

OPAL Bugs Count

Teaching supplement



This teaching supplement for schools, colleges and universities is designed to complement the **group leaders' support pack** which can be downloaded from the OPAL website www.opalexplornature.org/bugscount.

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Introduction

The OPAL Bugs Count survey investigates how the built environment affects invertebrates. It provides an opportunity for pupils to carry out a scientific survey where the outcome is not known, i.e. it is not the standard 'fair test' style of school science practical. It also allows pupils to carry out a safe, manageable and low-cost fieldwork activity within timetabled lesson time, and an opportunity to be part of a groundbreaking national survey that makes a real contribution to our wider knowledge.

The survey is suitable for all ages, but has been produced with the requirements of school science at Key Stages 2 and 3 borne particularly in mind. For more advanced students (Key Stage 4 and beyond), the survey could be extended to provide greater challenge - identifying organisms to a greater degree; developing the survey questions or method; or requiring students to present and report on their findings (using ICT).

Visit the survey's website www.opalexplornature.org/bugscount for regular updates and discussions of results, and an overview of how and why the survey was developed.



Links to the school curriculum

The survey links well to the teaching of scientific enquiry and investigation, and can be used as a practical in relation to the following curriculum topics concerning the environment, habitats, living things and their classification. Additionally, links could be made to our impact on the environment (geography, citizenship).

KS 1 & 2

National Curriculum KS1 & 2 (1999)

Science KS1 Sc1 1, 2a, 2b, 2e, 2f, 2g, 2h, 2j and Sc2 1c, 4b, 5a, 5b, 5c.

Science KS2 Sc1 1a, 2a, 2b, 2c, 2e, 2f, 2i, 2j, 2l, 2m and Sc2 1a, 1c, 4a, 4b, 4c, 5a, 5b, 5c, 5d, 5e.

Geography KS1 1a, 1b, 2a, 2b, 2d, 3a, 3c, 3d, 4a, 4b, 5a, 5b, 7a, 7b.

Geography KS2 1a, 1b, 1c, 2a, 2b, 2d, 3a, 3d, 3e, 4a, 4b, 5a, 5b, 6d, 6e, 7c.

KS3

National Curriculum KS3 (1999)

Science Sc1 1a, 1c, 2a, 2g, 2k, 2m, 2o, 2p and Sc2 4b, 5a, 5b, 5d.

Geography 1a, 1c, 1d, 2a, 2d, 3c, 3d, 4a, 4b, 5a, 5b, 6j, 7c.

GCSE & KS4

National Curriculum KS4 (1999)

Science 2f, 2g, 2m, 2o, 2q, 2s, 4a, 4b, 4c.

AQA Biology, Science A, Science B 8.1 How science works, 11.5 What determines where particular species live and how many of them there are? 11.7 Why have some species of plants and animals died out? 11.8 How do humans affect the environment?

AQA Applied Science 11.3 Countryside and Environmental Management, 13.2 Monitoring Living Organisms.

AQA Environmental Science Unit 1 B1 The Management of Wildlife Resources. This survey might also serve as a useful preliminary exercise in preparation for Unit 2 - Investigations in Environmental Science (Controlled Assessment).

Edexcel Biology (2011) Unit B1: Influences on life - Classification, variation and inheritance; Responses to a changing environment; Problems of, and solutions to, a changing environment.

OCR Biology A Module B3: Life on Earth. This unit includes the recommendation to perform fieldwork to investigate biodiversity and environmental change.

OCR Biology B Module B2: Understanding our environment. Module B4: It's a green world.

A Level

AQA Biology Unit 4 Populations and environment.

AQA Environmental Studies 3.1 Unit 1 The Living Environment, Unit 4 Biological Resources and Sustainability.

Edexcel Biology Unit 2 Topic 4: Biodiversity and natural resources, Unit 4 Topic 5: On the wild side.

Further and Higher Education

This survey would be of use to (or could be further developed for) students following a biological course, especially countryside management, environmental or agricultural science. It could form a starter activity within a more detailed invertebrate identification module, and is of relevance to any programme of study that considers human impacts on the natural environment, or planning and providing for biodiversity and sustainability in the built environment.



