Field Studies Council

National Fieldwork Week **6 to 10 June 2022**

KS3/KS4/KS5 Geography
Investigating Change in the School Grounds/Local Park

Teacher Resource Pack

This pack consists of a series of student worksheets to help with the delivery of fieldwork investigating change in the school grounds or local park over time:

- Annotating a field sketch or photograph of the location
- Monitoring human impacts in a small-scale ecosystem
- Using lichens on trees as bio-indicators of air pollution
- Weather investigation

The Field Studies Council

We are a UK environmental education charity and leading provider of science, geography, and environmental learning outside the classroom. 3,000 schools visit our 20 learning locations each year, including more than half of all A Level geography students.

Our residential and day trips for secondary schools are tailored to the curriculum and designed to suit your requirements. To find out more, visit: https://www.field-studies-council.org/secondary-and-further-education-courses/

To access our free resources and to find out about the Digital Hub, our resource bank of 100+ resources for secondary geography and biology, visit: https://www.field-studies-council.org/resources/

For online and in-person Group Leader and Teacher Training courses visit: https://www.field-studies-council.org/group-leader-and-teacher-training/

To purchase our publications for 14-18 Geography, including GIS, creative fieldwork and NEA, visit: https://www.field-studies-council.org/product-category/publications/ (select '14-18')

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National Fieldwork Week 6 to 10 June 2022

KS3/KS4/KS5 Geography
Investigating Change in the School Grounds/Local Park

Curriculum Links

England National Curriculum (KS3, KS4)

Geographical skills and fieldwork - use fieldwork in contrasting locations to collect, analyse and draw conclusions from geographical data, using multiple sources of increasingly complex information.

Human and physical - understand how human and physical processes interact to influence, and change landscapes, environments and the climate

Wales National Curriculum (KS3, KS4)

- Observe, measure, extract and record data through carrying out practical investigations and fieldwork and using a variety of secondary sources.
- Communicate findings, ideas and information using geographical terminology, maps, visual images, a range of graphical techniques and ICT.
- Carry out at least one group investigation and one independent investigation into a geographical question or issue.
- Use fieldwork to observe and investigate real places and processes.

Scotland Curriculum for Excellence

- Investigate the climate, physical features and living things of a natural environment different from my own and explain their interrelationship (SOC 3-10a).
- Develop understanding of the interaction between humans and the environment by describing and assessing the impact of human activity on an area (SOC 4-10a).
- Investigate the relationship between climate and weather to be able to understand the causes of weather patterns within a selected climate zone (SOC 3-12a) .

Aims and Objectives

Learners will develop their investigative skills and improve their understanding of the impact of human and physical processes on local environments. Learners will use a variety of fieldwork methods to collect, present and analyse geographic data and compare to secondary historic sources.

Equipment and Resources

Tablets/cameras and stopwatch
Clipboards
For weather instruments: hole puncher, drinking straws, pencils with eraser tips, elastic bands, tape, scissors, disposable cups, drawing pins, mirror tile, ruler, permanent marker

Health and safety checklist

- ✓ Risk assessment to identify hazards and manage them e.g. busy crossings, uneven ground, dog faeces, broken glass, aggressive dogs, low-hanging or fallen branches
- ✓ Identify group leader and responsibilities (for out-of-school fieldwork)
- ✓ Staff, pupils and volunteers are appropriately trained, experienced and briefed
- ✓ All paperwork completed prior to and after visit

Investigating Change in the School Grounds or Local Park

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Producing an annotated field sketch or photograph

This qualitative method is used for recording observational data and is a valuable starting point for fieldwork about a local environment. You will need to visit the area and either take a photograph or make a field sketch, from an appropriate viewpoint. Annotate with informative but concise notes relevant to your area of interest.

You could use this method to show your personal perceptions of the area, highlighting the features you associate with different feelings or activities. Or you could use it as a starting point for a specific enquiry, using the annotations to show positive or negative features in the area for accessibility, safety, or habitats for biodiversity, for example.

Example

The photograph below is a view of Leechwell Garden, Totnes. The photograph has been annotated to explain the social, economic and environmental benefits of this public space.

