

## **Blooming Algae**

This lesson provides a lab based activity that looks at the effect of phosphorous and nitrogen on the growth of algae.

Ponds are fragile habitats where nutrients for the most part are limited. A small increase in nutrients such as nitrogen and phosphorous can quickly lead to an increase in algae and summer algal blooms. This might be good for the algae but it is not necessarily beneficial for everything else in the pond.

### **Resources**

- Powerpoint presentation (see end of pdf)
- Teachers' notes to support the presentation (see end of pdf)



## Polluted Ponds – Blooming algae!

- Ponds can be fragile habitats where small amounts of pollution can have significant effects on the life in, on and around them.
- Nitrogen and Phosphorus based fertilisers (which make plants grow better) are washed out of and off soils from farms, causing rapid algal growth.
- Rapid growth of one species can have harmful effects on others in the community.





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**Starter: 1) Which is the odd one out from these pollutants and why?**

**Go to the next slide once you have answered the question**

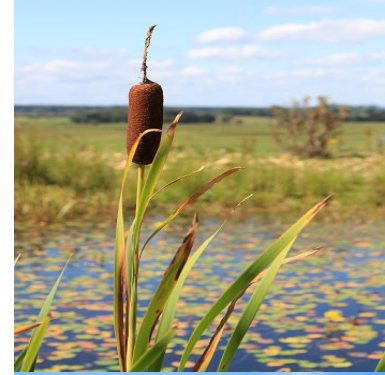
Too much Aluminium

Too much phosphorus

Too many nitrates

carbon dioxide

high temperature

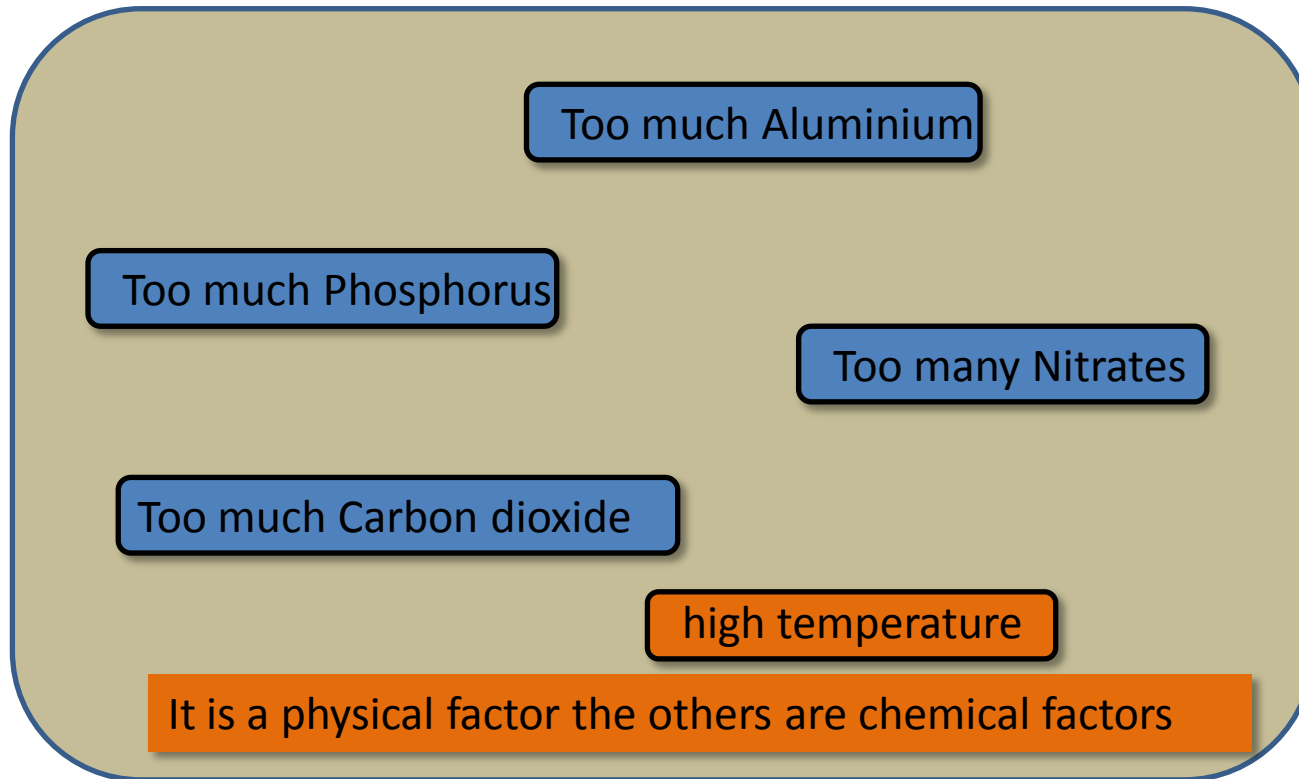




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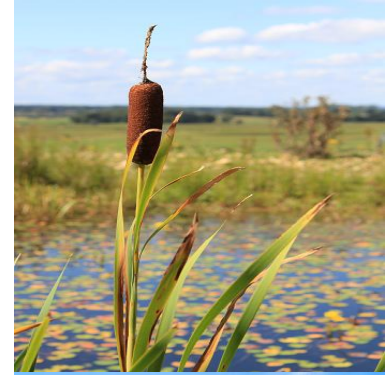
