<u>Geography fieldwork at Thorner's</u>

<u>KS1</u>

How does weather affect our lives?

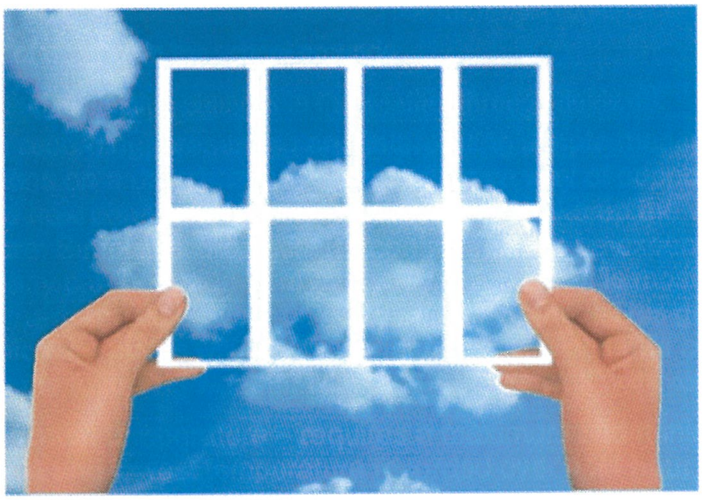
Autumn A (Lesson 1)

Exploring the concept of weather in the school grounds

Observing, recording and explaining changes in the weather through fieldwork

Observing and then recording, presenting and interpreting simple measurements of atmospheric conditions on a daily basis, is a very effective way of supporting younger pupils to understand how changeable the elements which make up the weather in the atmosphere really are. Simple recording instruments need not be expensive to acquire and/or make and many can be made from everyday materials. It is most effective if the data is collected at the same time every day for at least a month. This generates enough information from which the pupils will be able to identify basic patterns and draw simple conclusions. Taking the following weather recordings works well with younger pupils:

- maximum and minimum temperature – requires a maximum and minimum thermometer showing the highest and lowest temperature recorded over a 24 hour period
- wind speed using a simple wind gauge (anemometer)
- wind direction using a basic weather vane and a compass
- rainfall using a rain gauge
- Cloud cover is measured in units called **oktas** and each okta measures one eighth of the sky covered by cloud. Cut out eight squares from a large piece of card and have the pupils hold this up to the sky and estimate how many of the squares are covered.



The data collected from these five measurements can then be entered each day onto a simple **Excel** spreadsheet. At the end of the month the pupils can be supported to produce a range of graphs and charts from the spreadsheet to indicate how each of the variables (the five elements of the weather they have been observing) has changed. It is important here to enable pupils to identify and describe any changes they can see and then to encourage them to suggest reasons for any patterns they can see e.g. for why it may have become warmer/cooler/wetter/drier over the month or why the wind appears to be blowing mostly from one direction etc.

The film at www.bbc.co.uk/education/clips/z9g87ty is a good introduction for the pupils to the measurements they will be taking and the Meteorological Office booklets at http://www.rmets.org/sites/default/files/pdf/simweameasurements.pdf provide advice and instructions for simple homemade and purchasable weather recording instruments such as those shown in the film. Stockists of wet and dry thermometers, anemometers, simple wind vanes and rain gauges include www.metcheck.co.uk/acatalog/Min_Max_Thermometers.html.
For support related to Excel spreadsheets see www.youtube.com/watch?v=8L1OVkw2ZQ8

On sunny days

A sunny day provides great opportunities to investigate light and shade. Look for shadows of all kinds; people, trees, flowers etc. Are they the same? How are they different? Can you get away from your shadow? Why? Why not? How can we make our shadows change shape or disappear? Draw around each other's shadows using playground chalks. Stand the pupils in the same spot every hour and re-chalk the shadow to show how it moves as the day progresses. Chase shadows and try and jump on them. Make some simple shadow puppets indoors, for use outside. Create a simple sundial, using a stick that has been pushed into the ground, or position one using some Play-Doh® or Plasticine®. Make sure that there are plenty of sticks available so that children can make their own.

