

Lesson Plan

Lichen Indicator Lesson

Suitable for upper KS2 and KS3 pupils



Aim

The Lichen Activity Lesson will help children understand how pollution can affect the environment around them by looking at lichen samples growing on nearby trees. Lichen is made up of two organisms (fungus and algae) living together.

There are many types of Lichen (see the reference sheet below) but some are very sensitive to air pollution and will not grow readily in areas of high Nitrogen Pollution (i.e. Nitrogen Dioxide). Some are not affected by pollution and some only slightly, which means they are a good indicator of air pollution levels in your area.

N.B. Some lichen change colour in the rain making it difficult to identify the species in wet weather. This exercise works best on dry days.

The session will also:

- Help Children to understand biodiversity and ecology.
- Increase pupils' awareness of air pollution.
- Introduce or improve scientific data recording and mathematical skills.
- Encourage healthy and active lifestyles.
- Teach children how to collect scientific data and evidence findings
- Show how to conduct fieldwork investigations

National Curriculum Relevance (Suitable for Year 4 to year 9 pupils)

Main Activity: English: En2.1, En2.2, En3.1, En3.2, Maths: Ma2.1, Ma2.2, Ma3.1, Ma4.1, Science: Sc1, Sc2.1,

Additional Activities: Geography: Ge1.3, Ge1.4, Computing: Co2/1.6, Co2/1.7, English: En1, Art: Ar2/1.1

Key Words

Lichen, Air Quality, Pollution, Nitrogen, Nitrogen Dioxide, Air, Gas, Fumes, Ecosystems, Ecology, Biodiversity.

Lesson time

A one hour session (maximum 1.5 hours).

Resources

Recording Sheet for each child/group (attached separately) and pencils/pens.

You also need an area with trees in or near to your school (Deciduous broad leaved trees are better).

Remember, if you are leaving the school grounds to follow the school risk assessment for off site activities.

Lesson Activities

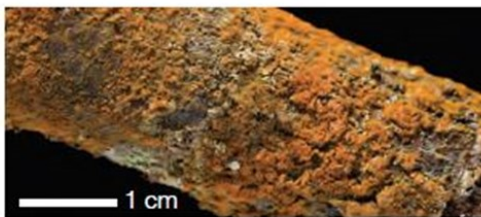
Introduction

- Explain to the class that you are going to be doing a scientific study today into the effects of air pollution on Lichen, which grows on trees but is not part of the tree.
- Explain that Lichen is made up of two organisms (fungus (like mushrooms and toadstools) and algae (like the algae that grows on ponds and lakes in hot summers) and that it grows on the trunks of trees but can also grow on walls and benches, etc.
- Tell the children that lichen are greatly affected by the air quality in and around their habitat, and as such are a great indicator of local pollution. We can get an idea of the air quality around the school by studying the lichen growing on trees nearby and observing which species are growing.
- Remind pupils about the importance of clean air and the effects that air quality can have on humans and other species as well as lichens. Air pollution affects children much more than adults as their lungs are still developing.

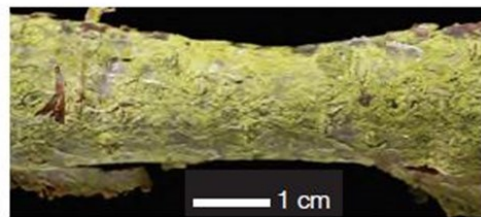
Main Activity

Record the number of lichen species you can find on any 4 trees in your area. Children do not have to choose the same 4 trees but ideally they want to be deciduous broad leaf species such as Oak, Ash, Elm, Maple, Sycamore or Yew as examples, most trees that shed their leaves in autumn fall into this category.

- Split the class into working groups or pairs and ask them to choose 4 trees for each group.
- Give each child a recording sheet (provided separately) and ask them to record any lichens they see on the main trunk of the tree.
- Tell the children not to climb the trees as they could damage the lichen that other children might spot and also risk injury through falling.
- Work in their small groups to record all species they see up to their own height,
- Ask the children to put a tick or keep a tally of each species of lichen they spot, so for example if they see one species of lichen growing on the trunk in 3 different areas then they put 3 ticks or tally marks.
- Explain that the data they are collecting is important and if they cannot positively identify a species for certain do not guess, as incorrect data is less productive than correct information. There are many more species of lichen than the ones listed on the recording sheet but these are the main ones of interest.
- Be careful not to confuse algae with lichen as they can look similar. Algae will not have fruiting spores.



Orange alga



Green alga

Reflection / Plenary

Once all the children have finished collecting their data and back in the classroom see if you can build up a picture of the lichen in your area.

- Were some trees more affected by Nitrogen Dioxide levels than others? Was this because they were closer to a road or other sources of Air Pollution?
- Combine everyone's results which will give you a much clearer picture overall on the condition of the air around your school.
- Discuss what you think are the main sources of pollution for your school or area.

Possible Extension Ideas

- As a class discuss ways in which the air quality could be improved around your school, or in the wider community. Identify which do you think are the worst polluters in your area.
- Publish your results on the school website or in the newsletter to help raise awareness of air pollution amongst parents and the wider community.
- Create a display in your school showing images of your study and the results. This will help other children and staff in your school see what you have been doing for science and the environment and maybe they will be inspired to do something themselves.
- Enter your survey results into an online survey via OPAL (Open Air Laboratories) and help build up a national picture of air pollution <https://www.opalexplornature.org/airsurvey>

Lichen Identification Sheet (also attached separately)

Use this sheet to help you identify which species of lichen you have discovered.

This sheet is not exhaustive and you might well spot lichen that are not included on this sheet but these are the more common indicative species that we are interested in. Species 1-3 will only grow in clean air zones whilst the nitrogen loving species 7-9 will be found in polluted areas.

1. Usnea

Nitrogen-sensitive




- grey-green all round
- branches thread-like




2. Evernia

Nitrogen-sensitive




- grey-green on top, white below
- lobes flattened, strap-like




3. Hypogymnia

Nitrogen-sensitive

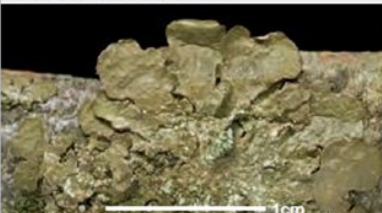


- lobes greyish on top, pale brown below
- lobes puffed up and hollow
- lobe ends often become powdery




4. Melanelixia

Intermediate




- dull brown lobes, closely attached to the bark
- paler areas show when surface is rubbed




5. Flavoparmelia

Intermediate

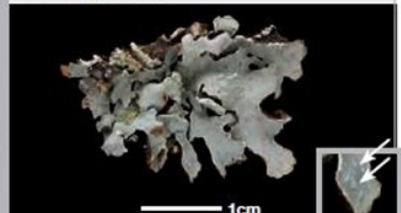


- broad, apple-green lobes
- wrinkled surface on which powdery spots may develop




6. Parmelia

Intermediate




- lobes grey on top, dark brown below
- lobes thin, loosely attached to the bark
- pattern of white lines on the surface




7. Leafy Xanthoria

Nitrogen-loving




- lobes yellow/orange to greenish yellow
- lobes broad, spreading
- a few orange fruiting bodies present




8. Cushion Xanthoria

Nitrogen-loving




- lobes yellow to green-grey
- lobes small and clustered
- many orange fruiting bodies present




9. Physcia

Nitrogen-loving



- lobes grey on top, whitish below
- lobe ends raised up becoming powdery
- black-tipped whiskers on the lobe edges



For support, advice or assistance with this lesson plan please contact your School Travel Advisor at into@staffordshire.gov.uk

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