**Air Pollution During Lockdown**

**You can either print this out to use or make your own copy of the key and table before completing the written activities. You can use your own paper or you can write in Word.**

Lichen, which consists of a symbiotic (working together) relationship between a fungus and an alga, is sensitive to atmospheric pollution including nitrogen oxide and sulphur dioxide gases made when cars and power stations burn fossil fuels such as coal and petrol. The gases create acid rain which some species of lichen can not survive. This sensitivity makes lichen a valuable biological indicator of air quality. An indicator tells us something, lichens in our area can tell us about how much acid rain is being made in our part of Wales.

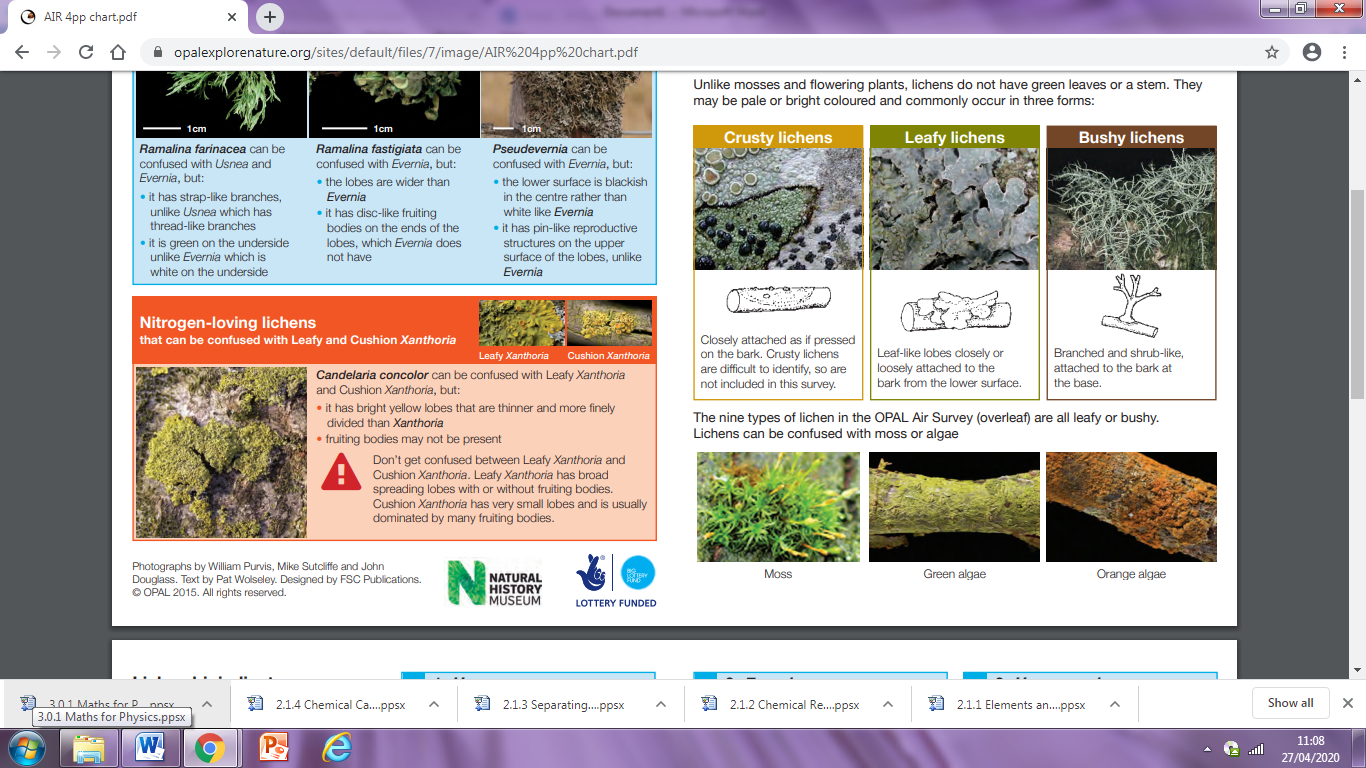
It can be difficult to identify lichen species, even for the experts.  We’ll generalise lichen into three categories for this activity.

**Crusty (Crustose)** lichens form a “crust” onto the trees, rocks or buildings they grow on. The crust is attached so firmly that it cannot be removed without causing damage.

**Leafy (Foliose)** lichens are leafy (they look like leaves) that attach loosely, and the lobes of the leaf are often along the surface they are growing on.

**Bushy (Fruticose)** lichens are three dimensional, often growing away from the surface they grow on.  They can look like little bushes growing off the side of a tree or rock.

Look at some pictures of each of these lichens until you’re comfortable identifying them. See the resources listed at the end.



**Practical Activity** Read carefully first before starting.

Go for a nature walk around your garden, or a park with your family during the allowed daily exercise. Try to do this in two different areas if you can. Remember to socially distance from other people not in your family.

As you walk, make an effort to look at the types of lichen present and record what you find out in the data table. Involve your family they may enjoy helping too.  Lichen is very slow-growing, so try not to disturb it as you examine it to determine if it is crustose, foliose or fruiticose.  You may want to bring a folder along with the lichen diagrams so you can more easily identify them. Generally speaking, the more lichen you see (in colour and quantity) the cleaner the air.

|  |  |  |
| --- | --- | --- |
| Area surveyed | Type of lichen | Tally of number found |
|  | crustose |  |
| foliose |  |
| fruiticose |  |
|  | crustose |  |
| foliose |  |
| fruiticose |  |

**Analysis** Use the index below to estimate air quality in the area.

1. No lichens present – very poor air quality.
2. Crustose lichens only – poor air quality.
3. Crustose and foliose lichens – moderate to good quality (based on number of different lichens).
4. Fruticose, foliose and crustose lichens – very good air quality.

**Written activities**

1. **Write a conclusion**

Remember to answer the following questions when you write your conclusion:

1. What do your results tell you about the amount of nitrogen oxide and sulphur dioxide in your area?
2. Which data supports your ideas?
3. What effect do you think the lockdown will have on the amount of acid rain being made?

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1. **Write a report**

Write a report about lichens. Include the following information as paragraphs. You may need to do further research. Useful websites have been included at the bottom of these instructions.

1. An introduction explaining what lichens are, the different types, a neat labelled diagram showing each type you list, what a bio-indicator is, and what lichens tell us about the quality of the air. The introduction should tell the reader exactly what lichens are and how they help us determine the level of air pollution so it needs to be quite detailed.
2. A description of what you did during your survey.
3. A description of your findings based on what you say in your conclusion.
4. A prediction saying what you think the effect the lockdown will have on the amount of acid rain made along with a scientific explanation as to why this will be the case (you will need to do your own research on this, but clearly there are less cars burning petrol during lockdown which should be a starting point for you).
5. A summary that rounds up your main points one more time. This only needs to be a about few sentences.

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Useful websites:

<https://www.opalexplorenature.org/airsurvey>

<https://www.bbc.co.uk/programmes/topics/Bioindicators>

<https://www.bbc.co.uk/bitesize/guides/zwt482p/revision/2>