Ideas for teachers of Key Stage 2 and 3 Science

The Bugs Count survey ties into several key areas of the National Curriculum for Science at Key Stages 2 and 3: ideas and evidence; investigative skills; variation and classification; and living things in their environment. It is, therefore, possible to introduce this survey project from several different directions.

Here are three ideas for introducing the survey within Key Stages 2 and 3. They are followed by an example 2-lesson teaching plan.

1. Our local wildlife - focusing on classification of invertebrate animals

Before starting the Bugs Count survey, it is important that students can recognize the different invertebrate groups that are being used. These groups have been carefully selected to be readily identifiable using simple features that are quite easily seen. Most students should be able to learn and remember the groups, and so the Bugs Count survey could be introduced with some time to learn the groups followed by a quiz:

- Picture recognition - using printed pictures or a Powerpoint slideshow. A picture quiz can be downloaded from www.opalexplornature.org/bugscount
- What am I? - reading out the descriptions from the Pocket ID guide and asking students to guess (students could use whiteboards to show their answers)
- Live specimens - placed around the classroom as a circus-style quiz. For health and safety advice, see page 7 of the Bugs Count Field Notebook

For further classification-based ideas, see the OPAL Key Stage 3 Discover Classification teaching resource pack, particularly lessons 2 and 3 www.opalexplornature.org/explorenature

2. Our local environment - focusing on habitats and conditions

Students could be presented with a picture of the study area (an appropriate area of the school grounds). This might be a printed copy or projected image - it could also be done outdoors, within the study area itself. They can then be asked to identify different habitats within this area and describe what conditions might be like there - light, shade, humidity, temperature.

Encourage students to predict (possibly in rank order) which of these habitats may be good for invertebrate animals and to suggest why. To support this activity, students could be shown the Bugs Count poster, or illustration within the Bugs Count Field Notebook (pages 3-4). Both show a range of likely living places for invertebrates. The survey could then be used to test the students' predictions.

The fieldwork element of the survey could also be developed further, such that students record observations about the physical and chemical conditions in different micro-habitats. They could then draw conclusions about invertebrate habitat preferences - temperature, relative light levels, humidity (by touch) and perhaps even soil pH. You might like to mention (or demonstrate) how scientists can test ideas like these with choice chamber experiments.

3. On safari... at school - focusing on scientific procedure and skills

Good teaching practice encourages students to spend time planning scientific investigations and subsequently reflecting on their work to evaluate it. The process of representing results and communicating findings is also important.

If a teacher feels that their students are sufficiently competent in the other areas, they may wish to focus their attention on the scientific process, or the importance of collaboration and communication in science. As students perform the survey they could be asked to photograph themselves at work and identify the steps that make it a good scientific investigation. For example, careful observation and data collection, considerate handling of animals and the use of controlled variables (such as the 15 minute time limit for searching).

Students could be asked to visualise their results (making use of ICT) as tables, bar charts or pie charts and to present these to the class. Alternatively, their findings could be prepared for display. You may like to ask students to discuss any elements of the investigation that they feel could be improved upon (and why).

Extension activity

If you are interested in taking this work further, you might ask your students to consider their own school grounds and to propose ideas for how these could be made more wildlife friendly (e.g. creation of new bug-friendly habitats around the school). A lesson based on this idea can be downloaded as part of the OPAL Discover Classification teachers resource pack (lesson 3b).

www.opalexplore.org/explore

Further information on this topic is also provided by the **Eco-Schools** programme and charities such as the **Wildlife Trusts** and **Learning through Landscapes**.

Discover Classification - KS3



An OPAL teaching resource pack

Summary

As part of the Big Lottery Funded OPAL (Open Air Laboratories) project we are looking to inspire and support the teaching of taxonomy (i.e. the naming, description and classification of organisms) and related activities within secondary schools. Being able to identify, describe and name the various plants and animals with which we share our planet is critical to many applied subjects - from nature conservation and predicting and monitoring the effects of climate change, to food production and disease prevention. Given the increasing pressures that life on Earth faces, there is an ever expanding need for knowledgeable taxonomists, yet recent evidence shows that the available skills base is declining.

This resource pack is an output of a pilot study to evaluate existing teaching methods and resources and trial new approaches for the teaching of classification in secondary schools within England. It contains a series of free lesson plans and supporting resources to aid the teaching of classification, particularly at Key Stage 3. It is hoped that ongoing development of this resource will help to further exploration of the subject within and outside the classroom.