On rainy days

When it rains get the umbrellas out and dance in the rain. Listen to the sounds that the rain makes. Attach small bells, corks or buttons to pieces of thread and tie them to the umbrella spike. Take them outside in the rain and listen for some unusual sounds. Put welly boots and waterproofs on and jump in puddles. Discover different ways to collect the rain. Examine raindrops on leaves, grass, windows and flowers. Provide magnifying glasses so that the children can look really closely. What do they notice? Challenge the children to bring a puddle indoors using sponges or pipettes to transfer the water in the puddle to a container. Watch puddles disappear in stages by drawing in chalk around them and watch them shrink in size as the water evaporates. Sprinkle cooking oil in puddles to make 'rainbows' as well as powder paints and inks. Float different things in the puddles. Investigate a range of materials to see what is waterproof and what is not.

On cold, frosty, icy and snowy days

When it is frosty place a gloved hand in a frosty place and watch the frost thaw. Scrape ice from windows and photograph the frost. Use the photographs as inspiration for creative work, indoors and out. During very cold weather place containers of warm water outside at the end of the day and then return to it first thing in the morning when the liquid has frozen. Bring it indoors and watch it thaw out again. Press gently with welly booted feet on shallow frozen puddles. Look for bubbles underneath. Listen for the cracks as puddles break. On snowy or frosty days fill squirty bottles with warm water and add food colouring. This can be squirted onto the snow to make patterns and pictures or even to 'write' with. Children can also make marks using sticks to scrape in the snow, while painting in the snow gives children the chance to see how melting snow affects both the mark and the colours, as they mingle. Using snow as a canvas allows the children to see contrasts of colour and texture. The children can collect items to make the pictures such as sticks, berries, stones and soil. Set up skittles or bottles weighted slighty with water and use them as targets for snowballs to encourage hand-eye coordination. A target can also be chalked onto a wall and snowballs thrown against this. Marking numbers onto the target will encourage number recognition. Things can be frozen into ice and then hung up as 'glass' ornaments outside. Freeze water in a variety of containers, allowing the children to see the different rates of melting for big and small, or thin and thicker pieces of ice. Anything can be placed into the water to freeze into it, from berries to leaves to items relating to topics of interest. To allow them to hang, weight the end of a long string and drop it into the water, wrapping the other end of the string around a stick propped over the container. Once frozen, the string can be tied round branches or fences.

On windy days

On windy days help the children to experience the sensation of the wind in their faces. Create some streamers, flags or balloons tied to a fence or post to show how windy it is. Move these around to different places in the school grounds to find the most sheltered and windiest spots. Fill up a washing-up bowl to almost overflowing so that the wind will 'catch' it and create small waves and ripples. Make some simple sailing boats with the children and investigate what happens when they are placed on the water to sail. Wash the doll's clothes and let the children peg them out on a windy day and watch them dry. Make wind chimes from reclaimed materials including some metal, such as old keys, bells, and cutlery etc. Hang them on wire coat hangers outside and listen to the noises they make on windy days.

What is the Geography of where I live like?

Autumn B (Lesson 5)

Ancillary Question 5: How can we introduce people to the physical and human geography of our local area?

Using a 1:10 000 map extract from *Digimap* the pupils can plan the route of a geographical walk around the local area. This route should visit examples of all the different types of land use they have identified along with other key features observed from *Google Earth* layers or from their own knowledge. It will also be important for pupils to have the facility to take photographs at key locations whilst out on fieldwork. Before going out remind pupils that in geography we recognise **human features** of the environment (those which have been created largely by people) and **physical features** (those which are largely natural). Whilst walking the route, pupils can annotate their maps with the names of significant examples of both physical and human geographical features and take a photograph to illustrate later.

Take time to discuss with pupils any feature they find difficult to classify e.g. an area of newly planted trees or a field of crops. Back at school and online with *Digimap* the pupils can use a wide variety of annotation tools on their local area base map (see http://digimapforschools.edina.ac.uk/schools/Resources/allstages/userguide.pdf for basic user guide). As well as drawing a line to plot (and automatically measure) the route of their geographical walk, they can drop labels and add the images they have taken at key points on the map. Two different colour tags can be used to distinguish between physical and human geographical features. Before printing, the pupils can name their map:
A geographical walk around the local area.

Why do we love being beside the seaside so much?

Spring B (Lesson 3 / 4)

Fieldwork possibilities

Torbay Coast and Countryside Trust (TCCT) in South Devon www.countryside-trust.org.uk/learning/school-visits-tcct has many years of experience of investigating the seashore with children and young people of all ages. The following two examples demonstrate how to connect geography with both science and mathematics.

