

## OPAL for Secondary Sciences: Biology and Environmental Science



**OPAL**, or Open Air Laboratories, is a *Big Lottery* funded Citizen Science project that aims to engage communities with science across Scotland and gather useful data about the natural world around us. There are seven possible scientific surveys to complete, each with a different focus and topic area.

**Water Quality:** assess the water quality in your local pond or lake by investigating the species present.

**Air Quality:** assess the quality of the air around you by identifying pollution sensitive lichens on trees.

**Biodiversity:** identify invertebrates and assess the variety of life in your local hedgerows.

**Bugs Count:** identify mini-beasts in different natural and man-made habitats in your local area.

**Tree Health:** observe, identify and inspect your local trees to look for signs of diseases and/or parasites.

**Soil and Earthworm:** assess soil characteristics and identify earthworm species in your local area.

**Climate:** look at how humans influence the weather we experience. *(Data no longer being uploaded)*



The OPAL surveys give schools a perfect opportunity to engage their learners with **Citizen Science** and **Outdoor Learning** whilst covering key areas of **Curriculum for Excellence** and **National Qualifications**.

### OPAL surveys for Sciences

OPAL surveys are a chance to conduct a 'real' scientific study with your students, uploading results to a national network and putting your school on the OPAL map of Scotland. Surveys develop skills in scientific inquiry and fieldwork sampling whilst covering core content including **ecosystems, habitats, biodiversity, indicator species, adaptations for survival and human impacts on the environment including climate change**.

### Relevant Outcomes and Experiences at S1-S3 (Levels 3 & 4)

*I can sample and identify living things from different habitats to compare their biodiversity and can suggest reasons for their distribution.*

SCN 3-01a

*I understand how animal and plant species depend on each other and how living things are adapted for survival. I can predict the impact of population growth and natural hazards on biodiversity.*

SCN 4-01a

*I can explain some of the processes which contribute to climate change and discuss the possible impact of atmospheric change on the survival of living things.*

SCN 3-05b

*I have collaborated with others to find and present information on how scientists from Scotland and beyond have contributed to innovative research and development.*

SCN 3-20a

*I have researched new developments in science and can explain how their current or future applications might impact on modern life.*

SCN 4-20a

## National 3, 4 & 5 and Higher/Advanced Higher Biology and Environmental Sciences

For National 3, 4 & 5 Biologists or Environmental Scientists, conducting an OPAL survey will develop skills in scientific inquiry and introduce and further the understanding of core course content particularly for the 'Life on Earth' unit for Biology or 'Living Environment' and 'sustainability' units for Environmental Science.

### Relevant Course Units (Biology):

**National 3: Life on earth** – sampling and identifying living things from different habitats to compare biodiversity and suggesting reasons for their distribution.

**National 4: Life on earth** – dependence between plants and animals, impact of population growth and natural hazards on biodiversity, adaptations for survival, and learned behaviour in response to stimuli linked to species survival.

**National 5: Life on earth** – biodiversity and the distribution of life, energy in ecosystems, sampling techniques and measurement of abiotic and biotic factors, adaptation, natural selection and the evolution of species and human impact on the environment.

**Higher (from August 2014): Sustainability and Interdependence**– measuring biodiversity including species diversity, threats to biodiversity including habitat loss/modification, impact of invasive species on indigenous populations.

**Advanced Higher (from August 2015): Biology and Evolution**– Field techniques for biologists including sampling wild organisms, classification and taxonomy.

**Scientific Principles and Practice** – scientific method, experimental design, sampling, evaluating conclusions.

### Relevant Course Units (Environmental Science):

**National 3: Living Environment** - Sampling and identifying living things from different habitats to compare diversity, factors influencing the distribution of living things, formation and characteristics of soils.

**Sustainability** - the impact of atmospheric change on the survival of living things

**National 4: Living Environment** – Interdependence (*feeding relationships, ecosystems, methods of sampling organisms*), adaptations of species for survival, impact of population growth and natural hazards on biodiversity.

