

The OPAL Water Survey

Group leaders' support document: planning, advice and ideas



Thank you for participating in the OPAL Water Survey. This document is intended to provide participating schools and group leaders with a guide to help prepare and run the survey and a give a few ideas for post-survey activities. The following sections provide a list of items to be considered for each of these stages, but are not exhaustive. Please add or customise the lists as appropriate to you. All information about the survey (including survey materials and recording sheets) is downloadable from the [OPAL website](#).

Pre-survey

1. Aims of the survey

General aims

The survey aims to generate enthusiasm for the freshwater environment – and, through this, the wider natural world – in as many people as possible including those with limited access to the countryside; help people discover the animals and plants that live in lakes and ponds and find out what these can tell us about the health of that water body; provide a legacy of knowledge and interest for pond life and aquatic ecosystems.

Scientific aims

The OPAL Water survey is a large-scale national survey intending to provide new and useful information with a particular focus on small and/or urban ponds which are not usually surveyed. The survey will provide:

- Information on pond health across England based on the use of aquatic invertebrate classes as indicators
- Assess these class distributions with respect to (a) simple measures of water quality, (b) indicators of pollution and (c) site characteristics.
- Contribute to knowledge of distribution of dragonfly and damselfly species for a new atlas being produced by the British Dragonfly Society
- Contribute to knowledge of the distribution of native and non-native (invasive) duckweed species (for Botanical Society of the British Isles)
- Undertake the first national survey of lake and pond water clarity using a simple technique developed especially by the OPAL Water Centre
- Undertake the first national survey of trace metals in lake and pond sediments (in association with the British Geological Survey)
- Identify potential new Biodiversity Action Plan (BAP) priority habitat ponds (e.g. those with exceptional assemblage of key biotic groups; ponds of ecological quality).

2. Time required

Please ensure you allow sufficient time. Field activities have been planned to fit into reasonable lesson or meeting times but these times exclude preparation and long travel times. Once your group has gathered at a suitable site, Activities 1 and 2 will

only take 5 minutes each. The main activity is Activity 3 and this will take 45–60 minutes, but you could take longer over this if you wish. The final activity, Activity 4 can take as long as you like. It may be that you use observations that you have made while doing the other activities, or if you have more time, you could spend longer looking for and identifying these other animals and plants.

Later, time is required to enter results online or they can be posted to us using the Freepost address given in the Field Notebook. Entering the data via the website or sending back the completed Field Notebook is very important as it allows us to compile the individual results into a national picture. Please encourage everyone who does the survey to do this.

3. Health and safety

As the group leader you are responsible for carrying out a risk assessment for the sample site. You should make a preliminary visit to the site and identify potential hazards in advance of any field work, and become familiar with local conditions and facilities. A first-aid kit should be taken out onto the site, along with a mobile phone. A map and GPS are also useful, especially if the site you are visiting is more remote. You should be familiar with all safety guidance with respect to working near and around water bodies. Make sure everyone taking part is familiar with safety instructions and what to do in an emergency. Although the survey need only take an hour or so in total, make sure that anyone who needs them takes any required medication with them, especially if you are planning to spend longer outdoors.

The survey is not suitable for children under the age of 5. Children of all ages must be supervised at all times when close to water. Make sure that there are sufficient adults for the number of children in the group so that all may be supervised properly. The safety instructions included in the Survey pack are as follows:

- Young children must be supervised at all times when near water.
- Children must make sure that they get their parents' consent before participating in this survey and make sure that they have read these guidelines.
- Do not do this survey on your own. Children must be accompanied by an adult. Adults should take a responsible friend who can help if things go wrong. It is advisable that one or both of you are strong swimmers.
- Make sure you know what to do in an emergency and have a means of summoning help if necessary.
- Make sure that the ground around the lake or pond is firm and not steep or overhanging.
- Choose a place to do the activities where you can safely and easily get close to the water. Remember, the areas around ponds and lakes may be slippery.
- If you find broken glass, litter with sharp edges like metal cans or discarded fish hooks, find somewhere else to do the survey.
- Cover any open cuts before starting the activities and wash your hands thoroughly afterwards and especially before eating.
- Make sure you are dressed appropriately for the weather and wear appropriate footwear.
- Do not try to walk on frozen ponds or lakes.

