

# What are the features of a local river?

## A geographical study of a local river

### Learning Objectives

- To identify the main features of a (local) river
- To understand these features as part of a river system

### **National Curriculum for Geography**

#### **Key Stage 1**

Pupils should develop knowledge about the world, the United Kingdom and their locality. They should understand basic subject-specific vocabulary relating to human and physical geography and begin to use geographical skills, including first-hand observation, to enhance their locational awareness.

Place Knowledge: understand geographical similarities and differences through studying the human and physical geography of a small area of the United Kingdom, and of a small area in a contrasting non-European country

Human and physical geography: use basic geographical vocabulary to refer to key physical features, including: beach, cliff, coast, forest, hill, mountain, sea, ocean, river, soil, valley, vegetation, season and weather

Geographical skills and fieldwork: use simple compass directions (North, South, East and West) and use simple fieldwork and observational skills to study the geography of their school and its grounds and the key human and physical features of its surrounding environment.

#### **Key Stage 2**

Locational knowledge: name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time

Place Knowledge: understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom, a region in a European country, and a region within North or South America

Human and physical geography: describe and understand key aspects of physical geography, including: rivers, mountains and the water cycle

Geographical skills and fieldwork: use the eight points of a compass (and) use fieldwork to observe, measure, record and present the human and physical features in the local area using a range of methods, including sketch maps, plans and graphs, and digital technologies.

This unit of work also supports links with art, English, mathematics and science.

## Activity overview

This unit of work will provide your pupils with:

- An introduction to the main geographical features of a river, with a particular focus on physical geography
- How the features of your local river 'fit' with the characteristics of a river system as it flows downstream from its source to its mouth
- Fieldwork opportunities in your local area, A case study which can be compared to other rivers around the UK and the wider world.

## Key vocabulary:

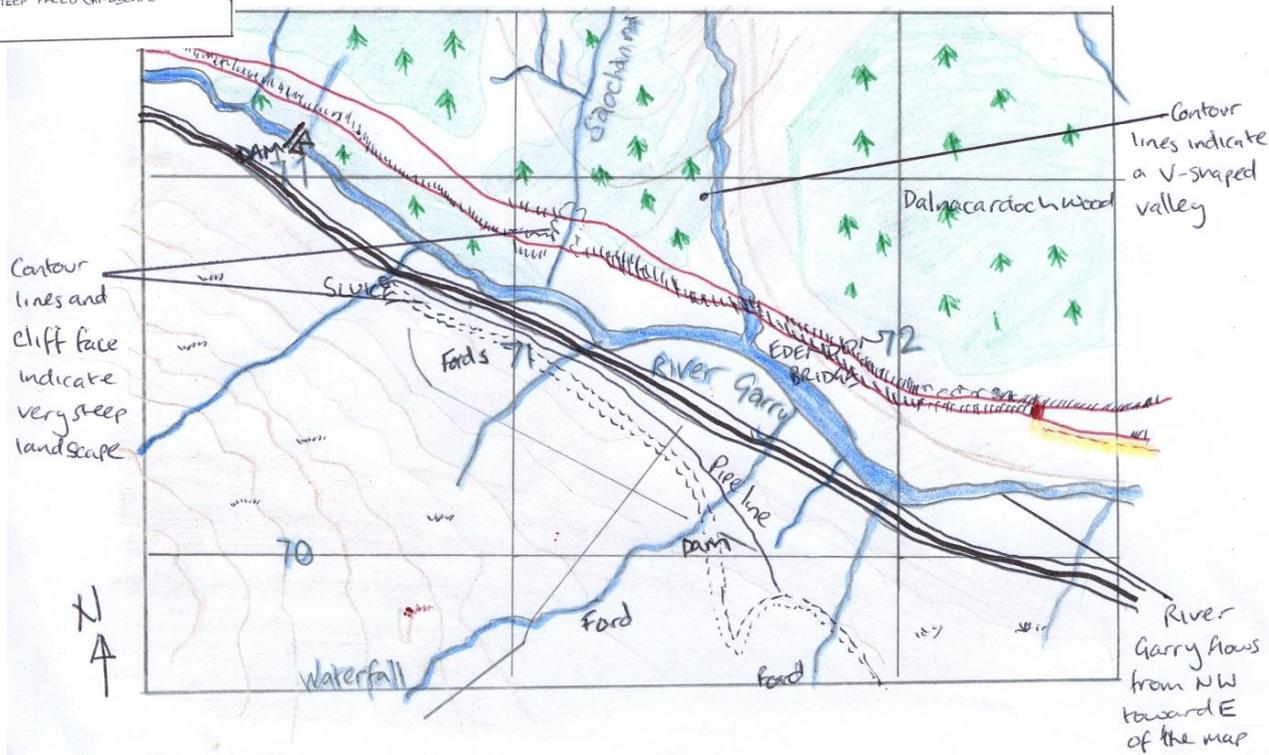
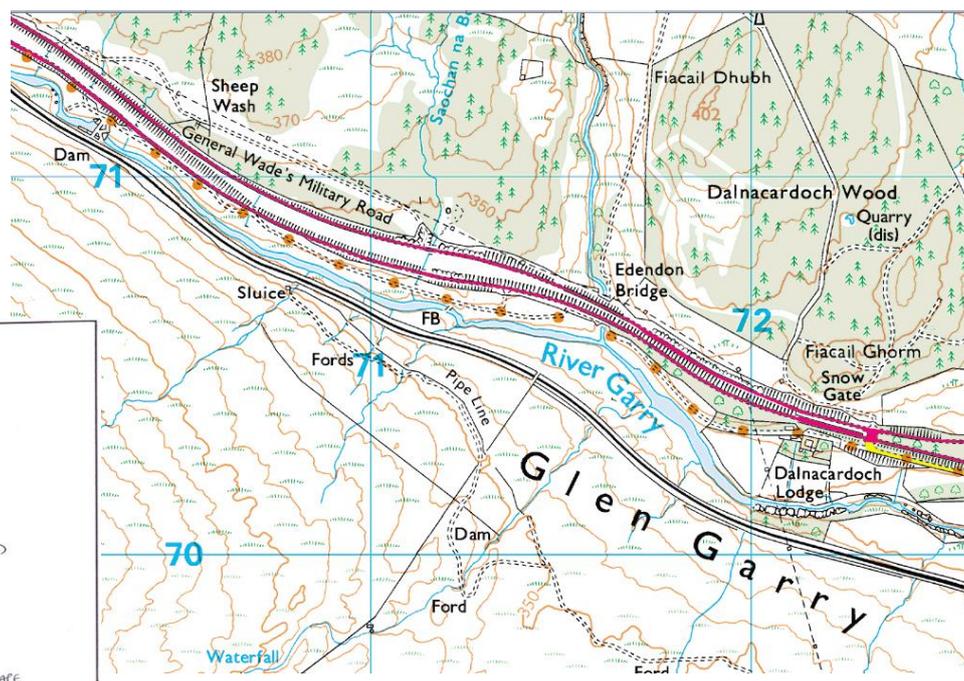
Pupils will need to learn and use key vocabulary where possible. It is a crucial literacy skill and vital for geographical knowledge and understanding.