Rock pooling

Before going rock pooling it is essential to ensure both health and safety considerations have been identified and managed appropriately. An example of a rock pooling risk assessment drawn up by the Charmouth Heritage Centre in Dorset can be seen at www.charmouth.org/chcc/images/Rockpooling_risk_assessment.pdf. It is also essential to consider the potential environmental impact of activities. For example small buckets and containers pushed gently through the water to gather living organisms is more sustainable for smaller creatures which may get entangled and injured in dip nets. For further guidance see the National Trust guide at http://www.nationaltrust.org.uk/article-1355886690753/

Pupils can gather living creatures from rock pools and then using a simple rock pool guide such as the one produced by John Walters http://johnwalters.co.uk/publications/the-rockpool-guide.php to create a simple tally chart of categories of organisms – see the TCCT table in **Resource 11**. This data can then be totalled and presented as simple bar graphs or histograms. The idea of adaptation can be developed by supporting the pupils to produce simple field sketches. Find an animal or plant and draw it, looking for identifiable features – colour, limbs, patterns, shape etc. Encourage the pupils to reflect on what special adaptations the plant or animal has, to live where it does in the rock pool.

Shell hunt

Start this activity by explaining very simply what a shell actually is – an exoskeleton that protects the animal that lives inside. Shells start their life as an egg and secrete calcium carbonate to make their shells on which the growth lines can be seen. Ask the pupils to collect as many shells as they can, looking for variety of shape, colour, size and patterns etc. within a set area of beach. After 10–15 minutes gather the pupils together and draw a large square in the sand. Ask volunteer pupils to divide the square into 18 equal sections – one for each type of shell they may find – see **Resource 12**. After all the pupils have added their shells to the correct section, support them to add up the totals and record them on the tally sheet. This data can then be presented mathematically in a variety of ways and a simple interpretation carried out e.g. which shells were most frequently/least frequently discovered? Were there any categories of shells which were not encountered at all and if so, why? Remember to get the pupils to return their shells, as close to the places where they discovered them as possible.

Marine Educator Course (Sea Green Leader)

Teachers with a keen interest in marine education might wish to investigate the Level 3 Sea Green Leader qualification offered by TCCT through its Sea Green Schools programme www.countryside-trust.org.uk/learning/courses-tcct/seashore

Fieldwork possibility

Pupils can work in pairs along the beach and the strand line (a line, especially of washed up seaweed and other debris, marking a previous high water level along a shore) to observe and tally (no need to handle or collect) things which are alive, dead but once were alive and never been alive. After 15–20 minutes gather the pupils together and discuss what they have seen and recorded.

How does the geography of Kampong Ayer compare with the geography of where I live?

Summer B (Lesson 2)

A local fieldwork opportunity could be to support the children to explore the local area of the school with the objective of investigating the range of homes that exist in comparison with those at Kampong Ayr. This could involve:

- Undertaking a tally count of different types of homes and houses, entering the data into a simple database and then producing charts and graphs – *terraced houses; semi-detached houses; detached houses; bungalows; maisonettes; flats; sheltered accommodation* etc. Alternatively the children could design their own symbols for the different categories of houses and homes and add them to the map with an appropriate key.
- Presenting the data collected onto a simple street map of the local area as categories of residential land use using a colour key. The base map can be hand drawn or sourced from *Google Maps* or http://digimapforschools.edina.ac.uk

Whilst undertaking their fieldwork the children can take photographs of the different kinds of homes and houses they see and then upload them at http://www.geograph.org.uk/. The *Geograph Project* aims to collect geographically representative photographs and information for every square kilometre of Great Britain and Ireland.

Why does it matter where my food comes from?

Spring A (Lesson 6)

This final ancillary question can be carried out in along with local fieldwork in a nearby town or at a supermarket so the pupils can see first-hand, meat, fruit and vegetables being prepared and presented for sale. A visit to a local farm would be a perfect accompaniment at any point in this enquiry. Support for teachers to set up farm visits as well as other learning and teaching resources is available from *Farming & Countryside Education* at www.face-online.org.uk/

LKS2

How and why is my local area changing?

Summer A (Lesson 4)

Ancillary Question 4: How and why does the quality of the environment change in my local area?

