

ARUN AND ROTHER RIVER EXPLORER

A CURRICULUM LINKED RESOURCE PACK

FOR TEACHERS OF KEY STAGES ONE AND TWO



Introduction

Background:

This resource pack has been produced by Arun and Rother Connections – Linking Landscape and Community – a Heritage Lottery funded project. ARC is a landscape-scale project being delivered by a partnership made up of the RSPB, Environment Agency, Sussex Wildlife Trust, South Downs National Park Authority, Natural England, West Sussex County Council and the Arun and Rother Rivers Trust. Following a year of development work the project was awarded over £1.1 million by the Heritage Lottery Fund (HLF) in July 2013 for a three year £2 million programme of work.

One of the key aims of the project is to encourage greater appreciation of the Arun and Rother rivers and their surrounding landscapes. Our local rivers provide wonderful opportunities for outdoor learning.

“First-hand experiences... can help to make subjects more vivid and interesting for pupils and enhance their understanding... [and] could make an important contribution to pupils’ future economic wellbeing and to preparing them for the next stage of their lives.” (Ofsted, 2008)

For more information and research about the benefits of outdoor learning the RSPB’s report **Every Child Outdoors** is a great place to start.



About this pack:

This resource pack will support learning across a range of curriculum areas at Key Stages 1 and 2 including geography, history, science, maths and English. It brings together a number of resources which have been used by different education providers in this region in recent years. The idea was to bring these resources into one place and to make it as easy as possible for teachers to use the Arun and Rother rivers for teaching (both indoors and outside the classroom). The ‘rivers mind map’ (page 4) demonstrates the wealth of learning that rivers offer and a handy links page signposts how each of the resources link to the curriculum (page 3).

The pack is accompanied by a series of case studies which detail four river locations in West Sussex where field trips have been or are being delivered during the ARC project. Each of these sites has been assessed by experienced field teachers and each case study includes information specific to the site including risk assessments and pre and post visit ideas.

River field trips are well linked to the curriculum’s requirements for Key Stage 1 and 2 to; “use simple fieldwork and observational skills to study the geography of their school and the key human and physical features of its surrounding environment” and “name and locate...geographical regions and their identifying human and physical characteristics, including hills, mountains, cities, rivers, key topographical features and land-use patterns; and understand how some of these aspects have changed over time”.

This resource pack and the accompanying resources can all be downloaded for free from:

www.arunwesternstreams.org.uk/learning

We hope you enjoy exploring the Arun and Rother rivers and bringing their wonderful natural and cultural heritage alive in your teaching.

We welcome your feedback and comments.

Contact: learning@southdowns.gov.uk

Contents

| Section | RIVER STUDY RESOURCES | PAGE |
|---------|--|------|
| 1 | Introduction | 1 |
| 2 | Cross Curricular Links | 3 |
| 3 | Rivers mind map | 4 |
| 4 | The Arun and Western Streams catchment map | 5 |
| 5 | River Arun facts and figures | 6 |
| 6 | River Rother facts and figures | 14 |
| 7 | Visiting a river | 17 |
| 8 | Example day | 24 |
| 9 | Field Trips | 27 |
| 10 | How to draw a field sketch | 29 |
| 11 | MINIBEASTS | |
| 11.1 | Discovering wetland minibeasts | 31 |
| 11.2 | Minibeast hunting in a river landscape | 35 |
| 11.3 | River kick sampling method | 36 |
| 11.4 | Minibeast recording table | 40 |
| 11.5 | Minibeast food chain information | 42 |
| 11.6 | Invertebrate photo key | 46 |
| 12 | RIVERS | |
| 12.1 | River corridor survey key | 47 |
| 12.2 | River corridor survey table | 48 |
| 12.3 | River WOW words | 49 |
| 12.4 | Investigating the speed of a river | 50 |
| 12.5 | Speed of river recording table | 53 |
| 12.6 | River rope activity | 54 |
| 12.7 | River Arun and floodplain photos | 56 |
| 12.8 | River Rother photos | 58 |
| 12.9 | Invasive species | 60 |
| 12.10 | Plant explorer key | 63 |
| | CLASSROOM ACTIVITIES | |
| 13 | Investigating water clarity | 65 |
| 14 | Measuring water use at home | 68 |
| 15 | River diagram | 73 |
| 16 | Cross-section of river and recording sheet | 74 |
| 17 | Further resources | 78 |
| | GLOSSARY AND RELATED VOCABULARY | |
| 18 | Important vocabulary | 79 |
| 19 | River vocabulary word search | 81 |

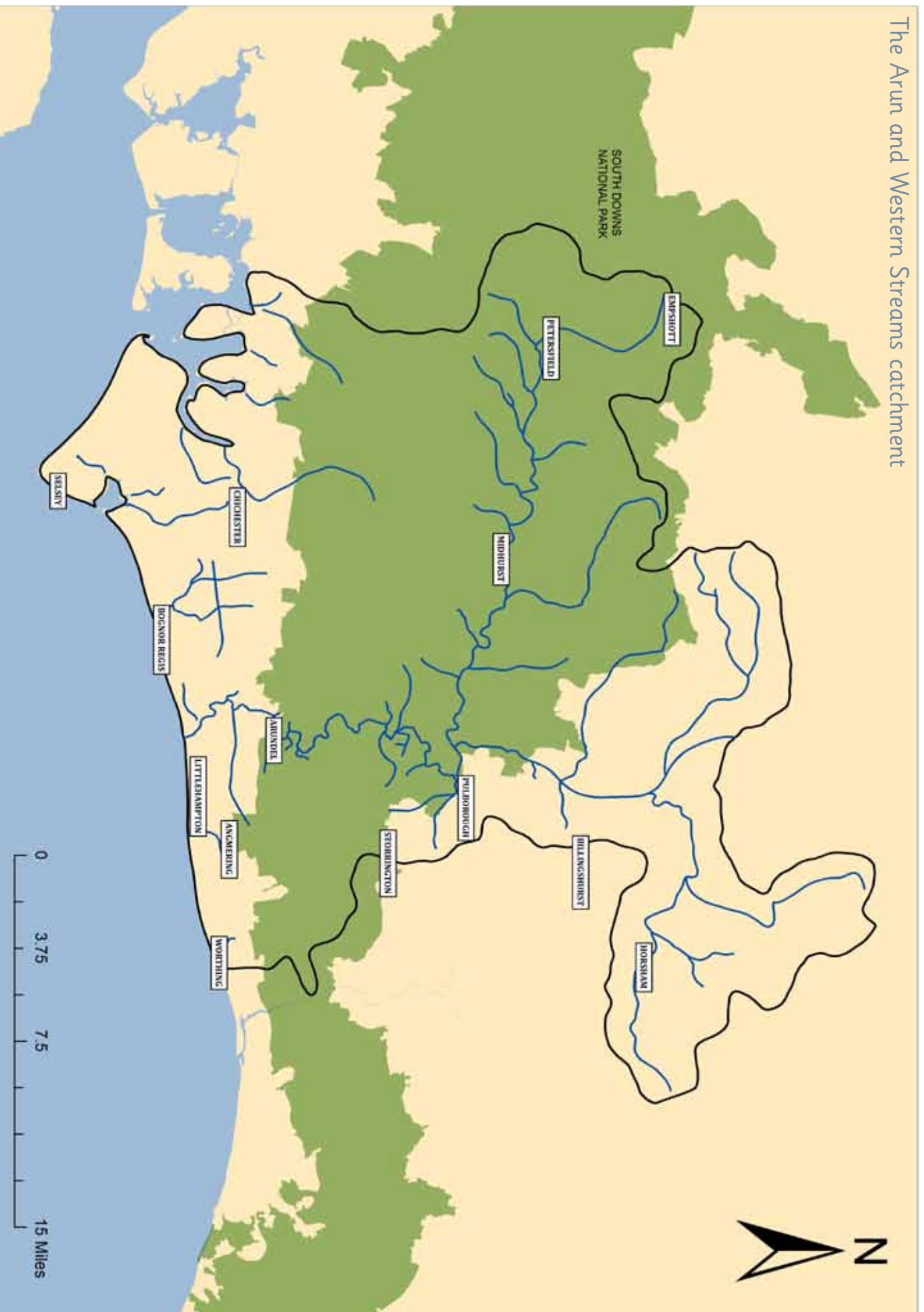
Cross Curricular Links

| Section | Activity | National Curriculum links |
|----------------|--|---|
| 5 | River Arun facts and figures | KS2 History – a local study |
| 6 | River Rother facts and figures | KS2 History – a local study |
| 10 | Field Sketch | KS2 Geography Geographical Skills and Fieldwork Use fieldwork to observe, record KS2 Art and Design – to improve mastery of art techniques including drawing with a range of materials e.g. pencil |
| 11/11.3 | Minibeasts and kick sampling | KS2 Geography Geographical Skills and Fieldwork Use fieldwork to observe, record KS2 Science Lower and Upper KS2 Working Scientifically Yr 4 Living things and their habitats Animals including humans (food chains) Yr 6 Living things and their habitats |
| 12.1 | River corridor survey | KS2 Geography Geographical Skills and Fieldwork Use fieldwork to observe, record Use symbols and key to build knowledge Human and Physical Geography Describe and understand key aspects of – physical geography including rivers – human geography including types of settlement and land use |
| 12.3 | River WOW Words | KS2 English Lower and Upper KS2 Writing – Vocabulary and Composition |
| 12.4 | Investigating the Speed of a River | KS2 Geography Geographical Skills and Fieldwork Use fieldwork to observe, record KS2 Maths Yr 3 Measurement – measure lengths, record and compare time Yr 5 Statistics – complete, read and interpret information in tables Yr 6 Statistics – calculate and interpret the mean as an average |
| 12.6 | River Rope Activity | KS2 Geography Human and Physical Geography Describe and understand key aspects of physical geography including rivers |
| 13 | Water Clarity | KS2 Geography Geographical Skills and Fieldwork Use fieldwork to observe, record KS2 Science Lower and Upper KS2 Working Scientifically |
| 14 | Measuring water use at home | KS2 Mathematics and Science |
| 17 | Cross-section of river and recording sheet | KS2 Mathematics and Science |
| | Case Studies | Links will be as above for the selected activities for each Case Study, and also: KS2 Geography Geographical Skills and Fieldwork Use maps to describe features studied Use symbols and key to build knowledge KS2 Science Guidance: Pupils should explore examples of human impact |

Rivers mind map



The Arun and Western Streams catchment



River Arun facts and figures

Course of the River Arun

The Arun is one of the longest rivers in West Sussex being 84km from source to sea and is noted as the second fastest flowing tidal river in the UK. It has many tributaries that join it throughout its length, the main named ones being the River Rother, River Stor, River Kird, North River, Boldings Brook and the Horn Brook.



It drains over 974 square kilometres of land within its **catchment area**. This is one of the largest **drainage basins** between the River Tamar on the Devon and Cornwall border to the west and the River Medway in Kent to the east.

River Arun facts and figures

The **source** of the River Arun rises in St Leonards Forest, east of the town of Horsham, as a series of small **streams** called **ghylls** (or **gills**). The forest here is around 125m above sea level so the land is not mountainous, just a bit hilly. Further downstream the River Arun can be one of the fastest flowing rivers in England. It is **tidal** as far as Pallingham Quay, near Pulborough, 41 kilometres upstream from the sea. The **mouth** of the river is at Littlehampton where the River Arun flows into the English Channel. 23% of water that the local water company Southern Water uses to supply local communities comes from our rivers. We can all help to keep the Rivers Arun and Rother healthy by using water wisely.



Woodland
ghylls



Tarrant Street,
Arundel



The river has not always been known as the River Arun. The first known recording of the modern name 'Arun' was in 1577. During the Roman occupation it was known as the Trisantonis, roughly translated as 'the wanderer' or "trespasser", probably because the river **meanders** across the landscape and regularly floods land near to it. By 1270 it became known as the Tarrant and it is thought that this name originates from the Roman name.



River Arun facts and figures

The location of the **mouth** of the River Arun has changed with time. Until the late 1400s the River Arun joined the River Adur at Lancing before continuing to the sea. Over time the **estuary** became blocked by shingle moved by tidal processes. This caused the River Adur to be pushed further east towards Shoreham, while the River Arun broke through to the sea. This happened first at Worthing and then moved west to Goring and Ferring, before eventually joining the sea at Littlehampton where its mouth remains today.



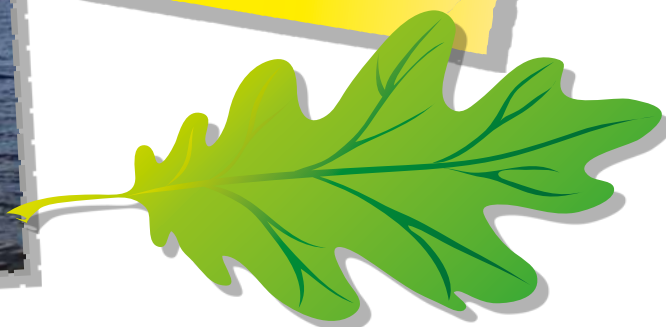
© Andy T Lee Photography

Littlehampton Harbour 2015



Use of the River Arun

The first organised use of the River Arun most likely occurred when the Romans invaded Britain in the first century AD. Travelling on the river gave an easier way to explore the country compared to moving through dense woodland on land. It provided fresh water and a source of food.