About this resource pack

This pack was compiled by Dr Malcolm Grant (Safari4Schools) and Dr John Tweddle (OPAL and Natural History Museum). It contains a series of three lessons on the topic of classification, plus two extension lessons, associated PowerPoint presentations and resource sheets. It is free to use for teaching purposes and additional electronic copies can be downloaded from www.OPALexplore.org.

Example Teaching Plan for Key Stages 2 and 3 Science

Lesson 1.

Starter - Introducing Bugs Count

Read the introduction from the Bugs Count Field Notebook, or visit the project's website to explain the aims and scale of the survey.

Main Activity - Getting familiar with the invertebrate groups

- **Provide students with the Bugs Count Pocket ID Guide.** Focus on the pages that illustrate and describe the main groups to be identified. Students can then have five minutes to revise these, perhaps testing each other in pairs.
- **What am I? quiz.** Read out descriptions of different groups. Students can use whiteboards to write which invertebrate group they think it is. Alternatively, a picture quiz can be downloaded from www.opalexplornature.org/bugscount.
- **Species Quest information.** Look at the information for the six species singled out for the Species Quest, to familiarise students with these.
- **Trial run.** Arrange students in pairs and provide them with a cup and lid (or alternative bug collecting pot). Moving outside, find an area that won't be used in the Bugs Count survey itself, and challenge students to find invertebrates in a five minute bug hunt. Re-assemble and look through what has been found - checking that students can identify the groups correctly. Collect in the Pocket ID Guides ready for next lesson.

Read the advice for Safe Fieldwork on page 7 of the Bugs Count Field Notebook prior to this activity and encourage students not to overcrowd their collecting cups.

Plenary - Looking ahead

Explain to students that next lesson they will be performing the Bugs Count survey, and will be taught the specific procedure that is to be used by everyone who does the survey across the whole country.

If you have time, you could conclude by showing the opening scenes from the BBC documentary **Life in the Undergrowth**.

Lesson 2.

Starter - Refresher quiz and overview of survey procedure

You might start with a refresher quiz on the invertebrate groups. Then, arrange students into pairs and provide each pair with their Bugs Count survey pack. Recap on the aims and scale of the survey (pages 1 and 2) and then read or paraphrase the section on how to take part (pages 6 and 7). Explain that there are three elements to complete:

1. Explore your survey area (choose and describe your study area)
2. Carry out one or more timed challenges (surveys)
3. Send in your results

Main Activity - Bugs Count survey

- **About your survey.** Tell students which physical area you have chosen to study and work together to complete the first set of questions within the Bugs Count Field Notebook (Questions 1-8; page 8). This can be done inside, or outdoors at the study area.

- **Explore your survey area.** Split into pairs. Within your chosen survey area, ask each pair to select their first habitat to survey, choosing from:

Challenge 1 - soft ground surfaces (pages 10-11)

Challenge 2 - human-made hard surfaces (page 12-13)

Challenge 3 - on plants (pages 14-15)

Then get them ready to complete Question 9 (page 9), which asks them to tick the micro-habitats that they can see within their chosen habitat. Explain that they will survey these micro-habitats in the next step.

Check that they are clear which block in question 9 they are going to complete - the block numbers correspond to the challenge numbers. Give students five minutes to complete Question 9.

- **Complete a 15 minute challenge.** Assemble the students and then start them off on their first timed challenge (15 minute invertebrate survey). You could get students to keep specimens in a cup or jar, if they are unsure about any identities.
- **Complete additional 15 minute challenges.** If you have time, complete the survey for all three types of habitat.
- **Send in your results and explore the data.** At the end of the timed challenges, return to the classroom and give students five minutes to review and check their results. If you have available ICT facilities, results can be entered online by students - their results will be immediately visible on the interactive results maps and the students will be able to compare their results with other people who have completed the survey. Alternatively, collect in the Field Notebooks to be returned to the freepost address (given on the back page of the Field Notebook).

Plenary - the bigger picture

To conclude, you could visit the Bugs Count website to see what results have been submitted already - drawing attention once again to the scale of the study.