In any locality where a school is surrounded by streets, pupils can be engaged in an investigation into how, in their view, the quality of the environment varies from one area to another and possible explanations for this. The suggested fieldwork-based enquiry which follows has been carried out by Key Stage 2 pupils of different ages at various schools including St Leonard's Church of England Primary School in Exeter and East-the-Water Primary School in Bideford. It is easily adaptable to any school context. It is recommended that a *Teachers TV* film of Sam Jones carrying out the full investigation with his pupils at St Leonard's is viewed before commencing the enquiry. It can be viewed and downloaded from www.creativeeducation.co.uk/video/684

The film shows the pupils undertaking each of the following stages of a hypothesis-based enquiry into how and why the quality of the environment might change between a local river and the school. This is just an example that can be adapted to other locations very easily e.g. from a new supermarket, local park or industrial estate to the school.

A 1:5000 Ordnance Survey map of the area surrounding the school or a copy of the relevant section from a local street atlas (both of which will show the names of streets) can be used as the base map for the investigation. It is possible to obtain a1:5000 OS map centred on the school covering a surrounding area of 4 sq km from various outlets at a reasonable cost e.g. www.mapstop.co.uk/product11701_A-Site-Centered-Ordnance-Survey-Landplan-Map-1-5-000---Flat.aspx or they can be printed online from *Digimap for Schools* if your school has a subscription. An alternative to both of these options is a street map generated at no cost from *Google Earth*. Simply search for the name of your school, drag the slider to zoom in and out until the school has been located as desired and then switch on *View in Google Maps* (the first icon on the right on the top tool bar). All of the local streets will be superimposed on to the satellite image, which can then be saved and printed off as required.

Having created a base map from one of these sources the next step is to agree with the pupils the criteria that will be used to evaluate the quality of the environment.

Divide the pupils into groups of four and encourage them to discuss what makes some streets attractive and others not so much. What would make their ideal street in terms of things that they would like to see? Which things would they prefer not to be present? Give them some ideas to progress their thinking e.g. what about the level of traffic, accessibility to local shops, parks and open space, the presence and quality of front gardens, noise and air pollution levels, safety concerns, litter and other pollution, satellite dishes and wires?

Support each group to identify their top 10 things (criteria) for an environmentally attractive street and then share with the rest of the class. Create a class list of the most popular criteria on the board and from this identify the top 10.

The next stage is to identify a hypothesis with the pupils. Explain that a hypothesis is just an idea or a hunch that geographers come up with about aspects of the world, which they can then test through fieldwork to see if it's true. At East-the-Water Primary School the hypothesis the pupils investigated was: *The quality of the environment improves with distance from the river to the school* – see **Resource 22**.

The 25 streets that they surveyed between the river and the school and the 10 criteria used to make an assessment of environmental quality in each one are shown in **Resource 23**.

It was agreed that the pupils would score each criteria on a scale of 1 to 10 with 1 equating to very poor and 10 to outstanding. This would mean that each street could receive a total maximum mark of 100. Some very worthwhile discussion ensued about exactly how to score each criterion to avoid confusion and to ensure consistency e.g. a pupil asked whether a lot of noise and pollution in a street would score high or low on the scale 1 to 10.

Fieldwork then involved the pupils working in supervised groups of four and visiting each of the streets. Each group of pupils then agreed a consensus score out of 10 for each of the 10 criteria and filled in the relevant column section on **Resource 23**.

Back in class, the next stage is to complete the relevant sections of the summary sheet **Resource 24** – its total score out of 100 and it distance (from the centre of the street) to the school in metres, calculated by using the linear scale on the map. The pupils can now transfer the summary data to a scatter graph (**Resource 25**). They place one small cross for each street at the point where the score for environmental quality and distance from the river intersect (as shown by Sam in the video). Having placed 25 crosses at their correct locations, the pupils draw a dotted line around the approximate area of the crosses on the graph and finally draw a 'line of best fit' through the enclosed area at the longest diagonal.

Examples are shown for the most probable scenarios in **Resources 26**, **27** and **28**. The pattern in **Resource 26** shows a positive correlation (connection) between the two sets of data and proves the hypothesis that the quality of the environment improves with distance from the river (the line of best fit inclines upwards from lower left to top right). The pattern in **Resource 27** shows the opposite – a negative correlation or connection as the quality of the environment declines with distance from the river (the line of best fit drops from top left to bottom right of graph). **Resource 28** shows a random pattern of distribution, which means that the quality of the environment remains much the same between the river and the school, with the line of best fit being virtually level from the left to the right side of the graph.

