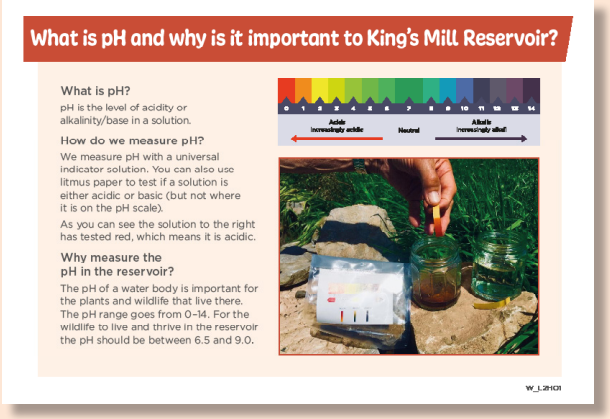
Testing the pH of King's Mill Reservoir

at Mill Waters heritage site

TN
TEACHER'S NOTES

TITLE SLIDE

In this lesson you will find out about pH levels and why they are important indicator of a whether habitat is healthy or not. You will visit the Mill Waters site to undertake a pH test of the Reservoir water, learning how to conduct the test and understand what the findings mean for the wildlife in the area. You'll also comparing the pH levels against other liquids.



SLIDE 2
WHY TEST PH LEVELS IN THE RESERVOIR?

Testing the pH level of King's Mill Reservoir is one way that Ashfield District Council can check that it is a healthy habitat for a wide variety of species to live – known as the aquatic ecology.

pH stands for potential hydrogen with the "p" meaning potential and the "H" standing for hydrogen. The pH scale is a scale that is used to rank how alkaline or acidic a substance is, based on the amount of hydrogen ion activity in it.

Water that has more free hydrogen ions is acidic, whereas water that has more free hydroxyl ions is basic (high in alkaline).

Since pH can be affected by chemicals in the water, pH is an important indicator of water that is changing chemically – this can signal contamination. The Reservoir could be contaminated by fertiliser contained in the soil which has blown off nearby fields; the oils and heavy metals swept off the roads when it rains; as well as contained in the silt carried in from the River Maun.

If phosphates get into the water (usually from fertiliser) they can make the plants, especially algae, in the Reservoir grow quickly; known as eutrophication. When algae overgrows on the surface of the Reservoir it stops light getting in, which means that the small plants which fish rely on for food can die. Plants use up hydrogen when they convert light into energy which changes the pH level of water.

In order for the wildlife in the Reservoir to survive and flourish the pH should ideally be between 6.5 and 9.0 - neutral to alkaline, rather than acidic.

There are lakes across the world that are an unusually high level of alkali. These have lots of dissolved minerals in them, so are known as salt lakes. Salt lakes are known to have healing properties, however wildlife cannot live in them. Acid lakes usually develop near volcanoes. With a pH level below 5 few organisms can live in them.

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LEARNING ACTIVITIES

1. Practical learning activity

The pH testing activity should be carried out at the Mill Waters heritage site. It is advisable to notify the wildlife ranger at Mill Waters when you are intending to visit (see contact details on the Mill Waters website) so that you can be advised if there is any reason why the activity cannot go ahead.

The learning space at the Mill Waters Café can be booked for carrying out your learning activity. Universal Indicator (UI) paper, beakers and protective aprons for primary schools are also available upon request.

It is recommended that you divide your class into six groups for testing. There should be an opportunity for everybody around each table to have a go at using the UI paper in one of the liquids.

Follow the instructions on Handout 2 to collect and test the pH from the samples taken. Pupils should record the pH readings using the pH data recording sheet (Handout 3).

What you will need:

- Plastic jars for collecting Reservoir water samples (we recommend 3 per class of 30 pupils)
- 42 beakers (6 beakers x 7 liquids: 6 x reservoir water, 6 x bottle water, 6 x tap water, 6 x fizzy drink, 6 x tomato ketchup or lemon juice, 6 x vinegar, 6 x baking soda dissolved in water)
- Litmus paper
- Plastic aprons / old shirt cover-ups
- Sticky labels / Post it notes
- Bottled water
- 3 cans of fizzy drinks
- Bottle ketchup
- Small bottle vinegar
- Carton of baking soda

After completing the experiment and filling in their record sheet, ask pupils:

- Is the Reservoir the right pH level for wildlife to thrive?
- How does the pH in the Reservoir differ from tap water, and bottled water?
- Which was the most acidic liquid they tested?
- Which was the most alkaline / base liquid they tested?

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LEARNING ACTIVITIES

2. The acid test! True or false quiz

1. **Alkaline turns litmus paper blue**
   True
2. **Litmus paper is always red**
   False (red litmus papers react to basic solutions whereas blue litmus papers react to acidic papers)
3. **Acids turn litmus paper blue**
   False (acid turns blue litmus paper blue and red litmus paper remains red)
4. **Acids can only be strong**
   False
5. **Neutral liquids turn litmus paper green**
   False (it turns purple)
6. **An alkaline solution can be weak or strong**
   True
7. **Vinegar has a pH close to 3**
   True
8. **Baking soda has a pH close to 4**
   False (it's about 8 – alkaline)
9. **Acids are always strong**
   False
10. **Tap water should always be over 6.5**
    True (More alkaline water with a pH of between 8 and 9 - is considered better for you. Water with more acid in is likely to contain metal ions and can leave a blue/ green stain around your taps)