River Arun facts and figures

Old Drover's Road



Until the end of the 18th century rivers were almost the only way to travel through Sussex as there were hardly any roads that were useable. Most were deep with mud and full of potholes. Rivers were also the easiest and cheapest way to move goods such as grain, coal, stone and animals.

Mill Pond



The upper reaches of the River Arun around Horsham were important in the development of the iron industry from 1540 to about 1630. The river was used to make many hammer ponds all around Slaugham and Mannings Heath. They were made by damming the river which created ponds used for cooling the molten iron. Leats (sluiced streams) diverted from the hammer ponds provided power to drive the water wheels for bellows and forging hammers.



River Arun facts and figures



Example of a medieval iron furnace or “bloomery”.

The River Arun flows mainly through countryside and does not pass through any large towns so there has never been a lot of industry on the river. Much of the river traffic was goods being transported such as chalk and lime from the Amberley chalk pits as well as coal and agricultural produce.



Littlehampton is an important site as it is at the mouth of the River Arun. It has had a large quay since the end of the 1600s used to transfer cargo between coastal vessels and river boats. When the Wey and Arun canal opened in 1816 the quay became even more important as it was easier to unload cargo onto barges there to be transferred up river. Ships have been built on the Arun for at least 400 years, especially in the early 1800s when fishing boats, merchant ships and small warships were built. At times in the past at least one in five men in Littlehampton worked in a job connected with shipping, either building them or as sailors. During the two World Wars the port was used as a shipping point for supplying ammunition and equipment to the Western Front in France.

Littlehampton Harbour c1850



River Arun facts and figures

Arundel is the main town on the river. It was established as an important port on the river when the Normans built a castle there. Arundel continued to be important because people with power and status wanted it to be so, rather than because it was a good location. Up until the 1800s there was still shipping going to and from Arundel. Imports included playing cards, glass, wrought iron, tombstones, millstones, paving stones, and wines from France and Spain. There were two breweries and a thriving timber trade there.



C1820 Arundel Docks



© Arundel Museum

With the coming of the railways and changes in coastal shipping, Littlehampton superseded Arundel as the port of the River Arun, and the Littlehampton harbour commissioners are still responsible for the river up to Arundel today, collecting tolls for its use.



River Arun facts and figures

Present use and significance of the river Arun

The Arun has now lost its commercial activity but this can be seen at the local museums designated to facilitating access to the images and stories of the past.

Littlehampton as a port is no longer evident but as a tourist and leisure destination it is a vital part of the South East coastline.

Walks and boat trips along the Arun provide a wonderful view of the rich landscape and wildlife within this area.

Arundel is a town steeped in historical buildings and provides a variety of tourist attractions including a vibrant antiques community, museums ,river walks and a wildlife centre.

The Arun has a diverse corridor of use running alongside its length and a network of bridges and pathways provide access to this wonderful area.

Floodplains and reinforced banks help to compensate at times of flood risk and livestock can be seen grazing on lush land. The riverscape and banks are teeming with life and vegetation such as; water voles, reeds, over wintering birds, a vast array of invertebrates and many other flora and fauna.

The river has various designations including :

- Special Protection Area (SPA)
- Special Area for Conservation (SAC)
- Wetland of International Importance (Ramsar)
- Three designations of Site of Special Scientific Interest (SSSI)

The above can be researched for the reasoning behind the designations as an extension activity



River Arun facts and figures

River Arun: key facts and figures

| | |
|-------------------|---|
| Country: | England |
| County: | West Sussex |
| Main tributaries: | River Rother, River Stor, River Kird, Loxwood Stream, North River, Boldings Brook and the Horn Brook. |
| Main towns: | Horsham, Arundel, Littlehampton |
| Source: | St Leonards Forest, Colgate, Horsham |
| | Elevation (height above sea level): 125m |
| | Elevation (height above sea level): 0m |
| | Tidal range at Littlehampton 5.2m (Spring tides) – 2.7m (Neap tides) |
| Length: | Total length 84kms (River Arun NRA booklet 1992) |
| | Tidal reach 41kms from Pallingham to mouth |
| | High tide at Pulborough is 4 hours later than at Littlehampton |



River Rother at Coultershaw

Drainage basin area:

974 square kilometres

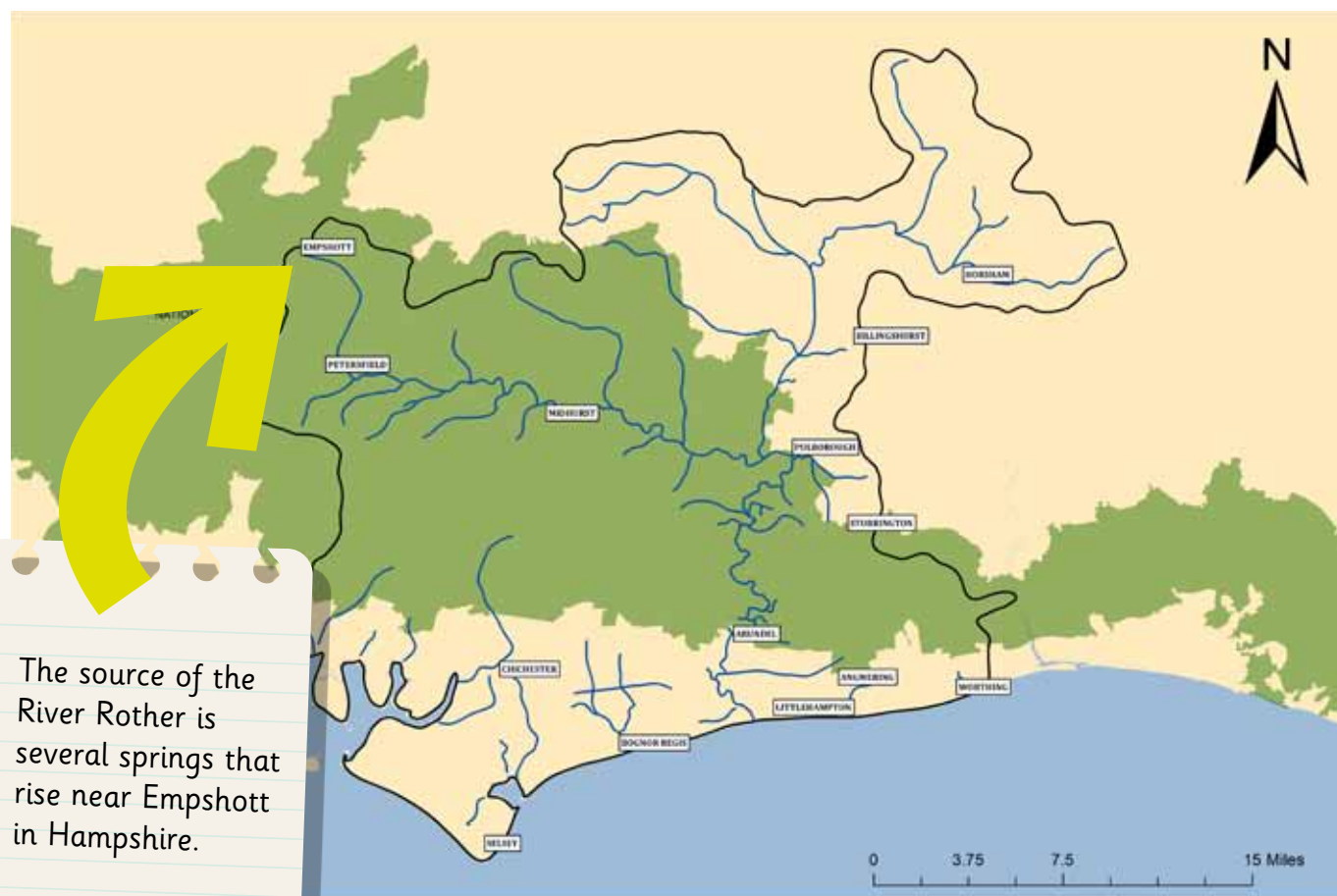
Protection status:

Ramsar Wetland designated in 1999

14 major bridges span the river.

The Arun is the second fastest tidal river in the UK (after the Severn).

River Rother facts and figures



The source of the River Rother is several springs that rise near Empshott in Hampshire.


See page 4 for larger map



The Rother does not flow out to sea and is the largest tributary of the River Arun joining it at Stopham in West Sussex. It flows along the foot of the South Downs and some of its water comes from springs from the chalk slopes of the Downs. It has been designated a Site of Nature Conservation Importance due to its wildlife and it has a wide range of fish living in it such as brown trout, grayling, bullheads, eels, lampreys, minnows and stone loaches.

River Rother facts and figures


white-clawed crayfish



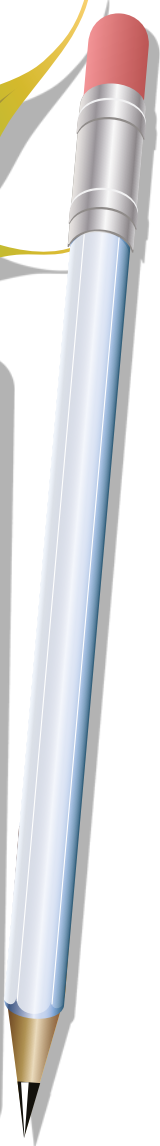
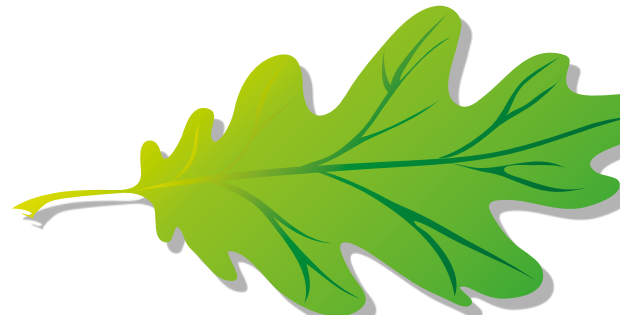
The white-clawed crayfish (*Austropotamobius pallipes*) is Britain's only native freshwater crayfish. The upper reaches of the Rother are the only location in the county where it can be found. It is under serious threat from an American invader – the signal crayfish, introduced for food in the late 1970s and 1980s.



River Rother at Fittleworth



The River Rother is 52km long, of which 42km are in West Sussex and it has a catchment of about 350km². It flows from west to east and is quite fast flowing. Its valley is narrow and its floodplain is also narrow, being used mainly for grazing cattle.



River Rother facts and figures

The River Rother was originally called the Scire or Scir which is an old Saxon word for 'clear' or 'bright'. This described the water as it flowed over the pebbles. Over the last 30 years the river bed has become covered in sandy silt due to a fine sediment entering the river. Its modern name of Rother, is taken from Rotherbridge, a hamlet near Petworth, and means cattle bridge.



Fittleworth



Stedham Mill.
Now a private residence



Between its source and Midhurst, the river has in its past, been used to power watermills. The earliest known of these is mentioned in the Domesday book in 1086. Though none of them work any more their buildings still exist, some even have their milling machinery still in place.

River Rother facts and figures

Cowdray ruins



From Midhurst to its confluence with the River Arun, the River Rother was once used by boats.

Midhurst



Most of the cargo taken along the river was coal and corn going towards Midhurst, also Petworth marble going towards the River Arun and down to the coast at Littlehampton. In 1782 a beam pump was installed on the river at Coultershaw (now Coultershaw Heritage Site) which provided an extra water supply for Petworth House and town.

The Earl of Egremont made this stretch of the river to Midhurst passable for boats in 1794 by building eight locks. Unfortunately, the railway opened a line to Midhurst and so commercial traffic stopped using the river by 1880. The river was neglected as only pleasure craft used it. Rowing boats could be hired at Coultershaw and Fittleworth but even they finally stopped using it as it became impassable.



Coultershaw beam pump

River Rother facts and figures

River Rother: key facts and figures

| | |
|--------------------|---|
| Country: | England |
| County: | Hampshire and West Sussex |
| Main tributaries: | River Lod, Costers Brook, Batt Brook, Tilmore Brook |
| Main towns: | Midhurst, Liss, Petworth |
| Source: | Empshott, Hampshire |
| | Elevation (height above sea level): 140m above sea level |
| Mouth: | River Arun, West Sussex |
| Length: | Total length 52kms (River Arun NRA booklet 1992) |
| Protection status: | Site of Nature Conservation Importance – area covered 234ha Areas of the Rother are designated as Areas of Outstanding Natural Beauty (AONB) |



Visiting a river

In this section you will find useful information which can be shared with parents and children before the field trip

Contents of this section

- Information for teachers
- Information for parents
- Dressing for the day
- Health and Safety and First Aid



Visiting a river

INFORMATION FOR TEACHERS

Behaviour expectations:

Prior to the visit talk about what the children can expect to see. Perhaps show photos from your pre-visit (although this may reduce the “wow” factor of self-discovery for the children). Create “code of conduct” style rules for the visit in discussion groups or talk partners.