**Sustainability** - The interaction between humans, the environment and the impact of human activity on an area.

**National 5: Living Environment** – Investigating ecosystems and biodiversity (*aquatic and terrestrial, quantitative sampling techniques, biotic and abiotic variables, species identification*), Interdependence (*food webs, energy flow, nutrient cycling*), Human influences on biodiversity (*indicator and non-native species, extinction and biodiversity loss*).

**Higher (from August 2014): Living Environment** - Investigating ecosystems and biodiversity, factors that influence biodiversity (including human influences), sampling plants and animals using qualitative and quantitative techniques, abiotic factors and their effects on the frequency and distribution of organisms, using paired statement keys, food webs, the importance of indicator species.



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## Why not use OPAL as part of the *Added Value Unit or Course Assignment*. e.g.

“Investigating biodiversity of invertebrates under native and non-native vegetation”

“Investigating lichen communities growing on different species of tree”

“Investigate changes in landuse on earthworm abundance and diversity”

“Compare freshwater invertebrate communities in different urban ponds”



**\*\*\*Use the contact at the end of this document to discuss opportunities and sources of information\*\*\***

## OPAL and ‘significant aspects of learning’

OPAL will support the assessment of learners’ knowledge, understanding, skills, attributes and capabilities in the significant aspects of learning of:

<b>Planet Earth</b>	<b>Biological systems</b>	<b>Skills and attributes of scientifically literate citizens</b>
	<b>Inquiry and investigative skills</b>	<b>Scientific analytical thinking skills</b>

## Development of scientific skills

Skills developed in Sciences	OPALs contribution
Asking questions and making hypotheses	Exploring local habitats, making observations and constructing hypothesis to test.
Planning and designing procedures and experiments	Following OPAL survey procedures to develop understanding and modifying methods based on local constraints or issues.
Selecting appropriate samples, equipment and other resources	Using appropriate equipment to collect relevant data, identifying species using ID keys.
Carrying out experiments	Practical experience in collecting and recording real data. Extensions possible including alternative survey methods.
Use practical analytical techniques	Conducting surveys in teams with peers. Communicating methods and results with each other and resolving conflict.
Observing, collecting, measuring and recording evidence	Comparisons and patterns interpreted in the field to assess health and impacts of local ecosystems.
Taking account of safety and controlling risk and hazards	Risk assessments needed for working in the field which can be constructed and/or shared with the students.
Presenting, analysing and interpreting data to draw conclusions	Results shared with class and teachers. Data uploaded to the OPAL network and compared to other areas locally, regionally and nationally.
Reviewing and evaluating sources used and results gained to identify limitations and improvements	Identifying limitations and suggesting improvements to procedures and sampling limitations.
Presenting and reporting on findings	Results can be presented to others in class, other classes in the school or in school magazines/newsletters. Data uploaded to network.



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## Approaches to scientific inquiry

### OPAL shares CfE principles of scientific investigation:

- Asking questions and making observations in local environments and ecosystems
- Classifying the living and non- living environment using survey techniques, identification keys and guides
- Fair testing by constructing a carefully thought out procedure with control variables
- Finding an association in the results collected and drawing conclusions

### Skills and attributes of Scientifically literate citizens:

OPAL can give all students a real world application of science in Scotland developing knowledge, awareness, opinions and values of scientific issues on local and global scales including climate change, habitat loss, invasive species and biodiversity.

## Responsibility of all practitioners:

Health and well-being	Literacy	Numeracy
By engaging with active outdoor learning and meaningful scientific investigation, students will develop independent views/opinions and gain confidence in new settings. An enjoyable OPAL experience will promote physical, mental and emotional well-being.	Students will interpret the OPAL survey packs and follow the scientific procedure described using new specialist vocabulary. They will need to record information and communicate their findings with peers and teachers alike.	Students will need to collect quantitative measurements about a habitat or ecosystem and record this information numerically. Comparing results and drawing conclusions is a key element of an OPAL survey.



Students investigating biodiversity of school grounds



OPAL can be used as an element of the John Muir Award or help you on your way to becoming an Eco-School

For more information, to order OPAL survey packs or to arrange for a community scientist to visit your school please contact us using the details below:

**Field Studies Council: Millport**

**01475 530581**

**[enquiries@field-studies-council.org](mailto:enquiries@field-studies-council.org)**



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