Please note that participation in the OPAL Water Survey is entirely at the participant's own risk. More water safety information is available from RoSPA: <http://www.rospa.com/leisuresafety/adviceandinformation/watersafety/>

Another very useful document when considering taking a group to water sites is the "Group Safety at Water Margins" document produced by the Department for Education and the Central Council for Physical Recreation (CCPR). This document is available for download as a pdf from the following site www.rospa.com/leisuresafety/information/groupsafety_watermargins.pdf.

4. Schools

The OPAL Water Survey provides an opportunity for pupils to carry out a scientific survey where the outcome is not known (it is not a 'fair test' style of science practical). It also allows pupils to carry out a safe, manageable and low-cost fieldwork activity within timetabled lesson time in science and an opportunity to be part of a ground-breaking national survey that makes a real contribution to our wider knowledge.

Links to the school curriculum: The requirements of school science for students aged 11 – 14 years have been considered during the development of the survey. National Curriculum KS3 Science SC1 2d; Sc2 5a, 5b. The survey links closely with QCA Units such as:

- 7c Environment and feeding relationships
- 8d Ecological relationships
- 9g Environmental chemistry
- 9m Investigating scientific questions

The survey is also suitable for students aged 14 – 16 years. As well as providing an opportunity for more independent research, it will also deliver these specific aspects of the GCSE Science and Biology specifications:

- AQA Science (A&B) and Biology A. To analyse and interpret scientific data concerning environmental issues (Substantive context: Water).
- Edexcel Additional Science. B2.4 (Interdependence): 3. Investigate, using primary and secondary data, the impact of human activity on the environment, including the pollution of..... water
- OCR Science B (Gateway Science). B2a (Ecology in our school grounds): (g) Indicator species whose presence/absence indicates the level of pollution

The survey enables development of enquiry skills, such as:

- Practical skills
- Working collaboratively
- Communication of results: orally, in writing and using ICT
- Scientific thinking: explaining phenomena, critical understanding of evidence
- Research and study of science in a local, national (and global) context

The survey can both be simplified for younger students and also extended to provide more challenge and independent research for advanced students.

Additionally, useful links can be made with citizenship, especially consideration of social and ethical issues.

The survey: Things to consider

5. Before you go

Finding a lake or pond

you may already know where you intend to undertake the OPAL Water Survey, but if you do not there are a number of ways in which you can find one:

- A map: A standard 1:50 000 Ordnance Survey map will show many lakes but the smallest ones may not appear.
- Google maps: This provides a good way of looking for lakes and ponds if you know where you want to search. Small lakes and ponds are not always visible.
- The Freshwater Habitats Trust maintain a database of ponds which can be explored via a map:
<http://www.freshwaterhabitats.org.uk/projects/surveys/ponds-map/>

You will also need to make sure that you are able to visit the lake or pond with your group. Remember just because a lake is on a map or in a database does not mean that the public have access. Please check with the owner or Local Authority first to make sure you are able to visit.

Choosing the sample site

Please consider practical and safety issues when choosing a location. Do not do the survey anywhere where you may place yourself or others in potential danger due to local hazards (steep or slippery banks, adjacent transport routes or systems, chemical or waste disposal outlets, etc.). Consider the time it will take to reach your site and if this is feasible in the time available. All activities may be undertaken at the same location and therefore it is worth taking a little time to locate a good spot (or spots) around the lake. If leading a group we recommend that you undertake a reconnaissance trip to assess the best access points, potential hazards etc. Finally, and especially if leading a group of children, you should consider whether facilities for hand-washing are available once the activities have been completed.

Equipment

The OPAL Water Survey pack includes:

- a fold-out chart to the activities and an invertebrate guide
- a field notebook (with recording sheets)
- 3 extra charts for the identification of amphibians, duckweeds, and dragonflies and damselflies
- pH dip-strips
- an 'Opalometer' disc for measuring water clarity
- an OPAL magnifier

In addition you will need:

- a pond net,
- a tray to put the invertebrates in,
- a large (2 litre) clear plastic drinks bottle,
- a 1p coin and some sticky tape.