Taking plenty of time to discuss the results of the fieldwork enquiry with the pupils is important. Having ascertained what the pattern of data shows and whether it proves or disproves the hypothesis, the next stage is to seek explanations for what has been discovered (as Sam can be seen doing with the pupils in the film).

Reasoning and speculation are important here. There may be a number of reasons for the pattern identified and synthesising these to create an explanation that the pupils can write up may require more time than anticipated. As with many things in geography there may not be a single correct answer to an enquiry. The truth may be a combination of many reasons and valuing what the pupils suggest is essential.

The final stage is for the pupils to write up their enquiry report to include the following sections:

- Hypothesis – what we set out to prove or disprove.
- Environmental quality criteria – how we decided on the things we were going to measure.
- Data collection – how we went about gathering the information we needed during fieldwork.
- Data presentation – what we did to display the data we had collected.
- Data interpretation – what the data told us.
- Explanation – possible reasons to help us understand our results.

UKS2

What is a river?

Summer A (Lesson 2)

Ancillary Question 2: How does the course of my local river change from source to mouth?

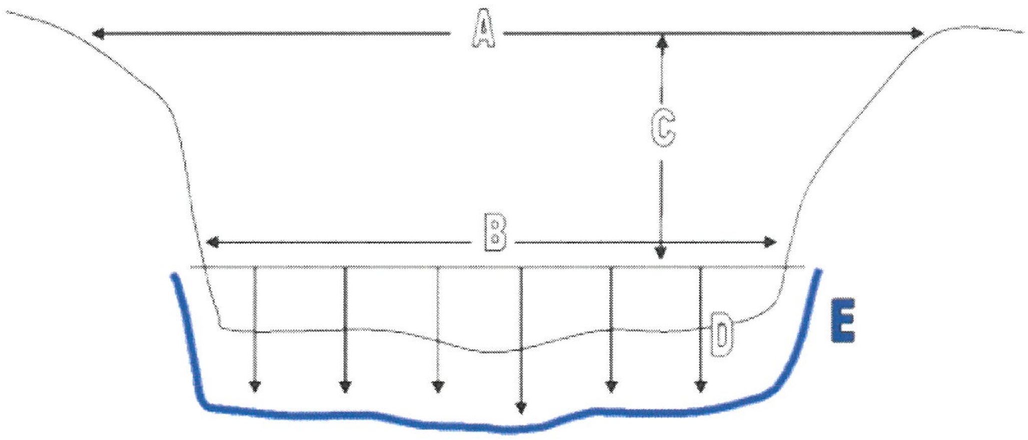
Several elements of the investigation of the River Axe in Ancillary Question 1 are easily replicable to a stream or river in the local area of any school. Photographs can be taken by a teacher of a nearby stream at various points along its course from source to mouth for the pupils to sequence and to describe and offer reasons for the changes observed – in exactly the same way as for the River Axe.

Similarly *Google Earth* satellite images of key points along the course of the stream can be easily 'screen grabbed', saved and then printed or projected for the pupils to observe. After having dragged the slider to zoom in and out to arrive at the level of detail required, any *Google Earth* image can be saved by clicking on the second icon from the right along the top toolbar.

Thirdly, 1:50 000 *Landranger* OS map extracts can be purchased of the area through which the course of the stream flows, either in hard copy from *Ordnance Survey* www.ordnancesurvey.co.uk/shop/maps.html or downloaded, saved and printed from *Digimap for Schools* http://digimapforschools.edina.ac.uk/ (if your school is a subscriber).

With these three resources – ground level photographs of the stream along its course, *Google Earth* satellite images at various points along the stream and a 1:50 000 OS *Landranger* map – the pupils can be supported to replicate the activities that they carried out when investigating the River Axe in Ancillary Question 1.