Easy access to green space may be a selling point for nearby houses, improving house prices in the area if it is seen as a nice place to live

Play equipment provides social benefits. It improves health in young people and builds a sense of community as people can meet there.

Broken branches and benches may be as a result of anti-social behaviour. This will cost the council money to mend and may put off local users if they think the park is dangerous in the evenings, reducing the benefits to health etc.

Pond provides habitat for invertebrates at the base of food webs. This increases biodiversity in the area and may provide social educational benefits through pond dipping.

Over-use of certain areas may be an economic drain on the local council if they have to constantly pay for new grass

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Measuring human impacts in a small-scale ecosystem

Your local space probably has heavily used/regularly maintained areas and wilder, less managed areas, which provide an insight into what the environment was like before it was developed into a school or public space. A plant or insect survey is a good way of investigating the ecosystem health of the different areas or for comparing the relative value of the managed versus unmanaged areas for biodiversity.

Activity

Design an investigation to compare the biodiversity value of the heavily used or regularly managed area(s) to unmanaged/wild areas. You will need to formulate a hypothesis or research question, design a data collection method and sampling strategy and plan how you will present and analyse your data.

It is important to select comparable areas, for example:

- Trampled/path areas of grassland versus untrampled/unused areas of grassland
- Mown grassland versus unmown grassland
- Planted woodland versus natural/regenerated woodland
- Flower-rich verges versus cultivated flower beds

You may wish to make an annotated field sketch of the area first, to indicate which areas you are defining as heavy use and which areas are light use/'wild'. You could use your sketch map for stratified sampling.

Planning a geographical investigation:

https://www.field-studies-council.org/resources/14-16-geography/route-to-enquiry/

Designing a vegetation survey:

https://www.field-studies-council.org/resources/16-18-biology/fieldwork-techniques/vegetation-sampling/

Designing a pollinator survey:

https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/POLLINATION-16pp-booklet_legacy.pdf

https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/Pollination-chart-26Feb16-low-res-web-quality_0.pdf

Investigating Change in the School Grounds or Local Park

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Using lichens on trees as bio-indicators of air pollution

Lichens are flattened, leafy or bushy structures that grow on trees and stone and are composed of two organisms, a fungus and alga. The algal partner photosynthesises and provides food to the fungus, whilst the fungal partner provides protection.

Lichen species can be used as bioindicators of nitrogen pollution, since some species are nitrogen-tolerant and only grow on trees in polluted air, whilst other species are nitrogen-sensitive and only grow on trees in clean air. Nitrogen pollution is produced by vehicle exhausts (as nitrogen oxides) and by agriculture (ammonia gas, emitted from livestock manure and chemical fertilisers). Most nitrogen deposition occurs within 200m from the source, so the range of lichen species may indicate the air quality in the local area.

The OPAL Lichen Identification Guide shows the nine bio-indicator species:

https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/AIR-4pp-chart.pdf

A UK survey (Wolseley et al. 2008) found that lichens growing on twigs were sensitive to lower concentrations of nitrogen pollution than those on trunks and responded earlier to changes in atmospheric conditions. The trunk may continue to support nitrogen-sensitive species, whilst the twigs become dominated by nitrogen-tolerant species. Therefore, a comparison of lichen species on the twigs and the trunk may indicate whether nitrogen pollution has increased or decreased in the last 8-10 years.

An example is shown overleaf.

Activity

Design an investigation to compare the lichens on trunks and twigs on trees in locations with different air quality (e.g. trees next to a busy road versus trees in park). You will need to formulate a hypothesis or research question, design a data collection method and sampling strategy and plan how you will present and analyse your data.

Use the OPAL Air Survey booklet to help you:

https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/opal/AIR-16pp-booklet_legacy.pdf

If possible, use oak, ash or sycamore tree species, growing in well-lit areas (e.g street trees or trees on the edge of woodland), with twigs (branches) that are within easy reach.

What other factors do you think could influence the mix of species of lichens on the twigs compared to the trunks?