Useful items, if you have them, include:

- a map and GPS device,
- mobile phone
- a camera.

If you are leading a group it is a good idea to think about gathering a number of these together in advance so that everyone is able to try each activity.

Pond nets and trays are available from a large number of stockists. Make sure they are appropriate for pond work (rather than for aquaria).

The pH strips used in the OPAL Water Survey packs are Pehanon pH 4.0 - 9.0 strips (11 x 100 mm). For school groups and other organisations who may want to do more of this work, these Pehanon strips are quite cheap (£10 - £15 for a box of 200) and can be obtained from a number of suppliers or alternatively contact opal@imperial.ac.uk

Making equipment

If you do not have enough pond nets for your group you can use a rock-pooling net or you can make a net by attaching a fine-meshed plastic sieve to a pole. Duct tape works very well for attaching the sieve or you can use electrical tape and/or cable ties. For garden or small ponds a sieve on its own may be fine. If you use a sieve make sure the mesh is fine or you may lose some of the smaller animals. Any equipment that has been used elsewhere needs to be cleaned with mild disinfectant, rinsed in clean tap water and dried beforehand to prevent the spread of non-native plants and diseases between lakes.

For a sorting tray, any large, pale coloured tray will do. It will be better if it is large and not too shallow as this will make it easier to sort through what you have collected in the net. You could use large white ice cream tubs or similar containers. It may also be possible to line a normal baking tray with white coloured plastic or even a piece of white paper. Although the paper eventually becomes soggy it should last up to an hour.

Each pack contains an 'Opalometer' disc for measuring water clarity. It is best if you 'make' this before you go. Tape a 1p coin to the back of the disc, roll it up and push this through the neck of the bottle. Again, if you intend to use this at more than one site then it should be cleaned with mild disinfectant, rinsed in clean tap water and dried.

Background information

Familiarise yourself with the survey and what it entails in advance; including the key characteristics of the main invertebrate groups and how to record them so you can answer simple queries. The survey is designed to make identification and recording simple but bear in mind that there are still some groups that look similar to begin with.

Preliminary briefing

Arrange a preliminary briefing, if you can, before the date of the survey, so that participants understand the main purpose of each activity, the scope of practical activities and what they should be prepared to bring with them.

6. Preparation on the day

Weather/clothing

Clothing appropriate for the weather should be worn by everyone – remember the weather could be hot and sunny or cold and raining! Carry extra warm layers and waterproof outer garments and take sunscreen as well in case the weather changes. If weather conditions are hazardous it is advisable to cancel the fieldwork. We recommend wearing wellington boots for the survey but you may also need strong footwear if you have to walk any distance to the site first. Do not let people do the survey in bare feet as sharp objects such as fishing hooks may have been left in and around the lake or pond.

Safety

Take a First Aid kit to the site, along with a mobile 'phone. Allow enough time for the slowest person to reach the lake if a walk is involved. If the site is more remote, a map and GPS is useful and we recommend informing others of your chosen sampling location, time on site, and expected time of return. Make sure you inform these people that you have returned! At the site, participants should be given a safety talk before the activities, to run through the main health and safety aspects and behaviour expectations. Participation in the OPAL Water Survey is entirely at the participant's own risk.

Working in pairs

The OPAL Water Survey must not be undertaken alone. Participants should work at least in pairs. This has obvious health and safety benefits and also allows participants to swap over between activities, so that each experiences both the practical and data recording aspects of the work.

Suitable locations for sampling

It is paramount that a safe location is selected to undertake the survey sampling activities. Access to water is required for the survey but the survey can be undertaken from the bank of the lake or the shallow edges. Be aware that, for example, it may appear safer to undertake the survey from the bank but if the bank is overhanging, steep or slippery it may be safer to undertake the survey from the water edge if the water is not too deep and the ground underfoot is stable and secure. If a member of a group does enter the water itself (and it is not essential for the survey that they do) they must test the depth of the water and the stability of the substrate before they step in. Only one member of each group should enter the water at any one time.