Ideas for rules:

- We will walk calmly and stay together as a group. (To reduce the risk of trip/slip hazards and to be able to sight members of the group at all times).
- No child to be “off-side” (i.e. closer to the river than a responsible adult or in front of the leader when walking).
- Use normal voices or “quiet” voices (To stand the best chance of seeing wildlife before noise frightens it away, and so that if someone does get in to difficulty they will be heard) Explain that rules suitable for visiting one river may need to be adapted to visit another. Important note: It is important to be aware that an individual river can change its character after heavy rain. Children (or adults!) should never conduct an activity in a river unless they are sure it is safe to do so.
- Do not pick wild flowers or drop litter



Visiting a river

INFORMATION FOR PARENTS

Perhaps the most important thing to emphasise with parents is the need for their child to be properly dressed for outdoor learning (see 'Dressing for the Day' below) to ensure a comfortable, safe day. It is important to emphasise that indoor shelter may not be available and this needs to be verified at during a pre visit and within any written trip information. Written consent and payment details. Outline of the activities and a parents meeting to inform about the visit, provide detail and reassurance.

Written information for parents about the visit may include:

- Date of visit
- Time and place of departure and estimated time and place of return
- Cost and payment return deadline
- Purpose of visit with outline of activities the children will take part in, and expected learning outcomes
- Information about arrangements regarding travel sickness prevention and personal medication e.g. asthma inhalers.
- Travel sickness medication may need to be taken before the child arrives at school.
- Opportunity for parents to advise of anything you may need to know for planning: medical/mobility/fear of water etc
- Packed lunch and drink needs.
- Clothing and footwear needs. (See page 20)
- Details for camera use such as; phones will be brought at parents own risk. Provide this in writing to avoid conversations regarding replacement of the phone/camera if lost or damaged.
- Permission slip to take part in visit, use hand-wipes/sanitising gel/sun cream/ give medication.
- Signed consent for photographs to be taken and used subsequently. Most schools have a "standard" trip letter, so adapt it to take account of the needs of preparing to be outdoors for prolonged periods of time in adverse weather (remember hot weather can be as hazardous as cold wet weather).



Visiting a river

DRESSING FOR THE DAY

Prepare for the seasonal weather and encourage layers of clothing for versatility and warmth.

A light-weight waterproof jacket is just as useful as a wind-proof. It is generally the wind-chill effect which is underestimated. If the visit day weather is bright and sunny you will need to check that coats have been provided as a precaution for variable conditions. One child starting to suffer from exposure may dictate that the whole group has to abandon the visit and mild symptoms can soon become more serious in extreme weather e.g. sun, cold, rain. Instructions to encourage parents to provide appropriate clothing, enable a visit to the outside classroom to be successful in almost all weather conditions.

Suggested “kit” list:

- Comfortable, appropriate, well fitting footwear– wellies, sturdy boots, trainers that can get muddy etc.
- Wellies are often not warm – extra socks is a simple but often overlooked solution.
- Hat and gloves in cooler weather
- Sunhat and sun cream in warmer weather
- Personal medication: Hayfever/asthma/travel sickness
- Several layers – vest, t-shirt, sweatshirt, second jumper, waterproof jacket, leggings under trousers
- Packed lunch with drinks – rucksacks are more suitable for carrying while walking.
- Re-sealable water bottles are more convenient than cartons or pouches, ensure plenty of water is provided in hot weather
- Consider bringing a carrier bag each to sit on if the ground is wet.



Visiting a river

HEALTH AND SAFETY AND FIRST AID

First aid:

Ensure you have enough trained first aiders with you. Clarify your school rules for off-site visits. Consider additional training for outdoor first aid and increase awareness of common related issues – particularly over exposure to sun and hypothermia. Provide a first aid kit and trained first aider for every group. Epi pens and asthma relievers need to be in the same group as they child they belong to. Epi pens (adrenaline) are emergency treatment of life-threatening allergic reactions (anaphylactic reactions) for example to food, drugs, insect bites or stings or other allergens. www.netdoctor.co.uk/allergy-and-asthma/medicines/epipen.html

Health and Safety

- **You will need to produce a risk assessment prior to the trip and a pre visit to the site is essential.** Most schools will have a template document to use and timescales for completion of the document for approval prior to the trip. We have also provided a risk assessment with each case study.
- Share the final approved version with the other responsible adults.
- Parent helpers will need to see the risk assessment and an outline of the day's activities. A briefing document for parents to read before departure will ensure that all helpers are aware of the routine and expectations.
- Tick bites: Walking in tall vegetation – be aware of how to identify and deal with ticks, (deer) www.webmd.boots.com/travel/ticks
- Plan for rubbish – check the area is clear when you leave. Collect the rubbish centrally or encourage each child to carry their own rubbish. (If parents are helping and the group may split up check that their child's lunch is going to be with the child and not with the parent somewhere else at lunchtime!)
- Provide wet wipes/ hand-sanitising gel if hand washing facilities are not available – check for allergies.















© Andy Hay rspb-images.com

ARC Education : site visit resources

Things to take on site visit

- ✓ Clip board and pen/pencils
- ✓ O.S map/Site map if available
- ✓ A4 paper and pencil for field sketch
- ✓ Camera
- ✓ Compass
- ✓ Tape measure
- ✓ Dog biscuits
- ✓ Sweep net /sheet
- ✓ Pond net (not one used at PB)
- ✓ River survey recording chart
- ✓ Stop watch/timer
- ✓ River corridor sheets and speed test sheet
- ✓ Throw line/river rope, and foil blanket

Minibeast recording table (terrestrial)
See how many of these creatures you can find and tick them off as you go

| Animals with no legs | | |
|---|---|---|
|  |  |  |
| Worm | Slug | Snail |
| Animals with 6 legs | | |
|  |  |  |
| Beetle | Caterpillar | Earwig |
|  |  |  |
| Hoverfly | Ant | Dragonfly |
| Animals with more than 6 legs | | |
|  |  |  |
| Millipede | Harvestman | Spider |
| Others seen | | |
| | | |
| | | |
| | | |

SECTION 8 PAGE 38



Example day

ARC EDUCATION FIELD STUDY VISIT

Site Coultershaw Beam Pump: explore Coultershaw

Suggested plan for fieldwork day for class of around 30 children.

Not all sites will be the same as this example, and teachers should look at the accompanying case studies.

10.00am

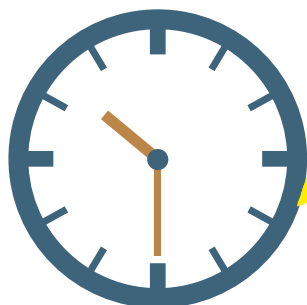


School arrive

Coultershaw volunteer will have met coach at top of track to direct to Warehouse.



10.30am



Explore History

A visit to the Pump House and the Engine House in small groups to explore the history of Coultershaw. Coultershaw volunteers will be on hand to give a short talk and demonstration in each building. Students will have the opportunity to ask questions and try out hands-on activities.



11.15am



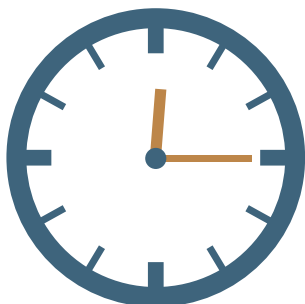
Explore Nature

Working in small groups doing practical activities, the students will have the chance to discover and find out about some of the wildlife including minibeasts, and their habitats around the site.



Example day

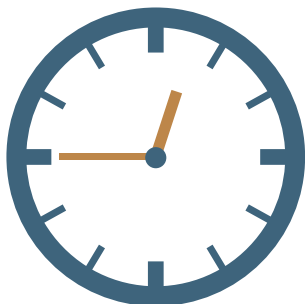
12.15am



LUNCH back at Warehouse. Wash hands/use of toilets. Visit the stables.



12.45am



Explore River

The groups of students will take part in closely supervised activities by the river, which could include a River Survey recording, a River Speed Investigation and/or a Field Sketch.



13.45pm



Plenary/review

At Warehouse. Review activities using Learning Outcome poster. What did you see? What did you learn? What did you enjoy? Return to Warehouse for toilets, collect lunch bags, goodbyes.

14.15pm



DEPART



| Minibeast recording table (terrestrial) | | |
|--|-------------|-----------|
| See how many of these creatures you can find and tick them off as you go | | |
| Animals with no legs | | |
| Worm | Slug | Snail |
| Animals with 6 legs | | |
| Beetle | Caterpillar | Earwig |
| Hoverfly | Ant | Dragonfly |
| Animals with more than 6 legs | | |
| Millipede | Harvestman | Spider |
| Others seen | | |
| | | |
| | | |

SECTION 8

PAGE 38

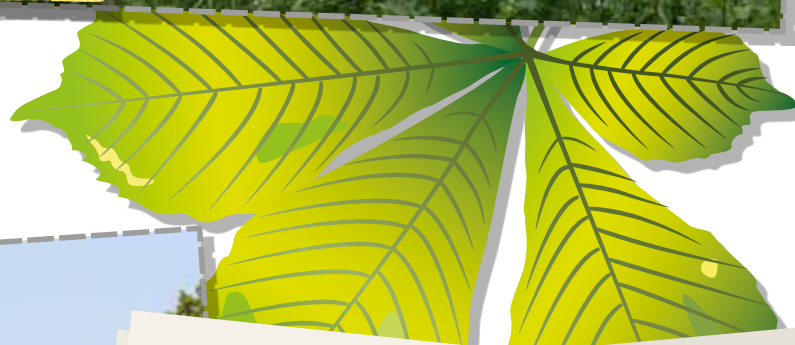
Field trips

Here are the details of four locations and providers that offer river based outdoor education activities on the Arun or Rother in West Sussex. There are case studies available for each of these sites which include risk assessments and site specific activities. These are available to download from www.arunwesternstreams.org.uk/learning

Coultershaw Heritage Site and Beam Pump, near Petworth, West Sussex, GU28 0TE.

This site includes a waterwheel, 18th century waterpump, 21st century water turbine and historic buildings set around the mill pond.

Contact: Elaine Sansom
learning@coultershaw.co.uk
Michelle Clifford
killybegs9@gmail.com
www.coultershaw.co.uk



Chesworth Farm, Chesworth Lane, Horsham, West Sussex, RH13 0AA.
 Horsham's Secret Paradise! This 36 hectare farm incorporates grassland, the River Arun, wildflower meadows, ancient hedgerows as well as a new wetland walk boardwalk. Outdoor education activities provided by experienced field teachers.

Contact: Steve Delahunt
Steve.Delahunt@horsham.gov.uk
www.horsham.gov.uk/parksandcountryside/parks-and-countryside-sites/chesworth-farm

Field trips

Arundel Museum, Mill Road, Arundel, West Sussex BN18 9PA

Re-opened in 2012 this award winning Museum's exhibits have been arranged to tell the story of the town of Arundel from the first pre-Roman settlements to the present day. It also features displays and models focusing on the river Arun and the surrounding countryside.

**Contact Suzanne Evans
or Polly Thorburn**

education@arundelmuseum.org
office@arundelmuseum.org
www.arundelmuseum.org



Botany Bay, Seaford College, near Petworth, West Sussex GU28 0NB

Botany Bay is an area of woodland with a beautiful chalk stream running through it where river features such as meander, flow, waterfalls, pools and banks, can be seen. There are opportunities for pond dipping and kick sampling in the stream. The woodland provides areas for plant identification and mini beast hunting. Above all Botany Bay is a quiet place for reflection and creative work

Contact Anne Dennig
annedennig@icloud.com

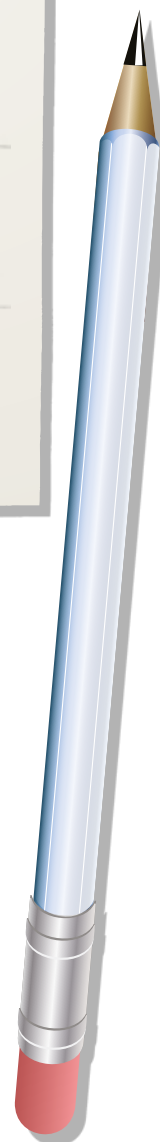
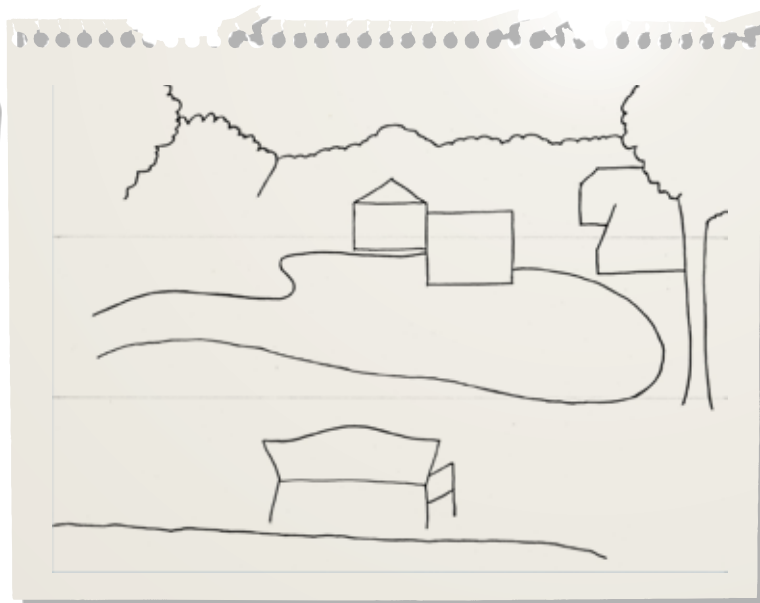
Example of how to draw a field sketch

This exercise can be done when on a field trip. There is also an accompanying Powerpoint presentation resource. The following instructions have been written to support the learning of students visiting Coultershaw Beam Pump.