Research paper investigating lichens and nitrogen pollution in London for older students

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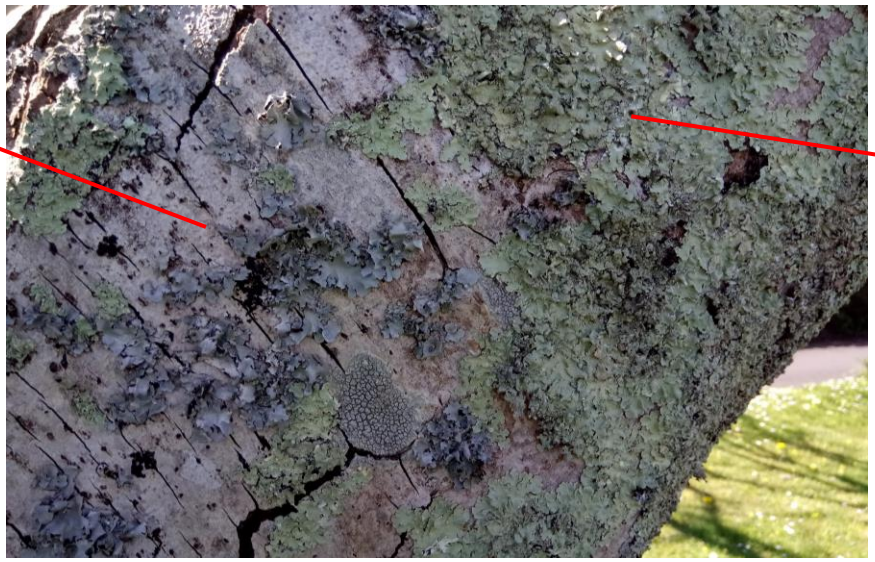
Example: lichens on trees as bio-indicators of air pollution

This sycamore tree grows next to the A381 in Totnes, a section of trunk road with nitrogen dioxide levels that regularly exceed the WHO safe limits.

The tree supported a high abundance of the nitrogen-tolerant species *Xanthoria* on the twigs but there were none on the trunk, suggesting that historic air pollution was not as high as the current time.

Trunk



Parmelia: intermediate species – can grow in clean and polluted air

Flavoparmelia: intermediate species – can grow in clean and polluted air

Twigs

Ramalina: not included in the survey but can be confused with *Usnea*, a nitrogen-sensitive species

Leafy *Xanthoria:* nitrogen-tolerant species – grows in polluted air

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Weather investigation

Activity

You will design a weather investigation to carry out in your school grounds or local park. You will identify the monitoring equipment you need using the table overleaf, to obtain from the school or to make your own.