If it is possible for the pupils to safely access a large stream or small river locally over a distance of approximately 250 m along its bank (such as the one shown in **Resource 7**), they can then carry out a hypothesis-based fieldwork investigation involving the collecting, recording, presentation and interpretation of data. A hypothesis is merely an idea or theory for the pupils to investigate to evaluate whether it is true (proved) or not (disproved). So the pupils could be set the hypothesis that: *There is no change in the course of River X between locations Y and Z.* The pupils could then work in groups at intervals of, say 10 m, along the stream between the two points X and Y. Each group will need a tape measure, a metre ruler, a cork and a stop watch. At each interval along the stream the pupils can collect data for five things or variables as shown in the diagram below:

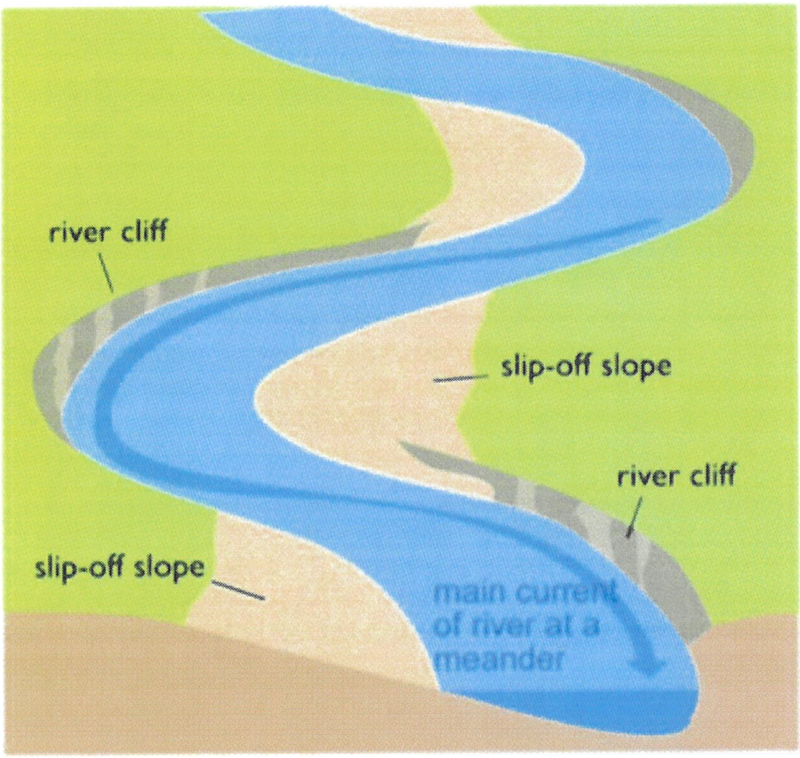


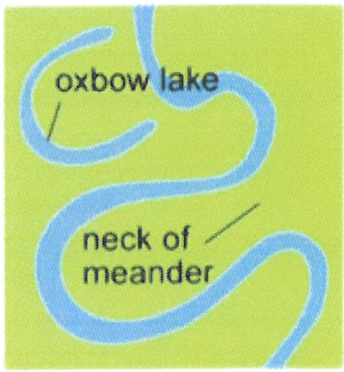
- Distance A: from the top of the left bank to the top of the right bank;
- Distance B: across the top of the water surface;
- Distance C: the distance from the water surface to an imaginary line joining the tops of the banks;
- Distance D: the depth approximately every 20 cm across the stream (then calculate the average;
- Speed E: the speed or velocity of flow of the water. Measure a distance of 5 m along the stream bank at each location (approximately 2.5 m above and 2.5 m below the measuring point). Now time how long it takes a cork to travel this distance. Do this five

The pupils can now enter their data into an Excel spreadsheet and use a range of graphical techniques to present and display their results. They could then write up their investigation in a short report with the following sections:

- *Objective of the investigation* (what they set out to prove or disprove linked to the hypothesis);
- *Location* (where the investigation took place including maps and photographs);
- *Methods of data collection* (the techniques used to capture the information required);
- *Recording* (how they created their Excel spreadsheet);
- *Presentation* (graphs and charts of results);
- *Interpretation* (what the results suggest);
- *Conclusion* (summary and judgements as to whether the hypothesis has been proved or disproved);
- *Evaluation* (a consideration of how the investigation could have been improved and how valid and trustworthy the results are).

If it is possible for the pupils to work at a meander along a large stream or small river (such as the one shown in the images in **Resource 8**), they could test the hypothesis that: *The depth of a river channel does not change when it meanders.* A curve or bend in the course of a river is called a *meander*. Meanders are the most easily recognisable feature of a river.