**Starter: 1) Which is the odd one out from these pollutants and why?**

**Answer**



**Notes:**

**The warmer a pond gets the less carbon dioxide it can hold.  
Aluminium is released from soil in acidic conditions.**







### Challenge:

You are going to carry out a lab investigation to check if nitrates or phosphates cause algae to grow fastest.



### Need to know beforehand:

Phosphorus and Nitrogen (Nitrates and Phosphates) are vital to growth. Algae will grow uncontrollably if either is available in large amounts, covering a pond, blocking the light to other plants causing them to die and rot which uses up oxygen in the water. This lack of oxygen can be lethal to animal life in ponds. This is called EUTROPHICATION.

### Equipment needed:

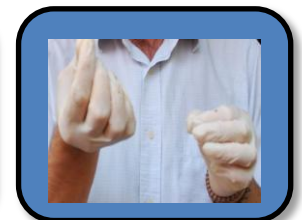
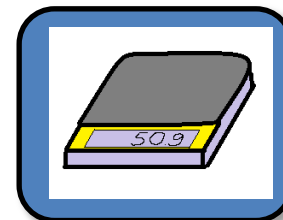
2 x 250ml beaker (with 150ml of pond-water) and 50g of green algae



A source of nitrogen (nitrate) and a source of phosphate of the same concentration and amount



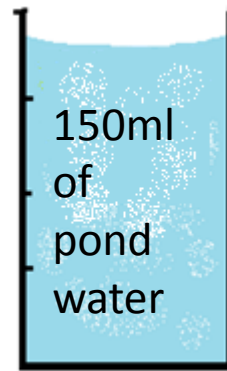
Plastic gloves and weighing scales



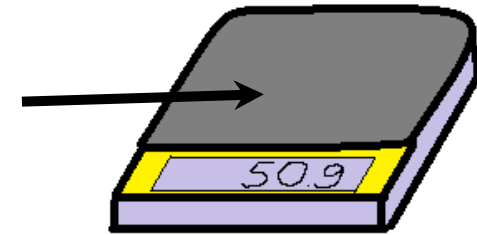


**Method:**

- 1) Gloves on to collect algae.
- 2) Place 150ml of pond water into each of your two beakers.
- 3) Weigh 50g of wet green algae on the scales.
- 4) Place 50g of algae into each beaker
- 5) Add the same amount and concentration of phosphate and nitrate into your separate beakers
- 6) Re-weigh the beaker and record it then leave the beakers on a room temperature shelf in sunlight covered with cling-film
- 7) Re-weigh the beakers next lesson and record the growth in weight.