An ideal location is a place where there is a gentle slope into shallow water with easily accessible emergent plants and other habitats. Ideally, Activity 3 should be undertaken at a number of locations around the lake in order to find differing habitats and / or sampling locations to maximise the number of invertebrate classes found. It may be that, having identified a number of safe sampling locations around the lake or pond, groups can swap round these different locations in order that they can sample in different places.

7. The survey activities

Which activities should I do?

While we would like everyone to take part in all the activities and send us data from each, it is not essential that everyone does them all. Participants can pick and choose from

the four activities and do whichever they wish. Having said that, Activities 1 and 2 are very quick so there should be no time constraints in doing them. If time is an issue then it may be possible to split activities between groups so that the water clarity and pH data from one group at the lake can be used for others undertaking the invertebrate survey at the same lake at the same time. It is advisable to carry out the water clarity test (activity 1) before you dip the net into the pond to avoid disturbing sediment in the water.

Site description

It is important to record the date and time of the survey and the location of the survey site. These can be recorded in the Field Notebook. The location of the pond or lake can also be identified on the OPAL website by dragging a marker on a map to the appropriate point. Other information on the area around the pond and any visible indicators of pollution will help us when we interpret the results so please encourage people to fill in these details.

Taking pictures

Participants may like to take a photograph of the pond they have surveyed and send it to us with their results via the OPAL website. It is assumed that any photograph sent to the OPAL website has the consent of the photographer to show the image on the OPAL website and also the consent of anyone appearing in the image for the image to be sent and used in this way.

Photographs can be very useful as aids to the identification of invertebrates and images can be compared with those on iSpot (www.ispotnature.org) or submitted there for help with identification.

Activity 1: How clear is the water?

Background: Activity 1 measures how clear the water is by viewing a disc (the Opalometer) with known gradations of 'greyness' through a known depth of water. This approach has been calibrated to suspended sediment concentrations and hence these data will allow us to:

- (i) undertake a national survey of water turbidity (or clarity)
- (ii) see the distribution of animal groups with respect to water clarity.

A high number of 'OPALs' recorded on the Opalometer means more light getting through the water. This is good for submerged plants which provide habitats for aquatic animals. If the water is turbid (low Opalometer score) then a record of the colour of the water will allow us to see whether this is due to re-suspended material (brown) or from an algal bloom (mainly green).

What to do: Prepare the Opalometer prior to your visit by taping a 1p coin to the back of the disc, rolling it up and pushing through the neck of the bottle. Fill the bottle with undisturbed water from the pond (i.e. water where the mud has not been stirred up) to the height of the Field Notebook. Make sure the Opalometer disc is the right way up (OPAL logos upwards), wait a moment or two for the water to calm and then look down through the neck of the bottle and count the number of OPAL logos you can see. Record this number and any observed water colour on Page 11 of the Field Notebook (Questions 11 and 12). It is a good idea for each member of the group to have a go at this and for the group to reach a consensus.

Activity 2: Is the water acid or alkaline?

Background: The pH of lake water controls many processes within a lake and can also dictate the assemblage of plants and animals that live there. While a major control on pH is the underlying geology for a natural lake there are many other factors that can influence it including the soils surrounding the lake and the scale of any contamination. We will use the pH data to help explain the distribution of the invertebrates that people find. People will also be able to explore the relationship of pH with the presence or absence of invertebrate classes via the OPAL website.

What to do: Holding the pH dip-strip by the arrow, put the whole strip in the pond water for three seconds. Remove the strip, and then match the colour of the indicator zone (middle unprinted area) to the colour scale. Read off the printed pH value and record this in the Field Notebook (Page 11; Question 13).

Activity 3: How healthy is the pond?

Background: This is the main Activity in the OPAL Water Survey. Pond dipping to find out the creatures that live in a pond is great fun and can lead to a life-long interest in aquatic life and the wider natural world. However, we can also use the animals we find to tell us more about the health of the lake or pond. Aquatic invertebrate animals have differing tolerances to water pollution and so by seeing which animals live in a lake or pond we can find out how polluted it is – a measure we are calling the ‘Pond Health Score’. Invertebrate groups score 10, 5 or 1 with those most sensitive to pollution scoring the highest. Adding up the scores for the groups that you find gives a score for the whole pond. If you only find worms and snails the pond is of poor quality and could be improved. The presence of many different invertebrate groups and especially those which are sensitive to pollution results in a high score and indicates that the pond is in good condition. This approach is based upon work undertaken by the Freshwater Habitats Trust (previously called Pond Conservation). The background to the scoring system can be found in a report available to download via the OPAL website.