Draw 2 lines lightly, approximately dividing the page equally into 3 parts.

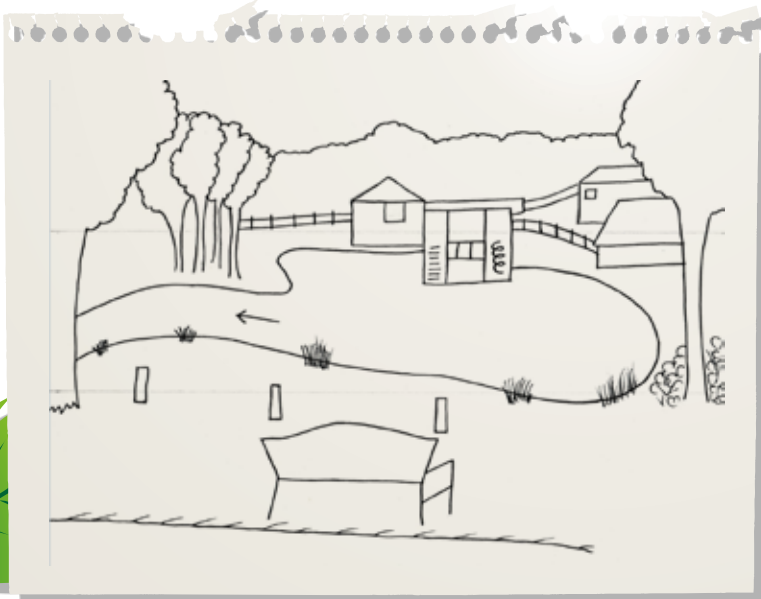
Looking at the landscape view draw in the HORIZON using the top line as a guide. Draw what you can see in the far distance e.g. Hills at the top. Draw things nearest to you at the bottom of your sketch.

Draw in the "middle ground" downwards from the horizon line. Remember, the nearer something is the more detail you can see.

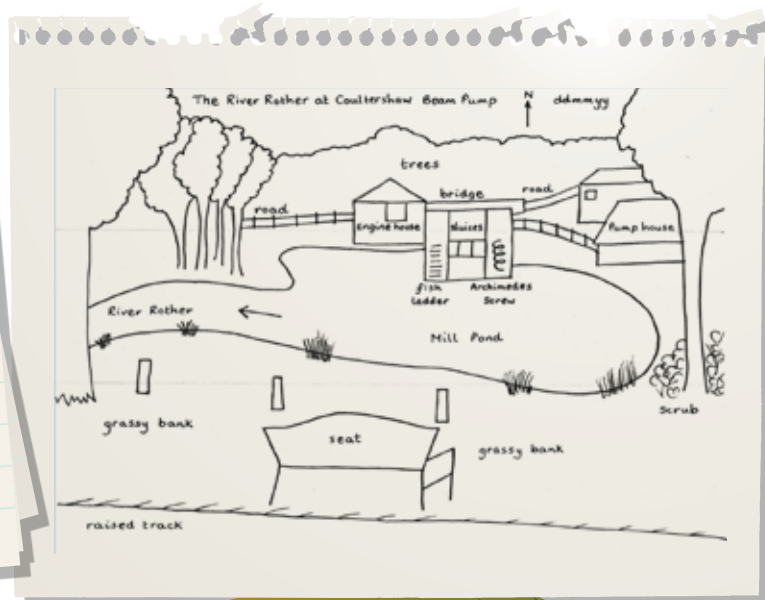


Example of how to draw a field sketch

Draw in
anything that
you can see!



If it doesn't look like it
should then label it. You
can add extra details, such
as the place, time, date,
weather, direction and don't
forget to put your name on
your field sketch.



Do you recognise this
photo? Compare this
to the field sketch.
Why is the field
sketch a really useful
way of recording this
special place?



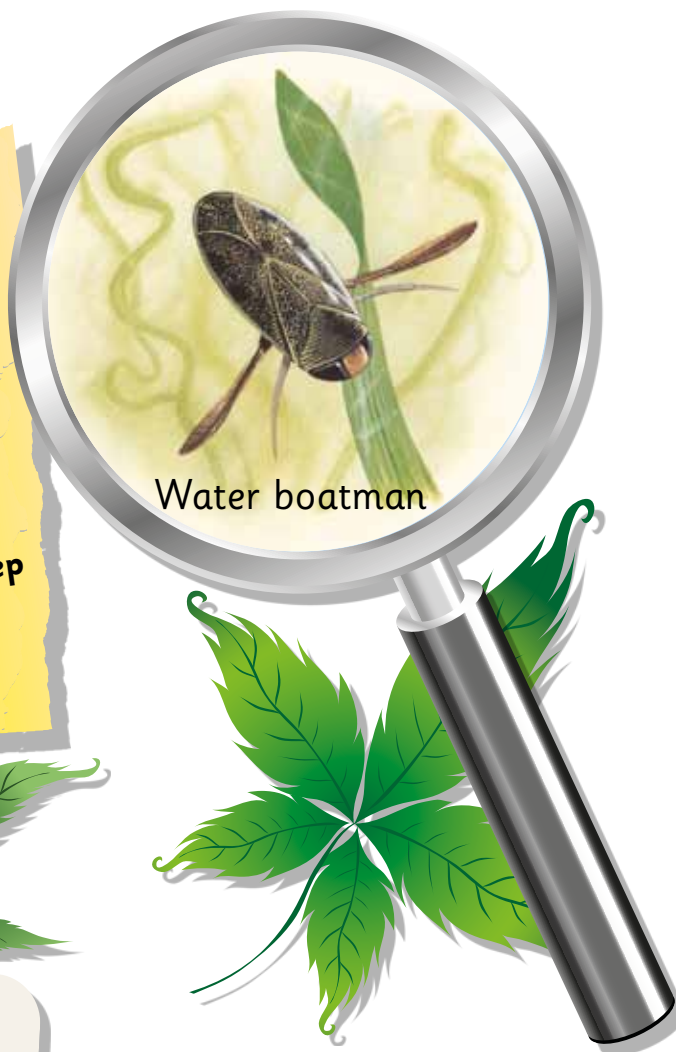
Discovering Wetland Minibeasts

AQUATICS MINIBEASTS

Pond dipping

Be aware of individual supervision needed around the pond/river edge.

Lay down boundaries and respond quickly to incidents.
Give clear instructions regarding safety, care of creatures, being vigilant of the environmental hazards e.g. deep water, animal faeces, broken glass, slippery edges etc.



Water boatman

Safety

- ✓ Throw line / rescue pole / net handle may be used in small shallow pond
- ✓ Risk assessment through site pre visit
- ✓ Cover any cuts with plastic gloves and plasters to avoid infections
- ✓ Antibacterial hand wipes or gel
- ✓ Suitable clothing for the seasonal weather and spare clothing
- ✓ Tick bites: Walking in tall vegetation – be aware of how to identify and deal with ticks, (deer)

Equipment needed:

- ✓ Pond nets
- ✓ Tray to collect pond water / creatures e.g. washing up bowl / pond tray
- ✓ Bucket with a rope to collect water
- ✓ Bug pot / magnifier/teaspoon / sorting pots/tray
- ✓ ID Chart / recording chart
- ✓ Plastic gloves – see safety note

Discovering Wetland Minibeasts

AQUATICS MINIBEASTS

Pond dipping



tadpole



- Instructions to be given at school and on site.
- Look carefully at the site on arrival. The condition of the river may be very different to that of the pre visit. If any concerns for safety do not carry out the activity.
- Manage the group calmly and set out the arrangements for conducting the dip.
- Small group work e.g. 4-6 children to minimise the amount of children at the waters edge.
- Discuss sustainability / care of creatures.
- Demonstrate techniques – safe and effective dipping e.g. not leaning over the water but sideways on and well apart to aid balance.
- Dip under vegetation and open water. You may catch more life by using a figure of eight motion.
- Position the trays away from the edge in a safe area and explain this to the children.



You can find additional pond dipping guidance on the RSPB kids pages as well as activities like how to make your own net as well as indoor learning games:
www.rspb.org.uk/discoverandenjoynature/families/children/makeanddo/choice-activity/pond-dipping.aspx
 RSPB pond mini beasts ID chart:
www.rspb.org.uk/Images/pond_dipping_tcm9-401046.pdf

Discovering Wetland Minibeasts

AQUATICS MINIBEASTS

Method

- ✓ Encourage the children to observe and describe the habitat and suggest what might live there.
- ✓ Collect water from pond or river – adult
- ✓ Share water out between trays
- ✓ Children take turns to dip
- ✓ Return with net of creatures – turn into pond tray – laminated ID charts to be used
- ✓ Handover net to next person and ID their find – children may wish to log this onto tick sheet
- ✓ Use teaspoon to gently place minibeasts into a bug pot for individual identification and feature examination e.g. Movement, behaviour, how many legs etc If sorting trays/pots are used minibeasts can be sorted into groups according to chosen features. Put bugs back into tray and adult to put back into river



Explain that:

- Only one creature should be placed into the bug pot at a time.
- Large creatures e.g. newts can be viewed in the tray or bucket.
- Try not to put too much into the trays as it will be difficult to see the life you have collected.
- The creatures can be very delicate and so by handling with a spoon they are more likely to survive the activity and also it will prevent any bites or stings
- Adults to place creatures back into the water as they will not survive out of the water.
- Remind children that these are living creatures and they will want to return to their home!

Discovering Wetland Minibeasts

AQUATICS MINIBEASTS



Wash hands and if no access to fresh water ensure that wipes or gel are used. Weil's disease can be a risk in river / pond water together with other causes of infection but with good instruction regarding not putting hands near mouths, not eating or drinking without washing hands, this will not be an issue.

Remind children to look at nature with a different view e.g. look up into the trees and take photos of their finds if cameras are available

Have a wonderful day!!



Minibeast hunting in a river landscape

MINIBEAST/ BUG HUNTING



Be aware of individual supervision needed in the river environment.

Lay down boundaries and respond quickly to incidents

Give clear instructions regarding safety, care of creatures, being vigilant of the environmental hazards e.g. animal faeces, broken glass, slippery edges etc.

On the pre visit to the site take note of the surrounding river habitat e.g. meadow, hedgerow, woodland. This will allow you to tailor the session accordingly, for example a meadow would require sweep nets and leaf litter would require a sieve.

ID charts can also be more focused if aware of the environment

Safety

- ✓ Throw line /rescue pole if close to water
- ✓ Risk assessment through site pre visit
- ✓ Cover any cuts with plastic gloves and plasters to avoid infections
- ✓ Antibacterial hand wipes or gel
- ✓ Suitable clothing / footwear for the seasonal weather



River kick sampling method

Aim: To capture, identify, count and record a sample of river invertebrates by kick sampling.

Safety considerations

River levels can increase after heavy rain so always consider when the last rainfall was and pay attention to changing weather conditions during the activity.

Undertake a pre-visit of the site and complete a risk assessment.

Cover cuts or open sores on hands with plaster to reduce the risk of infection. Remind children not to put fingers in mouths (or up noses) during the activity.

If hand washing facilities are not available provide wipes and/or sanitising gel and obtain parental permission for children to use it.

A safety throw line may be required.

Carry at least one emergency foil blanket in your first aid kit.

Consider taking changes of clothes.

Not all sites are suitable for kick sampling. Please check with a qualified education provider about the suitability of your chosen site.



River kick sampling method



Equipment

- Wellies for those entering the water
- Sampling net – best choice would be a 2mm sample net, but kitchen sieve either hand-held or securely fixed to a cane could be used
- Stopwatch
- Plastic tray – preferably white to empty sample into. 4-6 children per tray.
- Jug or bucket to fill plastic tray with river water
- Identification key
- Magnifying viewer pots
- Plastic spoons
- Minibeast recording table worksheets
- Clipboard
- Pencil
- Camera



River kick sampling method

Method

View the river from the bank and involve the children in deciding upon a sample area that has easy, safe access and which represents the typical conditions. The criteria needed could have been discussed in class prior to the visit. Decide on the sample time – e.g. 3 minutes.