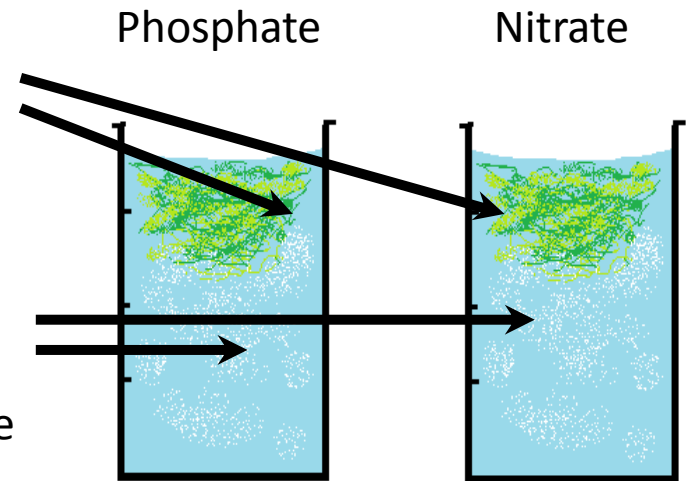


Weigh out 50g of green algae



50 g Green algae in each beaker

Phosphate or nitrate fertiliser added (one type to each beaker). Same concentration, same amount.





### Results:

Record your results in table like the one below:

| Fertiliser added         | Algal Weight before (g) | Weight after ___ hours (g) |
|--------------------------|-------------------------|----------------------------|
| Phosphate Conc: 1mol 1ml | 50g                     | ?g                         |
| Nitrate Conc: 1 mol 1 ml | 50g                     | ?g                         |

### Conclusions

1. Which fertiliser caused more growth in the time period?
2. Why might this be?
3. What factors (variables) should be kept the same when carrying out the experiment to keep it a valid test?
4. What might happen to the algae once it had used up all the phosphates and nitrates?
5. What effects would eutrophication have on freshwater fish?



## Polluted Ponds – Blooming Algae!

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**Age group:** 14-18 years (the resource is adaptable for different levels as required by the facilitator)

**Curriculum links and keywords:** Pollution, eutrophication, plants, photosynthesis, aquatic life, adaptations, food webs.

**Group size:** up to 30 students

**Locations:** anywhere with a pond or static water that is safe to access and a classroom

**Time needed:** 1 hour

**Learning outcomes:** For students to observe and compare the effect of rapid growth in the presence of different mineral fertilisers.

**Note: No specialist knowledge is required but students will need to have prior knowledge of which minerals affect plant growth**

**Preparation:** 2 x 250ml beaker, a source of nitrogen (nitrate) and a source of phosphate of the same concentration and amount e.g. garden fertiliser, plastic gloves and weighing scales, notebooks, pencils.

#### Activity

1) Open the PowerPoint included in this download

Basic info:

- Ponds can be fragile habitats where small amounts of pollution can have significant effects on the life in, on and around them.
- Nitrogen and Phosphorus based fertilisers (which make plants grow better) are washed out of and off soils from farms, causing rapid algal growth.
- Rapid growth of one species can have harmful effects on others in the community.

Slide 1: The PowerPoint begins with an introductory video clip to ponds (click on the link in the PowerPoint to open the video which is already loaded onto YouTube). To preview the clip see: [http://www.youtube.com/watch?v=STasskXuUiQ&feature=channel\\_video\\_title](http://www.youtube.com/watch?v=STasskXuUiQ&feature=channel_video_title)

Slides 2, 3: Starter activity on pollutants with answers

Slide 4: Introduces the challenge activity where students carry out a lab investigation to check if nitrates or phosphates cause algae to grow fastest. It includes a “need to know section” on basics of eutrophication.



Slide 5: Challenge instructions and method.

Slide 6: Results section including conclusion questions.

Questions for students to consider:

1. Which fertiliser caused more growth in the time period?
2. Why might this be?
3. What factors (variables) should be kept the same when carrying out the experiment to keep it a fair test?
4. What might happen to the algae once it had used up all the phosphates and nitrates?
5. What effects would eutrophication have on freshwater fish?