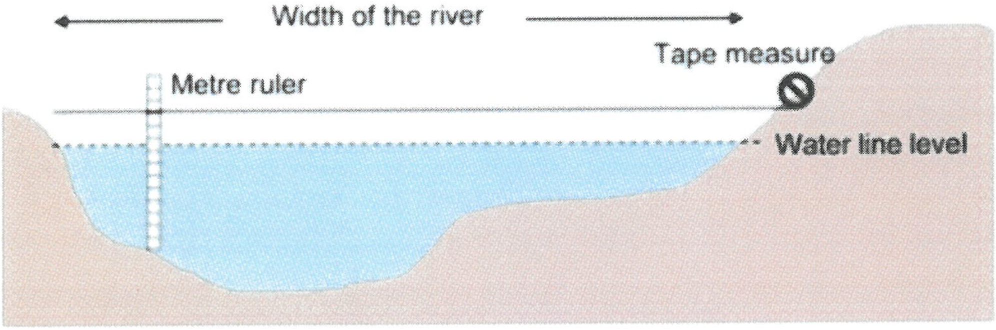


The speed at which water flows through a river meander will vary at different points on the bend – the outside, middle and inside sections. Water flowing around the outside of the meander will flow the fastest as it has the furthest distance to travel, so should have the most energy for erosion. The water depth will therefore be deepest at this point. The slow flowing, low energy water on the inside of the meander will deposit its load of heavier gravel and stones, creating the shallowest points on the cross-section. During fieldwork, pupils can collect data from across both a meander and a straighter section of the stream. By comparing cross-sections of their results for both locations the pupils can ascertain whether there is a noticeable difference in the depths of the river channels.

The method is as follows:

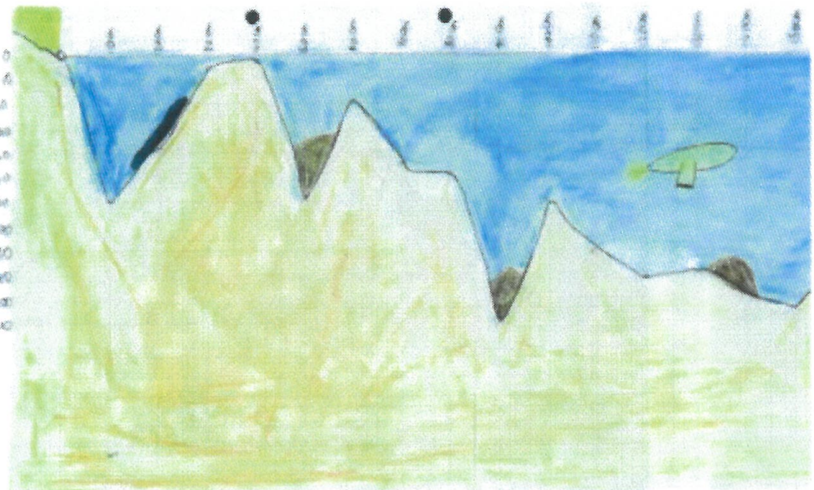
- Two pupils record the width of the stream channel from the water's edge on either side, by using a tape measure held straight just above the water. Once they have measured the stream's width they should remain in place with the tape measure held tight.

- At 20 cm intervals across the stream, two other pupils should measure and record the depth in centimetres, using a metre stick with centimetre markings.
- Repeat the method as outlined above, on a straight section of the same stream.



Measure the depth of the water, from river bed to water line level, every 20cm.

On separate sheets of squared graph paper plot the two cross-sections to scale. Plot each 20 cm interval along a horizontal axis (stream width). On the vertical axis plot the stream depth using a negative scale as shown in the example below. Join the dots to create the stream profiles. There will almost certainly be a clearly noticeable difference between the profile of the meander and straight stream sections. It is expected that the meander cross-section will show the greatest variety in stream depth measurements. The example of a cross-section below shows the progression of stream depth from the shallowest point on the inside of the meander to the deepest section on the meander's outside edge.



Stafford Brook meander plotted profile by pupils from Hatch Beauchamp Primary School, Somerset

Pupils can connect their geographical study of a large stream or small river with a variety of science investigations e.g. testing the hypothesis: *River X provides a healthy habitat for invertebrates.* Invertebrates are defined by one characteristic: they do not possess a backbone – 97 per cent of all animals are invertebrates. In a stream habitat, insects such as dragonfly larvae and water boatmen are part of this group, along with molluscs such as pond snails, crustaceans (e.g. freshwater shrimps) and also aquatic worms and leeches. Amphibians, birds, mammals and reptiles all have backbones and are therefore vertebrates.

