil as you move up the slope?
- Why is this graph drawn as a bar chart and not as a line graph or scattergram?

Questions

1. List 3 factors that may control the pH of the soil up the slope in Clouts Wood.
2. Explain, briefly, how and why each of the above factors may control the pH.
3. With specific reference to your sample sites and using your observations, which factors may help to explain the difference in pH you have observed as you move up the slope? If your pH values do not change, why do you think this may be? Think about the equipment as well as the soil.
4. Below is a list of 5 activities that humans undertake, or which result from human activities, which could result in the pH of soil changing. Do you think the activities would lead to the soil becoming more acidic or more alkaline and, briefly, why?

Pollution and the production of acid rain

Deforestation

Climate change, specifically the proposed increase in winter rainfall in the UK

Climate change, specifically the proposed increase in forest fires globally

The application of fertilizers to soil

5. Other than changes in pH, what other effects will climate change have on soils? See if you can think of three.
6. Why is it important that soils are used by humans in a sustainable way and that they are managed well and looked after?

PREDICTION BOX

If you complete all of the above, try the experiment at one new site, but taking soil from 5cm, 10cm, 15cm, 20cm and 25cm depths and testing pH at each depth. Before you start, what do you **predict** will happen to the pH with increasing depth?

Why do you predict this?

Did your experiment prove your prediction?