What to do: You should look for invertebrates in different areas around the lake and try to sample different habitats where possible. Different animals have varying habitat preferences so looking in different places increases the chances of finding more invertebrate groups. Try looking amongst plants, stones, dead wood and leaves. First, however, it is best to look for animals on the surface. Pond skaters are rarely caught in nets during sampling and it is easier to see them when you first arrive at the sampling location prior to undertaking any sampling. They are sensitive to vibrations on the water surface so are likely to disappear before they are caught! Next, vigorously sweep the pond net in and around the plants or other habitats for about 15 – 20 seconds. You will need to disturb the plants – but try not to damage them. Also, try not to get too much mud in the net as that makes identification difficult. If mud is in the net rinse with pond water to remove it before emptying the net into the tray. The net sweep should be undertaken several times around the pond in different areas and habitats. Use the fold-out guide to identify the animals in the tray to their groups. You only need to identify the presence or absence of each group – numbers of each are not important for this survey. Record the groups you have found using the table on Page 12 of the Field Notebook. You can use the magnifier included in the pack to get a better look at the animals too.

The presence of the animal groups can be used to calculate a pond health score. This is very straightforward. Just add up the individual scores for each animal group found in the pond. There is an example on Page 12 of the Field Notebook to help. This calculation can

be done later if people would prefer but as a group leader it may be a good idea to make sure everyone knows what to do. Alternatively, when the animal groups are entered onto the OPAL website, the score will be calculated automatically.

Important: Please make sure that people in your groups are gentle with the animals they catch and make sure they return them where they found them. Don't leave them in the tray in the sun as they will get too hot. Also, it is important to remember that Great Crested Newts are a protected species and if anyone accidentally catches one, they should be returned straight away. But do make sure its presence is recorded and you let us know!

Activity 4: What else lives at the pond?

Background: When people are visiting the pond for the OPAL Water Survey they will undoubtedly see a number of different things that are of interest to naturalist organisations. The aim of Activity 4 is to provide information on a few of these to our partner organisations. Each of these is supported by a card in the pack specially designed by the organisation and the Natural History Museum. By taking part in Activity 4 participants will be providing information of great interest to these organisations.

What to do: There are three groups that we are asking people to tell us about.

- (i) **Dragonflies and damselflies.** The British Dragonfly Society has put together a guide featuring 6 adult dragonflies and damselflies that they want to know more about.
- (ii) **Amphibians.** Amphibian and Reptile Conservation have compiled a card on frogs, toads and newts. They are asking people to provide information on any they find and also if they spot tadpoles or eggs (of any species).
- (iii) **Duckweeds.** The Botanical Society of the British Isles is interested in finding out about the distribution of a number of key duckweed species including one invasive one - Least Duckweed. The spread of invasive species can negatively affect native species and although it is known to be very common in some areas, its distribution is not fully known. Although initially these tiny plants look alike, the card shows people how to identify 6 different duckweed species.

This part of the survey could be done while other activities are in progress or people might like to jot things down as they see them. It is also an activity that could be undertaken on its own or observations could be recorded on an ad hoc basis.

8. Completing the survey and exploring the data

Sending the results of the survey to OPAL is very important to us as it allows us to compile a national picture from individual replies.

Data submission

After completing the survey, results should be entered online if possible because this enables participants to compare their results with those being collected across England. They can also explore maps of water pH and clarity and see where the different classes of invertebrate have been found. Data from groups working on a lake at the same time can be entered separately or together. Enter data at www.opalexplorenature.org If any participants do not have access to the internet they can post the completed Field Notebook to the Freepost address given on the back cover.

Data exploration

As mentioned above the Pond Health Score is calculated automatically on the OPAL website as the data are added and these and other data are plotted immediately so they can be compared with others across the country on an interactive map.