Prepare the white plastic trays by filling with 3cm of river water and stand them ready somewhere level. These will hold the catch later and the children will need enough space to gather round them to identify the creatures.



The number of children entering the river to sample will depend upon the river width. If some children are to remain on the bank ensure they have a safe place to view from and are not likely to fall in. The children carrying out the sampling should carefully enter the water with their nets held in the water downstream of their feet. It's important for the children to get into position as gently as possible as some creatures will swim away if they sense vibrations. One child can be the timer and on their "start" signal the sampling children kick the stones, sand and sediment on the bottom of the river at their feet. The kicking needs to be firm enough to move the river bed material but not so energetic as to topple the child. Invertebrates dislodged will flow downstream into the net. The children continue kicking until the timer signals "stop" and then lift their nets from the water. The children need to carefully exit the river while carrying their catch and transfer the catch into the white plastic trays located somewhere safe on the bank...continued over/

River kick sampling method

Put the sample nets to one side to avoid someone tripping over them. In small groups gather round the trays and use the key to identify the creatures caught. Magnifying pots or viewers may help with identification. Plastic spoons are helpful to move creatures into the pots to avoid crushing the creatures. Record what has been found and when you are ready return the catch and water to the river. It may be easier to empty each plastic tray into a single bucket to manage the re-entry into the water.















Repeating the sample

If you wish to carry out more than one kick sample, perhaps to allow all children to have a turn, each subsequent group's sample area should be upstream of previous sample areas where the river will be undisturbed by previous kicking.













Minibeast recording table

See how many of these creatures you can find and tick them off as you go







| Animals with no legs | | |
|---|---|---|
|  |  |  |
| Worm | Slug | Snail |
| | | |
| Animals with 6 legs | | |
|  |  |  |
| Beetle | Caterpillar | Earwig |
| | | |
|  |  |  |
| Hoverfly | Ant | Dragonfly |
| | | |
| Animals with more than 6 legs | | |
|  |  |  |
| Millipede | Harvestman | Spider |
| | | |
| Others seen | | |
| | | |
| | | |

Minibeast recording table (aquatic)







See how many of these creatures you can find and tick them off as you go

| Animals with no legs | | |
|---|---|---|
|  |  |  |
| Leech | Tadpole | Pond snail |
| | | |
| Animals with 4 legs | Animals with 6 legs | |
|  |  |  |
| Newt | Dragonfly nymph | Mayfly nymph |
| | | |
| Animals with 6 legs | | |
|  |  |  |
| Pond skater | Water/diving beetle | Water boatman |
| | | |
| Animals with more than 6 legs | | |
|  |  |  |
| Water louse | Water mite | Freshwater shrimp |
| | | |
| Others seen | | |
| | | |
| | | |






Minibeast food chain information

| Creature | Carnivore/omnivore/ herbivore or detritivore? | Predators |
|---|--|---|
| Ant  | Carnivore (predator) omnivore Small minibeasts, the honeydew from aphids | Birds, other invertebrates. Foxes and badgers will dig out anthills to get to beetle larvae. |
| Aphid  | Herbivore Aphids drink plant sap with their proboscis. | Birds, ladybirds, lacewings, ants, spiders, earwigs, parasitic wasps, insect larvae inc. lacewings, hoverflies |
| Bee  | Herbivore Nectar and pollen from flowers | Birds, mites Parasitized by worms and flies; also attacked by fungi |
| Butterfly  | Herbivore Usually nectar in plants | Frogs/toads, small birds, spiders |
| Caterpillar  | Herbivore Leaves, flowers, fruit, stems/ roots, some are leaf miners, some are plant specific | Birds, often migratory birds rely on caterpillars of moths. Host to wide range of parasites inc parasitic wasps, flies. |
| Centipede  | Carnivore, secondary or tertiary consumer Small arthropods/molluscs: Woodlice, slugs, other centipedes | Mainly nocturnal Frogs/toads, shrews, hedgehogs, small birds |






Minibeast food chain information

| Creature | Carnivore/omnivore/ herbivore or detritivore? | Predators |
|--|---|---|
| Cranefly (Daddy long legs)  | Herbivore Adults occasionally feed on nectar and plant juices Larvae; on roots of plants can be a pest to gardeners. | Adults: Small birds and spiders Larvae: small birds, shrews, centipedes, ground beetles, beetle larvae |
| Cricket  | Herbivore plants | Birds, spiders, lizards, small mammals, amphibians |
| Earthworm  | Detritivore/decomposer Eats through soil digesting leaves/leaf litter/bacteria Worms consume more oak and beech leaves than all other soil invertebrates put together! | Mainly nocturnal Worms are rich in protein – moles (mutilate by biting off front segment and storing in caches), hedgehogs, shrews, foxes |
| Earwig  | Omnivore Flowers, plants, fruit, fungi; sometimes aphids and ants | Nocturnal Toads/frogs, hedgehog, shrew, some birds They can eject chemicals from their abdomen to dissuade predators. Parasitized by worms and flies; also attacked by fungi |
| Fly  | Herbivore/detritivore Fluids from; Plants, fresh dung, animals or slime on fungi | Birds, spiders, |
| Grasshopper  | Herbivore plants | Birds, spiders, lizards, small mammals, amphibians |

Minibeast food chain information

| Creature | Carnivore/omnivore/ herbivore or detritivore? | Predators |
|---|---|---|
| Ground Beetle  | Carnivore Hunt by sight using large eyes and bristles to detect prey. Worms, slugs, woodlice, caterpillars, crane fly larvae, springtails. | Generally nocturnal Ground beetles often feign death to fool predators. Foxes, hedgehogs, owls, birds, frogs/toads. |
| Harvestmen  | Carnivore (predator), secondary or tertiary consumer Often hunt at night; Small animals: mites, slugs, snails, other harvestmen/spiders, fungi, caterpillars; plant material and bird droppings – kill and eat prey like spiders | Produce a strong-smelling fluid to deter predators. Centipedes, harvestmen, frogs, toads, hedgehogs, birds, |
| Ladybird  | Carnivore Small insects (aphids, green and black fly); some eat plants or mildew. | Some birds peck at them e.g. blue tits, but nasty to taste because contain toxic alkaloid poisons. Shrews, foxes. They can bite (nip) |
| Millipede  | Detritivore/herbivore Dead plants; climbing millipedes eat fruit and foliage Some need extra nitrogen so feed on fungal hyphae or dead animals | Mainly nocturnal Frogs/toads, shrews, hedgehogs, small birds |
| Moth  | Herbivore plants | Bats, spiders, lizards, sm. mammals & birds, amphibians. |

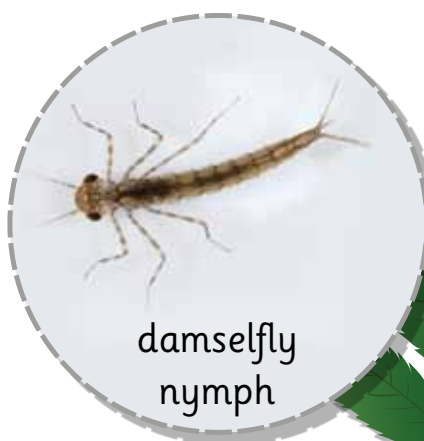
Minibeast food chain information

| Creature | Carnivore/omnivore/ herbivore or detritivore? | Predators |
|---|--|--|
| Slug  | Herbivore/detritivore Decomposer/primary consumer Dead and decaying leaves, roots, shoots, flowers, fungi | Mainly nocturnal Hedgehogs, moles, shrews, frogs/toads, birds |
| Snail  | Herbivore/detritivore, decomposer/primary consumer Fungi, soft juicy plant leaves. Some are carnivorous | Mainly nocturnal Birds, hedgehogs, badgers, foxes, toads, mice, centipedes, beetles (glow worms larvae eat nothing else!) Woodlice feed on their droppings! |
| Spiders  | Carnivore (predator) secondary or tertiary consumer All are hunters, though in different ways, of mainly small insects: bugs, butterflies, moths, weevils, woodlice, grasshoppers | Birds, frogs, hedgehogs, shrews, lizards, other spiders. |
| Wasps  | Carnivore | Other insects |
| Woodlouse  | Detritivore/Herbivore, Decomposer Dead and decaying plants and bark, fungi, green plants | Mainly nocturnal Very few: tough calcium carbonate cuticle –Toads/ frogs, spiders, wasps, shrews (occasionally), voles, hedgehogs |

Invertebrate photo key (aquatic)



flatworm



damselfly
nymph



blackfly larva



water beetle



snail



leech



non-biting
midge larva



water
hog-louse



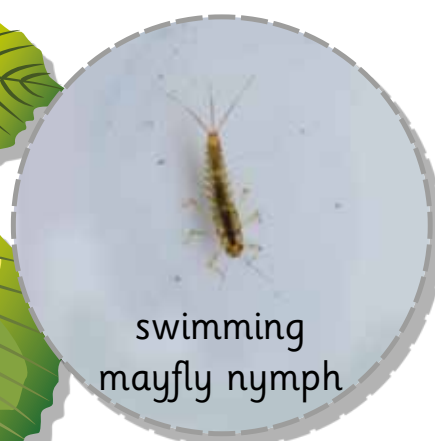
freshwater
shrimp



water
boatman







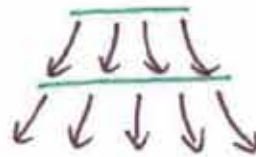

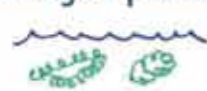





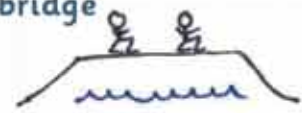




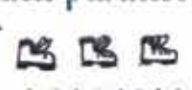





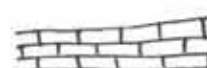


crane fly larva



swimming
mayfly nymph

River corridor survey key

| Vegetation | Deposition features | Erosion features | Non-natural features |
|---|--|--|--|
| Grass  | Mud  | Rock cliff  | Fence  |
| Emergent plants  | Sand  | Slip slope  | with style  |
| Submerged plants  | Gravel  | | with gate  |
| Scrub  | Cobbles  | Steep-sided bank  | River crossing bridge  |
| Tree  | | Plunge pool  | ford  |
| Woodland  | | | Path/track parallel to river  |
| Hedgerow  | | | Water control features weir  |
| | | | sluice gate  |
| | | | Dredged bank  |
| | | | Bank side defences soft e.g. geotextiles  |
| | | | hard e.g. concrete  |



Using the River Corridor Survey Key (previous page) draw the features that you can see as you view each cross-section of the river. The features do not have to be placed to represent their situation in real life, just placed somewhere within the correct corridor strip.

| Distance along bank from start point | | | | | | | | | | |
|--------------------------------------|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | |

River WOW words

rough ● smooth ● violent ● picturesque
● pretty ● scenic ● clear ● beautiful ●
calm ● turmoil ● restless ● fast ● rapid
● swiftly ● slow ● gentle ● steadily ●
sluggish ● unhurried ● gradual ● leisurely
● sparkling ● dirty ● polluted dynamic
● peaceful ● serene ● wide ● massive
huge ● spacious ● extensive ● enormous
● gigantic ● great ● extensive zigzagging
● twist and turn ● snaking wandering
● curving ● winding ● flat ● even ●
level ● shiny ● velvety ● boggy squelchy
● soggy ● waterlogged ● moist dry ●
arid ● parched ● waterless ● dried up ●
ripple ● swell ● current ● rise and fall
● flowing ● stream ● tributary ● brook
● pour out ● flood ● gush ● torrent ●
cascade ● downpour ● deluge ● rainstorm
● torrential ● bucketing ● heavy ●
hammering ● driving ● windy ● blustery
● breezy ● bracing ● gusty ● still ●
stagnant ● moving ● motionless ● stormy
● vast ● important ● major ● graceful
● elegant ● sinuous ● dark ● murky ●
overcast ● clear ● transparent ●
see-through

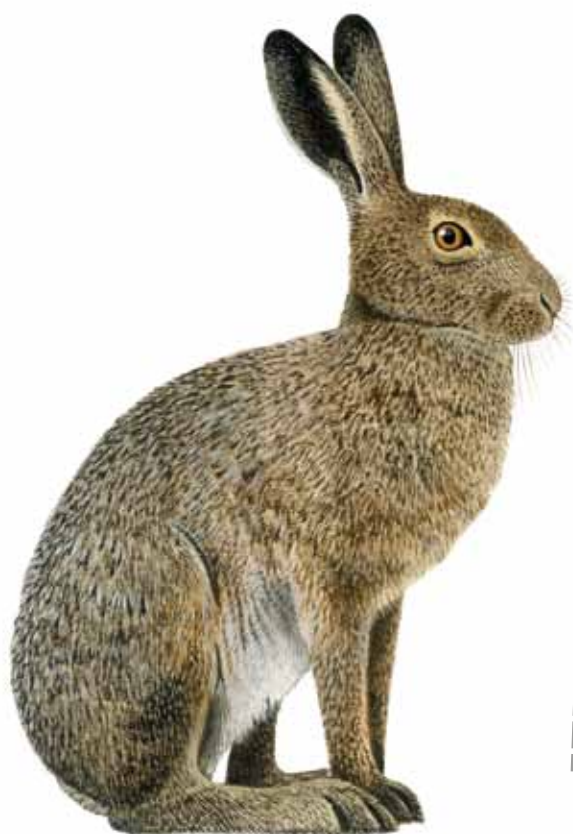
Investigating the speed of a river

Aim:

To determine the speed of a river and its direction of flow.