Ideas for investigations

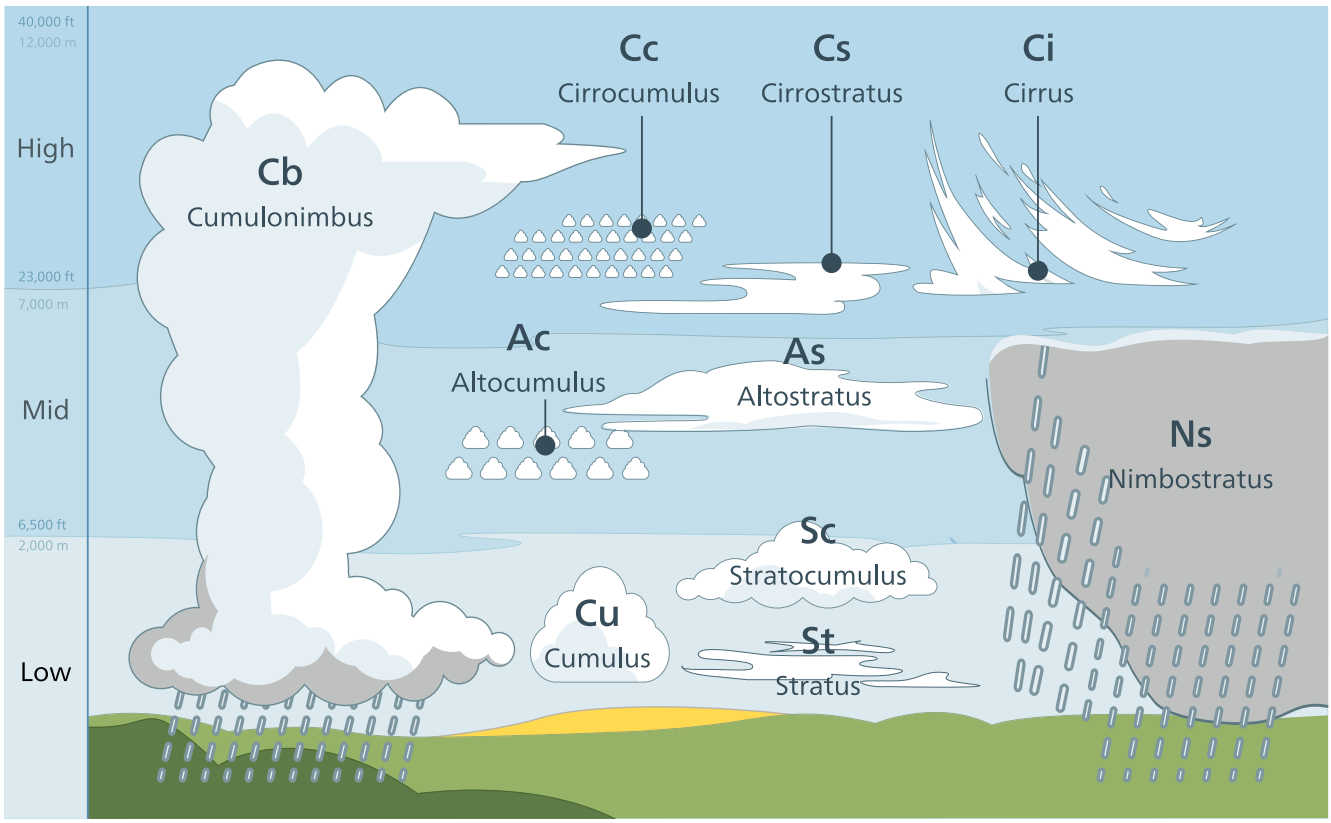
- Is cloud type and cloud cover/wind direction and speed at a specified time of morning a reliable predictor of weather at the end of the day/next day?
- Is there a correlation between temperature, atmospheric pressure and cloud cover?

You will need to formulate a hypothesis or research question, design a data collection method and sampling strategy and plan how you will present and analyse your data.

You may wish to compare field-collected data to historic weather data as part of your investigation. These ArcGIS maps and resources feature mean monthly temperature and rainfall data from 1970-2019 and explore the impacts of climate change in the UK:

https://teach-with-gis-uk-esriukeducation.hub.arcgis.com/pages/climate

Identification chart for the main cloud types (see overleaf)



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Weather investigation

You can monitor the weather using cheap and homemade meteorological instruments, as detailed below.

Weather element	Definition/instructions	Equipment list
Temperature	Stand in shade with thermometer held 1 metre above the ground. Read temperature (^{0}Celsius) after 2 minutes.	Thermometer
Precipitation	Fix rain gauge so that the top is 30cm above the ground, to avoid rain splash. Read depth (mm) from side of container.	Rain gauge
Wind direction	Measured from the direction the wind is blowing from, using a wind vane	*To make your own:* Scissors, drinking straw, cardboard, pencil with eraser on end, drawing pin, pen, compass https://youtu.be/NnU-RUQLjp0
Wind speed	Hold anemometer at arm's length above the head. Record wind speed in metres/second (or number of spins in one minute if using homemade anemometer)	*To make your own:* hole puncher 2 drinking straws, pencil with eraser on end, 5 disposable cups/yoghurt pots (same size), drawing pin https://youtu.be/Af0LB3abBsk
Atmospheric pressure	This is the weight of air pressing down on us and is measured in millibars using a barometer	*To make your own:* Scissors, elastic bands, drinking straw, tape, card and pencil https://youtu.be/m_VFxqM41EM
Cloud cover	Helps to predict precipitation and solar radiation Cloud cover is measured on an eight point scale, using the unit 'Oktas'	*To make your own:* Mirror tile from DIY shop, ruler, permanent marker https://www.sserc.org.uk/wp-content/uploads/2012/04/Resource-2_2-Measuring-Cloud-Cover.pdf
Cloud type	Can help to understand the type of weather moving into or across an area e.g. nimbus clouds may carry rain whilst cirrus clouds predict fine weather	Clouds are categorised according to height and shape – use chart on previous page