Multiple surveys

Some participants may wish to carry out an activity more than once at different lakes and ponds to compare the survey results within a local area. Copies of the recording forms from the Field Notebook can be photocopied and are available for download from www.opalexploraure.org. Registered users will be able to view a page of their pond health scores.

Post-survey

9. Related activities

After the survey has been completed and the results have been entered onto the OPAL website www.opalexploraure.org or sent back to us, participants may wish to follow up with other related activities, so here are a few ideas. Please expand these as you wish.

Looking at the national results: After uploading results on the website, users can view both their own results and those of other participants. Many invertebrates can travel quite easily between water bodies that are reasonably close as many of the adult forms can fly. Look at a few lakes and ponds in your local area. How do the survey scores vary? What might make one lake more favourable to invertebrates than others?

Seasonal changes: Visit the pond or lake at different times of the year. How do things change? What do you notice about the animals and plants you find in different seasons? Enter your results in the normal way. Why not take photographs of your lake or pond at different times of the year and send them to the OPAL Water gallery?

Adopt-a-pond: When you have done your survey you might find that the pond health is very good and you might like to make sure it stays that way! Alternatively, you might find that the water quality is poor and want to do something to improve it! Or you may just have had a good time and want to visit the lake or pond again! Why not 'adopt' the pond and form a 'Friends of....' group to look after or improve it? You could find out more about the history of the pond; organise litter collections to clean it up; see what the impacts are on it. You could repeat the OPAL Water Survey in future years to see how things have changed.

Find out more about aquatic life: If participants have enjoyed finding the animals and plants in the lakes and ponds it is easy to take this further. Participants can take photographs of animals and send them to the iSpot website (www.ispotnature.org) to get help in identifying them. If a particular group of animals or plants are of interest then there are a large number of amateur naturalist groups with people who share that interest. There are web links at the end of this document or they can be found on the OPAL website.

Make a pond of your own: Participants might like to try and create a pond of their own. Even a small pond in a back garden can encourage a vast wealth of aquatic life and is endlessly fascinating. Visit the [Freshwater Habitats Trust](http://www.freshwaterhabitats.org) website to see how to create your own garden pond. If you have very little space you can use a large plant pot filled with rainwater as a pond. Sink this into the ground or just leave it standing 'above ground' as a pot-pond. Put a few aquatic plants in and see what visits and what colonises first!

10. Additional resources

If you would like to know more about lakes and ponds or if a particular animal or plant group has interested you, you can find more information by visiting the OPAL website or the following organisations:

- Freshwater Habitats Trust www.freshwaterhabitats.org.uk (previously Pond Conservation)
- Buglife: The Invertebrate Conservation Trust www.buglife.org.uk
- British Dragonfly Society www.british-dragonflies.org.uk
- Amphibian and Reptile Conservation www.arc-trust.org
- Botanical Society of the British Isles www.bsbi.org.uk
- The Freshwater Biological Association www.fba.org.uk
- Plantlife www.plantlife.org.uk
- The Riverfly Partnership www.riverflies.org
- National Biodiversity Network <http://nbn.org.uk/>
- Royal Entomological Society www.royensoc.co.uk
- Amateur Entomologist's Society www.amentsoc.org
- British Entomological and Natural History Society www.benhs.org.uk

Help with identification:

The organisations listed above have some identification keys, many photographs and assistance with identification. Additionally, you can try some of the websites below to assist you with identification pond animals.

- iSpot. You can share photographs and get help with identifying animals and plants at the iSpot website www.ispotnature.org. iSpot are also developing online keys to help with identification. These are being developed all the time so if there is not one there for the group you are interested in, check from time-to-time to see if one has appeared. A useful 'getting started' section on the iSpot website will help you if you have not used the keys before.
- The Natural History Museum Identification Forums. Upload a photograph or description of what you have found and learn how to identify it with help from Museum experts and other forum members:
www.nhm.ac.uk/natureplus/community/identification
- Freshwater Life's Identification guides: www.freshwaterlife.org/id_home.jsp

Information about non-native and invasive species:

- GB Non-natives Species Secretariat www.nonnativespecies.org
- Plantlife non-native and invasive species campaign
www.plantlife.org.uk/campaigns/inns/