Safety considerations:

- The children should be briefed on how to behave near the river and the dangers inherent in carrying out this activity.
- Pre-visit the site, and assess on the day, the safety of the bank from which the children may be working. Consider that vegetation may mask the true bank edge or may be wet and slippery etc.
- Complete a risk assessment. A throw line will be a vital piece of safety equipment to include.
- Have a first aid kit including emergency foil blanket.



Investigating the speed of a river

Equipment for each group:

- Packet of 4 – 6 dog biscuits (dog biscuits are ideal because they float and are the same shape and weight. They are made of cereal and will either be eaten by fish or birds or dissolve having little environmental impact).
- Stopwatch
- Tape measure
- Clipboard
- Copy of “Speed of River Recording Table”
- Pencils
- Compass (optional, to determine direction of flow) eight motion.



Group size is usually 7-8 pupils, and then everyone has a role to play.

Investigating the speed of a river



Method

Explain to the children that they need to design a repeatable method that will allow them to investigate:

- What is the river flow direction?
- What is the speed of flow?

Encourage the children to offer ideas as to how this may be done. Equipment they are going to use could be shown as a prompt or shown as the children mention it in their suggestions. Encourage the children to suggest the distance that they will measure e.g. 2 metres, 5 metres, 10 metres (the “best” distance will depend on the particular location).

OR

They could decide to see how far the biscuit travels in a given time unless the experiment is being carried out using a bridge, in which case the width of the bridge will determine the distance. Once the method has been agreed encourage the children to divide the tasks between the members of the group.



You need:

- Someone to be the “start” location marker
- At least 2 people to measure out the distance
- Someone to be the “stop” location marker
- Someone or several people to throw a dog biscuit into the water*
- At least one person to measure the time taken for the biscuit to travel between the “start” and “stop” locations
- Someone to write down and record the data collected

* In the interests of a fair test it should be the same person throwing, however, because it is also a good idea to have as many people involved in the activity as possible, spend some time discussing why it isn't a fair test if more than one person throws the biscuits.

If this is being carried out on a section of the river where the direction of flow may be influenced by the tide or where the direction of flow cannot be easily observed, then a dog biscuit could be thrown in to determine which way the river is flowing. This enables the group to determine where the “start” and “stop” markers need to be positioned.

Use the method on the data recording sheet to calculate the average speed of flow.

Speed of river recording table

NAME _____ DATE _____

CLASS _____

| Measurement | | Observations & notes |
|--------------|--|----------------------|
| Distance (m) | | |
| Time 1 (s) | | |
| Time 2 (s) | | |
| Time 3 (s) | | |

Use this calculation to
work out the speed

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

This means
"distance divided by time"

Don't forget!

Time must be measured
in seconds. (There
are 60 seconds
in a minute)



Example

If your dog biscuit goes
10 m in 5 seconds, its speed is
2m/s (10m divided by 5 s)
(you say this "2 metres per second")



Speedy Questions

1. How many seconds are there in 1 minute
10 seconds?
2. If the dog biscuit floats 10m in 20 seconds,
what is its speed?
3. If a dog biscuit floats 20 m in 1 minute,
what is its speed?

Answers: 1. 70 s 2. 0.5 m/s 3. 0.33 m/s

River rope activity



Aim

To identify, label and explain the features of the river in a visual and interactive manner. Children are encouraged, through this fun activity, to use the knowledge gained from the day in the field to recognise and label the geographic river features on a rope 'river' and to give a short explanation of the feature and for their placement of label decision. It makes a good plenary activity.



Equipment

Each group will need:

- ✓ A length of rope 2–2.5 metres, preferably blue
- ✓ A set of laminated river words
- ✓ Camera

Method

Lay out the rope on ground, which ideally has a slope to it, to simulate the course of the river from source to mouth. Create a few bends in the lower end of the rope.

Each child, or pair, takes a word card and in turn reads it to the rest of the group, explains to them what the word means and where the feature can be found on the river and then places it on the rope. E.g a wide, shallow river valley is found on the lower parts of the river's course. When everyone has taken a turn and all the labels have been placed then a photograph should be taken as a permanent reminder for later use in class. Some words could be placed correctly in more than one position.

River rope activity words

Enlarge and cutout the cards

| | | |
|--------------------------------|---------------------------------|---|
| Narrow, deep valley | Wide, shallow valley | Confluence |
| Oxbow lake | Floodplain | River Bank |
| Hills | Source | Mouth |
| Sea | Flow | Meander |
| Estuary | Island | Tributary |
| Colegate | Littlehampton |  |



River Arun and floodplain photos

These images are also available in an accompanying powerpoint presentation

River Arun at Pulborough Brooks, looking south.



Flood plain at Pulborough Brooks in flood in March



River Arun at Pulborough Brooks, in full flood, looking north.



River Arun at Pulborough Brooks, in full flood, looking north.



North **sluice gate** at Pulborough Brooks that connects to the river Arun, allowing the nature reserve to “move water” in or out of our ditch network.

River Arun and floodplain photos

Main **ditch** on the flood plain at Pulborough Brooks, one of our most important habitats.



Pulborough Brooks **nature trail** flooded in January prior to trail improvements



View looking across the Arun valley in summer. The flood plain is dry and if you look carefully you can just see the River – middle/left.



Nature trail at Pulborough Brooks in June, to compare with January flooded picture



View of the **flood plain** from West Mead hide at Pulborough Brooks

Sunset looking across South Brooks looking towards the South Downs



River Rother photos

Solent and South Downs,
Environment Agency South
East Images

These images are available on
a powerpoint presentation

Rother Floodplain
at Fittleworth



Stedham Mill Pool

Flooding at Hardham



Moorland Lock River Rother



River Rother photos

Coultershaw Mill



Ford across River Rother
(Stedham)



Rother Floodplain
(Stopham)

Invasive species

What does this mean?

This can be a plant (flora) or an animal (fauna) which does not originate from this area but has been introduced. This can be a serious issue as it can threaten native species (plants and animals which have always been found in that environment and have adapted to living within the specific habitat).

In the Arun and Western streams we have a number of invasive plants and animals which are causing problems for our native wildlife and plant species.

The problems can range from clogging up waterways which increases the risk of flooding, causing river bank erosion, root damage to buildings, predators to local wildlife and risk to human health.

Himalayan Balsam
Impatiens glandulifera



New Zealand Pigmyweed
Crassula helmsii

To find out more about non native invasive species in the Arun and Western Streams catchment visit:

www.arunwesternstreams.org.uk/invasives

Invasive species

Floating Pennywort

Hydrocotyle ranunculoides



Parrots Feather

Myriophyllum aquaticum



Japanese Knotweed

Fallopia japonica

Invasive species

Signal Crayfish
Pacifastacus leniusculus



American Mink
Mustela Vison



Giant Hogweed
*Heracleum
mantegazzianum*



Plants and trees along the river

Many of these species can be recorded using the ARC Explorer app and mobile website – a fun way to explore the West Sussex countryside and record species that you find. Download the app for free via arcexplorer.org.uk



heather



bracken



silver birch



gorse



reeds



purple loosestrife



water iris



soft rush



willow tree in winter

Plants and trees along the river



dandelion



nettles



oak tree



buttercup



bramble



common ragwort



ivy



pine tree



alder



hawthorn

Investigating water clarity



Aim

To investigate the clarity of a sample of river water. What is water clarity? Clarity is another word for clear. Water in rivers may be clean but not very clear because there may be particles suspended in the water such as

- particles of silt and clay
- particles of dead plant material and algae (microscopic plants)
- microscopic animals. The clearer the water, the further sunlight can penetrate into the water. This is good for aquatic plants which need sunlight to be able to photosynthesise. A by-product of photosynthesis is oxygen which is released into the water and becomes available to aquatic animals.

sunlight
penetration

healthy
plant growth

more oxygen
released

more population
and biodiversity

Water clarity can be measured using an Opalometer which can be made easily at home or school prior to the investigation (see over).

Water samples could be collected when on the field trip and taken back to school to carry out this activity as a classroom exercise. This would also allow a comparison to be made with tap water, and perhaps pond water if the school has a pond.



Investigating water clarity

Safety considerations

Even water which is “clear” may not be clean.

Cover open cuts / sores on hands and keep fingers away from mouths (and noses) until they can be washed after the activity.

Insist on calm, sensible behaviour when working near open water.

Consider how the water sample will be safely collected from the river.

Have a first aid kit, including an emergency foil blanket.

Complete a pre-visit to the site to enable completion of a good risk assessment. This may identify the need for a throw line. Share the risk assessment with other responsible adults accompanying the children.



Equipment

To make the Opalometer:

(See the Complete Water Survey Pack

www.opalexplornature.org/watersurvey)

Empty a 2 litre clear plastic drinks bottle

Weighted water clarity disc card (Opalometer disc). Copy and cut out the disc using the weblink supplied. Laminate and trim the plastic to a circle, keeping a plastic rim around the disk to keep it waterproof. Weight the disk with a 1p coin, or similar, secured to reverse (to keep it the opals facing up as the water is added). Or similar, secured to the back and insert it into the empty drinks bottle.

Jug/bucket and rope/funnel – whatever is needed to fill the bottle safely from the water source

30cm rule or sheet of A4 paper/card

Throw rope

Investigating water clarity

Method

Fill the bottle to a depth of 30 cm (long side of A4 paper) with water from the river. Stand the bottle on a level surface. Look in the top of the bottle and count the number of clarity opals (circles) you can see.

Less than 3 opals counted = poor water clarity

Between 4 and 9 opals counted = average water clarity

Greater than 9 opals counted = very good water clarity

The results can be used to compare the water clarity with another river, stream or pond, or the investigation could be repeated at the same location to compare different conditions e.g. after heavy rain, or at different times of the year. Remember... Clarity of water is not necessarily an indicator of cleanliness as some chemical pollutants are colourless.



The water on Earth moves in a never-ending cycle. Every living thing needs water to survive, so we all need to use water wisely!

We can keep the Rivers Arun and Rother healthy, for us and all living things to use, by all making small changes to save water ... a drop at a time!

Use this sheet to keep a diary of how much water your family uses at home.

Your name: _____

How many people live in your house? _____

| Activity | Flushing toilet | Shower | Bath | Dishwasher | Washing up (by hand) | Washing machine | Drinking | Brushing teeth | Washing car | Watering plants | TOTAL |
|----------------------|-----------------|-----------|-----------|------------|----------------------|-----------------|----------------------|----------------|---------------------|---------------------------|-------|
| Amount of water used | 6 litres | 40 litres | 80 litres | 14 litres | 12 litres | 50 litres | 0.5 litres per drink | 6 litres | 5 litres per bucket | 4 litres per watering can | |
| Monday | | | | | | | | | | | |
| Tuesday | | | | | | | | | | | |
| Wednesday | | | | | | | | | | | |
| Thursday | | | | | | | | | | | |
| Friday | | | | | | | | | | | |
| Saturday | | | | | | | | | | | |
| Sunday | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | |

Total water used in a week = _____ litres

How much water do you use at home?

How do you compare?

The average person in the UK uses 150 litres of water per day. That's the same as 300 of these bottles of water.

Can you calculate the average water used by your household per day? _____ litres per day

Use this calculation to work out the average household water use per day:

**Average household water use per day =
Total water used by household in a
week / 7 days**

Is your household using more or less water than the UK average? _____

(Remember to consider how many people live in your house!)



Test your family!

Are your family water savers or water wasters?

Ask your family about how they use water and ring their answers.

In the bathroom ...

- | | |
|--|-----------------|
| 1. Do you have a shower to wash instead of a bath? | Yes / No |
| 2. Do you shower for 4 minutes or less? | Yes / No |
| 3. Do you turn the tap off while brushing your teeth? | Yes / No |
| 4. Do you have a dual flush toilet (with a choice of big flush and small flush buttons)? | Yes / No |

In the kitchen ...

- | | |
|---|-----------------|
| 5. Do you wash dishes or vegetables in a bowl rather than under a running tap? | Yes / No |
| 6. Do you fill your kettle using only the number of mugs of water that you need? | Yes / No |
| 7. Do you wait until your dishwasher and washing machine are full before turning them on? | Yes / No |

Outside and in the garden ...