For the purposes of this investigation a healthy stream or river habitat is assumed to be one with low levels of water pollution. Pollution levels in a stream directly affects the levels of dissolved oxygen, i.e. polluted water contains lower levels of dissolved oxygen which, in turn, impacts upon the number and variety of invertebrates present. The main sources of stream and river pollution include:

- *Organic matter: sewage, food waste, farm effluent and fertilisers*

  This is the most common source of freshwater pollution. Bacteria and other micro-organisms feed on organic matter and large populations quickly develop, using up much of the oxygen dissolved in the water. Fertilisers and farm waste draining into a river will increase the concentration of nitrates and phosphates in the water. Algae use these chemicals to grow and multiply rapidly. This will turn the water green. This massive growth of algae, called *eutrophication*, leads to pollution. When the algae die, they are broken down by the action of the bacteria, which quickly multiply, using up considerable amounts of dissolved oxygen in the water. As a result there is much less oxygen for other animals living in the river habitat.

- *Industrial and chemical waste*

  Chemical waste pollutants such as cyanide, zinc, lead, copper and mercury from factories and industrial processes, are sometimes accidentally discharged into rivers. If these discharges are in high concentrations, river animals will be killed immediately. Pollutants in lower levels can enter the food chain and accumulate until they reach toxic levels, eventually killing predators at the top of the food chain such as fish, birds and mammals.

- *Oil pollution*

  If oil enters a stream or river then the oil will spread out to create a thin film over the entire water surface, which prevents oxygen entering the habitat.

- *Water temperature – water warmed by industrial processes.*

  Industry often uses river water for cooling factory machinery. Sometimes large quantities of warm water can be discharged back into a river, raising the water temperature and lowering the amount of dissolved oxygen (warm water has less capacity for storing dissolved oxygen).

Certain species of freshwater invertebrates cannot survive in water with low levels of dissolved oxygen, so their presence or absence indicates the extent to which a river is polluted. These species are called *indicator species*.

This investigation uses a simple method of stream dipping called *kick sampling* to discover which invertebrates are living in the stream or small river. Scientific keys are then used to identify invertebrate species by closely observing their characteristics. Invertebrates will each be given a *sensitivity score*. This indicates how sensitive they are to levels of pollution (dissolved oxygen) in the water (a '10' means they are very sensitive whereas a '1' means they are not affected by pollution levels and can live in any environment).

Sensitivity scores are combined to calculate a *Biotic Index*, which can help ecologists reach conclusions about the health of a river habitat. The recording of the species found, their sensitivity scores and the calculation of the Biotic Index is carried out using **Resources 9** and **10**.

The pupils can be divided up into groups of three or four and each group will require the following equipment:

- A pond dipping net;
- A large white tray;
- An 'interesting finds' tray – a smaller white tray split into sections (similar to a cutlery drawer tray);
- A large tea strainer or smaller net for closer inspection of invertebrates found;
- A magnifying glass;
- A freshwater invertebrate identification key, which can be downloaded for free from the *Open Air Laboratory* (OPAL) network at www.opalexplorenature.org/sites/default/files/7/file/water-survey-field-guide-2014.pdf
- Invertebrate recording sheet (**Resource 9**);
- Water pollution and Biotic Index score sheet (**Resource 10**);
- Clipboard;

- Pencil;
- Calculator;

Working in supervised groups the pupils can now collect examples of invertebrate species present in the stream or small river using a simple technique called *Kick Sampling and Stone Washing* – see the Field Studies Council demonstration and guidance at www.youtube.com/watch?v=yoFK4hCu42c

Following sampling the invertebrates can be identified from the key and recorded on a copy of **Resource 9**. The Biotic Index can be calculated simply by following the instructions in **Resource 10**. The Biotic Index score will then give the pupils an indication of the health of the stream using the following as a guide:

Poor 1.0–2.0
Fair 2.1–2.5
Good 2.6–3.5
Excellent 3.6 +

Fieldwork involves a range of the following skills

Raw data must be gathered, recorded and presented in a suitable manner. From this the children can -

Recognise

Identify

Describe

Observe

Reason

Explain

Reach conclusions

Make judgements

Evaluate

Apply

Hypothesise