- | | |
|--|-----------------|
| 8. Do you have a water butt to collect rainwater for plants in the garden? | Yes / No |
| 9. Do you use a watering can to water your garden? | Yes / No |
| 10. Do you wash your car with a bucket and sponge instead of a hose? | Yes / No |



Test your family!

How many times did your family answer yes?

If you scored:

| | |
|-----------|--|
| 5 or less | You are water wasters – time to start saving water and money with our easy tips! |
| 6 – 9 | You are starting to save ... one drop at a time: water, money, energy |
| 10 | Well done, you are champion water savers! Keep it up! |

Start saving ... one drop at a time.
Water, money, energy

My family's water saving promises

We promise to ...

In the bathroom ...

- Take a shower instead of a bath. ☐
- Turn off the tap while brushing our teeth. ☐
- Install a dual flush toilet or save-a-flush bag. ☐

In the kitchen ...

- Fill the kettle using only the mugs of water we need. ☐
- Use a bowl or put a plug in the sink when washing up. ☐
- Make sure our washing machine and dishwasher are full before using them. ☐

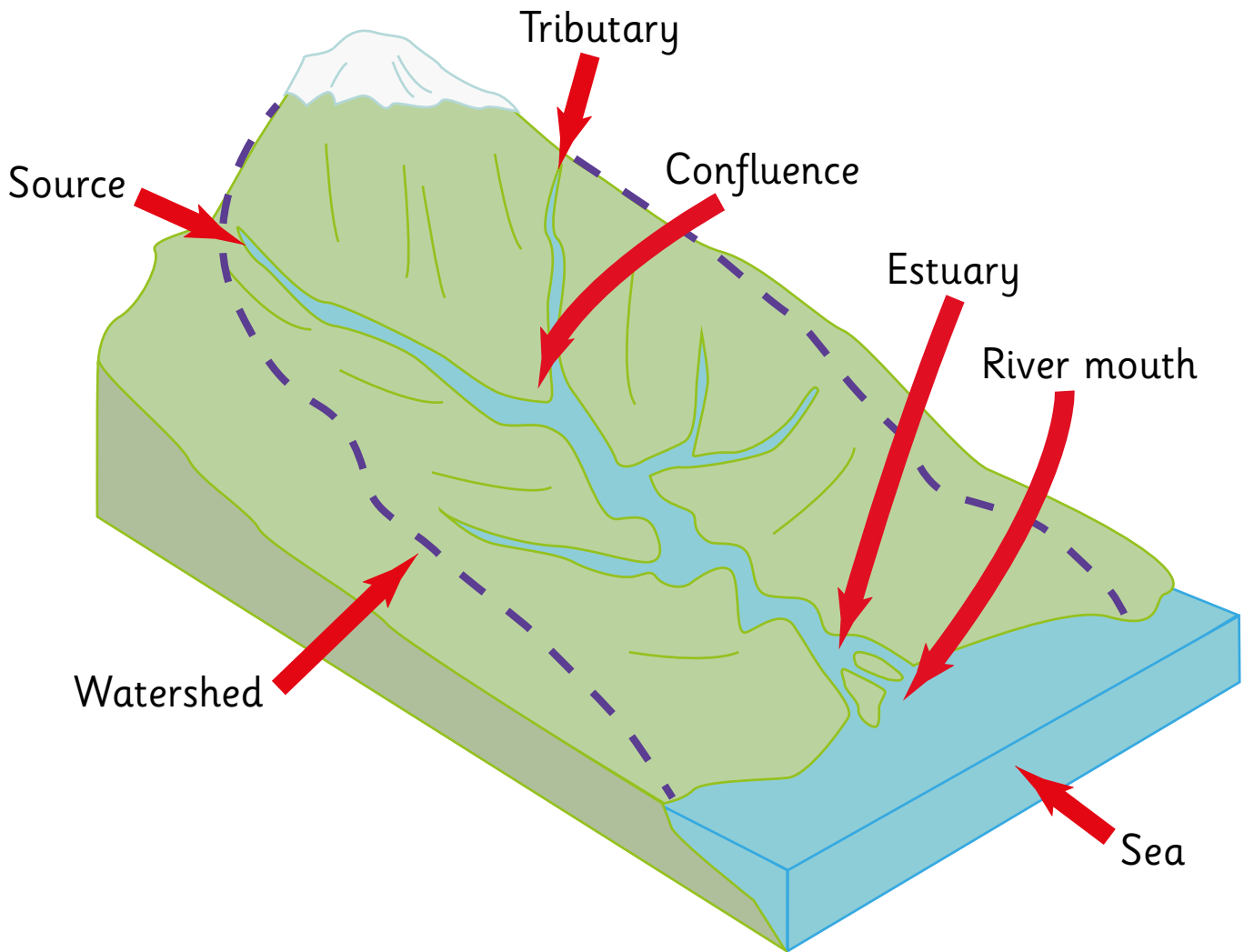
Outside and in the garden ...

- Use a water butt to collect rain to water plants. ☐
- Wash our car with a bucket and sponge, instead of a hose. ☐

For more information on how to save water and for a free Waterwise activity pack please visit

www.southernwater.co.uk/waterwise-packs

**Small changes
every day
can bring you
big savings!**



Cross-section of river and recording sheet

Classroom activity to
produce a river
cross-section model



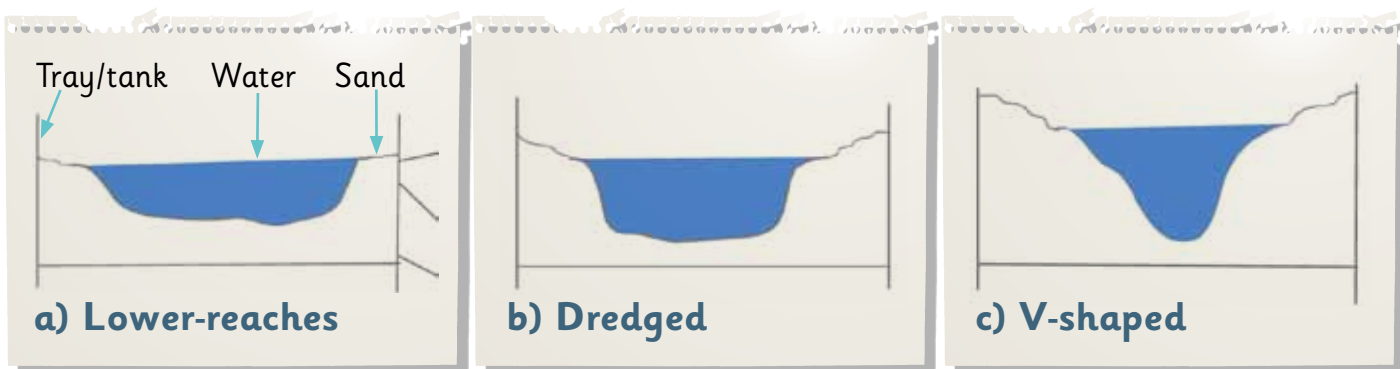
Equipment per working group

- Plastic deep tray/drawer or rectangular fish tank/small mammal tank
- Play sand
- 2 pencils (which could be striped horizontally every 2cm to represent ranging poles – electrical tape is a good waterproof option).
- String marked to show 2cm divisions, or a tape measure, or a 30cm ruler
- Dilute glycerine solution (stops sand drying out if profiles need to be kept for a while)
- Data recording sheet

Method:

1. Create river profile

Create a river profile in the tray with the play sand and add water to create the river. This is best created in the final working position as the tray is heavy to move once created.



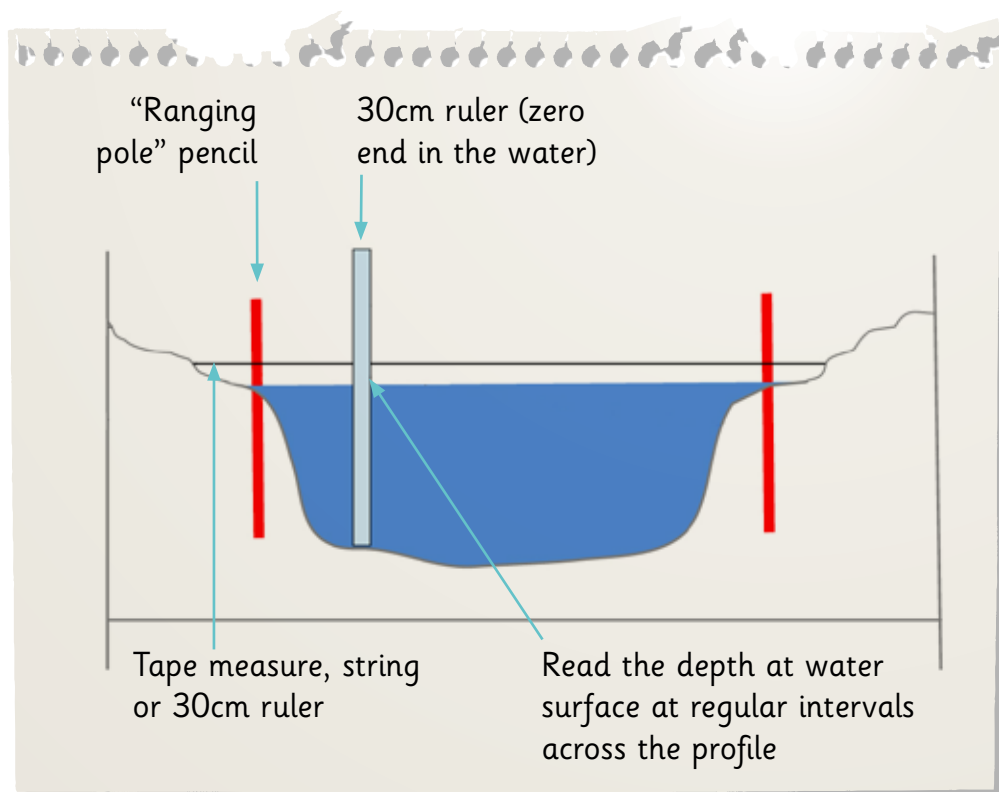
A variety of profiles can be customised to represent different parts of the river depending on your topic needs e.g. lower reaches on level valley; V-shaped narrow valley of upper valley; vertical sides to represent dredged channel.

Cross-section of river and recording sheet



2. Data collection and recording

To measure the width of the 'river channel' hold the tape measure or string straight between two 'ranging poles' placed in the sand at the water's edge. One pencil must be at zero.



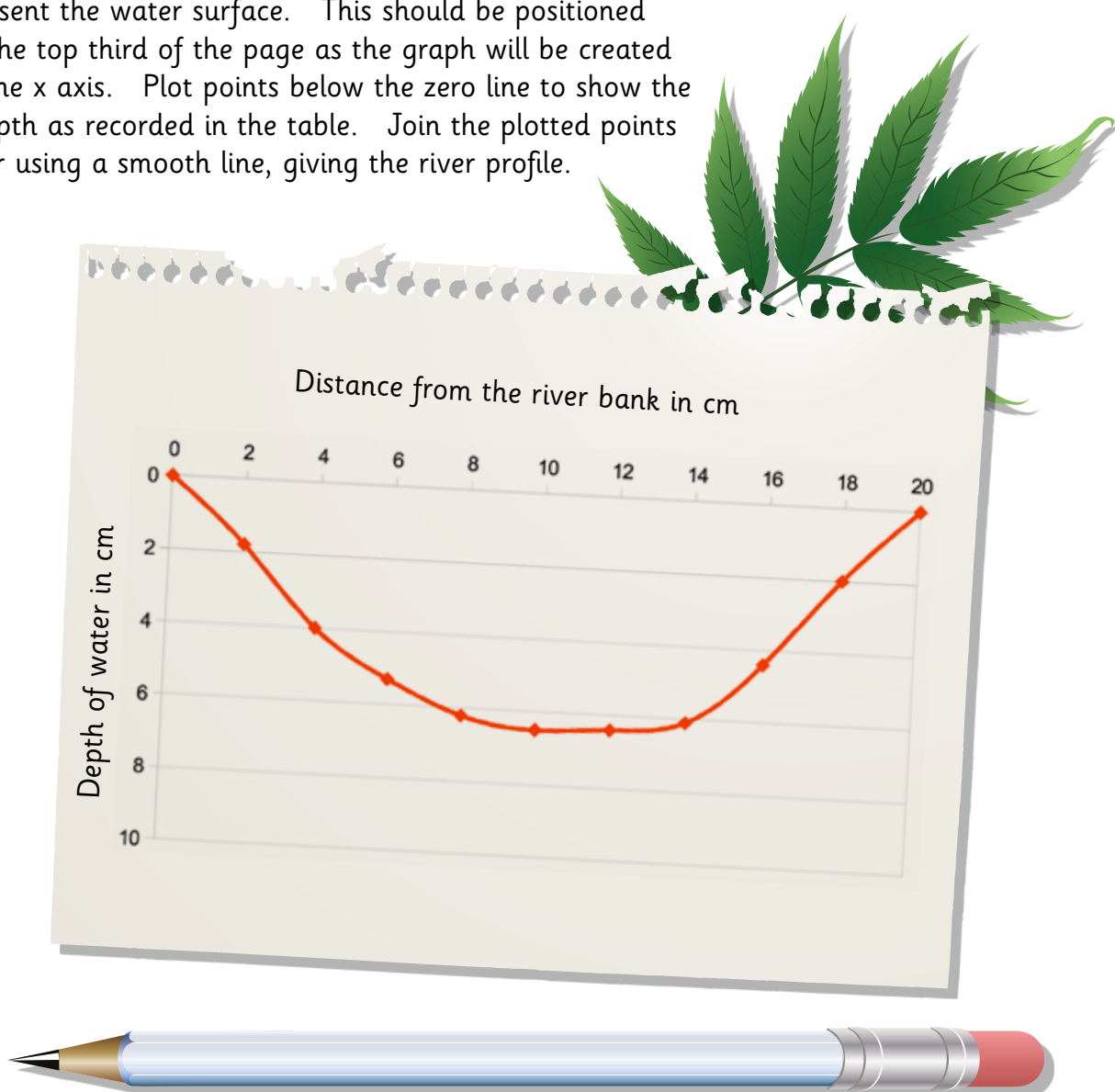
At 2cm intervals across the 'river channel' measure the water depth using a 30cm ruler. Care must be taken to gently place the ruler on the 'river bed' and not to press it into the sand. Read the depth measured at the water surface (checking zero is always submerged) and record the data in the table over.

Cross-section of river and recording sheet

| Distance across the river (in cm) | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
|-----------------------------------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Depth (in cm) | | | | | | | | | | | | | | | | |

3. Data presentation

Create a line graph to show cross-section profile. Determine a suitable scale (probably 1:1 for A4 paper) and draw a line to represent the water surface. This should be positioned within the top third of the page as the graph will be created below the x axis. Plot points below the zero line to show the river depth as recorded in the table. Join the plotted points together using a smooth line, giving the river profile.



Make comparisons between the profiles created representing different stages of the river.

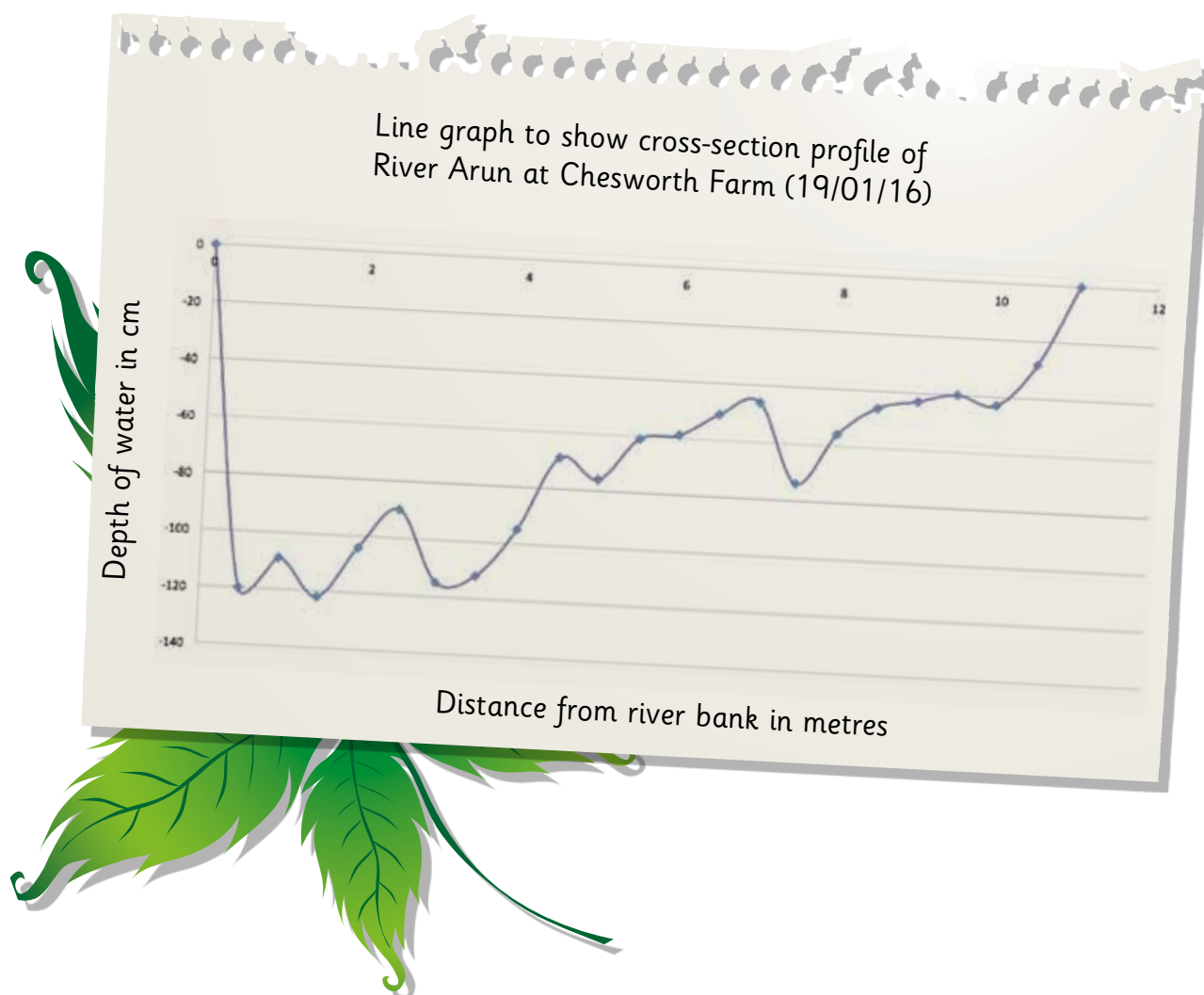
Cross-section of river and recording sheet

4. Calculating the cross-section area of the river

The profile created could be used to calculate the cross-section area of the River Arun by converting the scale. The River Arun at Pulborough Brooks is 10m wide on average. If the tray profiles are 30cm wide then a suitable scale could be 2cm:1m. The same scale needs to be used for the x and y axis.

Draw the profile to scale on squared or graph paper. Count the number of squares within the cross-section diagram to calculate the cross-section area. In the example above the cross-section area is _____ m².

Here is some “real life” data from the river Arun at Chesworth Farm and the cross-section using the data to show what it looks like.



Further resources

RSPB resources and activities for teachers (including a range of minibeast and wildlife ID charts): rspb.org.uk/teaching.

For a free resource pack & education e-newsletter email: education@rspb.org.uk

South Downs Learning Zone:

learning.southdowns.gov.uk

Arun & Western Streams catchment website learning page:

www.arunwesternstreams.org.uk/learning

Southern Water's Waterwise activity pack and free school talks:

www.southernwater.co.uk/waterwise-packs

Rivers Trust education pack:

www.therivertrust.org/education/education_pack.html

Canal and Rivers Trust education resources:

<https://canalrivertrust.org.uk/explorers/teachers>

Clean Water for Wildlife survey (ideal for schools):

<http://freshwaterhabitats.org.uk/projects/clean-water/take-part/>

BBC rivers class clips (short educational films about rivers):

www.bbc.co.uk/education/topics/zw9k7ty/resources/1

Interactive Rivers KS2 geography resources:

www.everyschool.co.uk/geography-key-stage-2-rivers.html

Free geography rivers worksheets:

www.3dgeography.co.uk/#/river-worksheets/c18cy

Rivers, the school run:

www.theschoolrun.com/homework-help/rivers

Mid Suffolk District Council rivers resources KS1 & KS2:

www.midsuffolk.gov.uk/leisure-and-culture/countryside/outdoor-learning-and-activities/schools-and-groups/environmental-education-resources-project-packs/

Field Studies Council fold-out charts: www.field-studies-council.org/publications.aspx

Resources for children, teachers and parents

RSPB Kids – interactive games, facts and learning:

www.rspb.org.uk/discoverandenjoynature/families/children/

Wildlife Watch is the junior branch of the Wildlife Trusts with great resources for children, teachers and parents: www.wildlifewatch.org.uk/educational-resources

Important vocabulary

Bedrock

The solid rock beneath a layer of soil or under the river bed.

Catchment

The area from which rainfall flows into a river.

Cobbles

A water worn rounded stone.

Confluence

The place where two or more rivers meet.

Deposition

Material that is dropped or laid down by the river.

Downstream

The direction that a river or stream is flowing.

Erosion

The gradual wearing away of something.

Estuary

The mouth of the river, where the river meets the sea.

Flood

An overflowing of water over land.

Floodplain

A flat area of land where the river overflows its banks.

Foothills

Smaller hills that lie at the bottom of larger hills or mountains.

Gravel

Coarse sand and small water-worn or pounded stones.

Ghyll

A deep and narrow cutting, often wooded forming the course of a stream.

Island

A piece of land completely surrounded by water; one not large enough to constitute a continent. Also a place cut off at high water or during floods.

Lowlands

Low lying parts of land or a district.

Meander

The curves and bends in the course of a winding river.

Mouth

Where the river ends its journey and joins a lake or ocean

Oxbow lake

An oxbow lake is a stagnant lake that is formed alongside a winding river when the river changes path because of soil erosion, leaving an abandoned stream channel, cut off from the rest of the river

Point bar

A feature lying on the inside of a meander bend in the river made up of material that is deposited, dropped or laid down by the river.

Reservoir

A large natural or man made lake or pool used for collecting and storing water

Important vocabulary

River bank

the raised or sloping edge or border of a river, the bank or ground adjacent to a river

River bed

The bed or channel in which a river flows: the bottom of the river.

Runoff

Runoff is water that drains into a river (or other body of water) from uncontrolled streams, drains, or sewage lines. There is runoff from agricultural irrigation water, snowmelt, storms, etc. It eventually flows into lakes and the ocean.

Sand

Granular material consisting of small eroded fragments of rocks, finer than gravel, forming the constituent of a beach, desert, or the bed of a river or sea.

Sediment

Sediment is solid material that is moved and deposited in a new location. Sediment can consist of rocks and minerals, as well as the remains of plants and animals. It can be as small as a grain of sand or as large as a boulder. Sediment can also be held in suspension.

Silt

Fine particles of sand, soil and rocks.

Source

The start or origin of the river.

Tributary

A smaller stream or river flowing into a larger stream or river.

Uplands

An area of hilly or mountainous ground.

Upstream

In the opposite direction to the way a river or stream flows.

Valley

A low, elongated area more or less enclosed by hills or high ground and typically having a river or stream flowing through it.

Waterfall

A vertically descending part of a stream where it falls from a height over a rock, precipice, etc.; a cascade.



River vocabulary word search

G X C T K P O M W D Y R A T U B I R T S
 K N A B R E V I R S B H K C O R D E B E
 A O K O C E I A D T N E M I D E S O M L
 W O Y R X S B N B W O J J D J D X T N B
 K T U T L T A N S N O N U O C D N A S B
 L O Y A N L Z C I Y E L L A V I M B Q O
 S I N I W D M A A D D O O L F X Y A S C
 I D O O K H L W A T E R F A L L F L F C
 S P L K X P R W E G C F O O T H I L L S
 W Z Q R D A M T Y M R H R V R U N O F F
 L R I O V R E S E R N X M A E R T S P U
 U L O N O I T I S O P E D E F C J V L G
 Y L R G Z S S D K A U P L A N D S Y E U
 F V E A D O W N S T R E A M T T V T V V
 W A Y R I V E R B E D Y B M L Y I R A H
 C H U Y R A U T S E D W U F I M J F R U
 D S E Y X C D N O I S O R E S T B K G C
 T C U A F T S C O N F L U E N C E B Z X
 D Q O X B O W L A K E W S M E A N D E R
 J J I C K C L L X N H T U O M L L Y H G

BEDROCK
 DOWNSTREAM
 ESTUARY
 COBBLES
 GHYLL
 MEANDER
 RESERVOIR
 POINTBAR
 SEDIMENT
 TRIBUTARY
 VALLEY

CONFLUENCE
 EROSION
 FLOOD
 GRAVEL
 ISLAND
 MOUTH
 RIVERBANK
 RIVERBED
 SILT
 UPLANDS
 WATERFALL

DEPOSITION
 CATCHMENT
 FLOODPLAIN
 FOOTHILLS
 LOWLANDS
 OXBOWLAKE
 RUNOFF
 SAND
 SOURCE
 UPSTREAM

Acknowledgements

This resource pack was produced by Arun and Rother Connections – Linking Landscape and Community – generously supported by the Heritage Lottery Fund.



Front cover illustration © Tim Bernhard

All other illustrations © Chris Shields

Main photography © John Dominick and © RSPB Images

Graphic design Sally De Souza