- *River*: a body of water that flows toward the sea
- *Main channel*: the main river which flows and drains the surrounding area
- *River catchment*: all the rivers, streams and lakes within one area which drain through the same river mouth into the sea
- *Source*: where a river starts in higher ground, usually a spring, although some rivers flow from lakes or reservoirs (and also glaciers)
- *River mouth*: the end of a river where it meets the coast and drains into the sea, or sometimes a lake
- *Downstream*: the direction a river flow from its source to its mouth, from highland to lowland area
- *Upstream*: Moving against the flow of a river from low land to higher land, towards its source
- *Upper, middle and lower courses*: the three main sections of a river
  - *Upper course*: characterised by narrow channels and steep gradients, often with rapids, waterfalls and gorges. Upper courses are typically in highland areas and have steep sided 'v-shaped' valleys with interlocking spurs. Erosion is vertical, deepening the channel.
  - *Middle course*: characterised by more gentle gradients and a wider channel, which is deeper and meanders across a wide valley. Erosion is lateral, particularly on the outer edges of meanders, which will cut into the surrounding area, whilst deposition occurs in the inside of the meander loops.
  - *Lower course*: characterised by deep and wider channels located within a flat landscape. Flood plains are typically found in lower courses. As a river floods it may also deposit material on the river banks forming raised levees. Where a river drains into the sea it may deposit materials to form a delta.
- *Tributary*: a smaller river, or stream, which flows into a larger river
- *Confluence*: where a tributary meets another river
- *Meander*: a natural bend in the river
- *Flood Plain*: the area onto which a river floods, usually in the lower course
- *Erosion*: the break-up of material from the river bed or the river banks
- *Transportation*: the movement of materials, such as pebbles or silt downstream
- *Deposition*: when a river stops transporting materials and the materials are 'dropped' either in the river bed, at the inside of a bend, on the riverbank or flood plain during a flood, or in a delta at its mouth.
- *Delta*: an area of new land formed at the mouth of a river when material (sometimes called sediment) is deposited. Deltas are usually found when a river flows into the sea or an ocean, and can also be found when a river flows into a lake or reservoir.
- *Estuary*: a coastal body of water, into which rivers or streams flow which is influenced by both fresh water from the rivers and saline water from the open sea.

**Activity One:** field visit and field sketches, identifying the geographical features of your river and surrounding area.

**Preparation.** Before you visit your local river you should locate it using a map of your local area. You can reinforce your pupils' map skills by asking them to plan a route to it using appropriate geographical terms for direction and distance and also your pupils could identify key landmarks, buildings or green spaces they pass on their way to the river. You should also explore and explain the different features of a river and characteristics of the upper, middle and lower courses (see the identification sheet below which outlines these different stages of a river).

Example: drawing a sketch map <http://www.edwardboyle.com/blog/?p=1821>



Health and safety at water margins. All the following work can be undertaken from the river bank and it is not necessary for you, your colleagues or pupils to enter the river itself. Further guidance on fieldwork at water margins can be found on this link, which also provide a link to previous DfES guidance on this issue:

<http://www.rgs.org/OurWork/Schools/Fieldwork+and+local+learning/Fieldwork+safety/Safety+around+water.htm>

Whilst discussing appropriate behaviour with your pupils about how to behave during the fieldwork (and do remember to also brief your teaching colleagues, teaching assistants and parent helpers) you may also wish to explore general safety around water. Some of the rivers you visit may have no swimming signs or other information about how people should use the river safely.

Field-sketches. During your fieldwork you might ask your pupils to draw a brief field sketch of their river, looking either up or down stream. If you take a compass they can also record the direction they are looking for their sketches and also which direction the river is flowing.

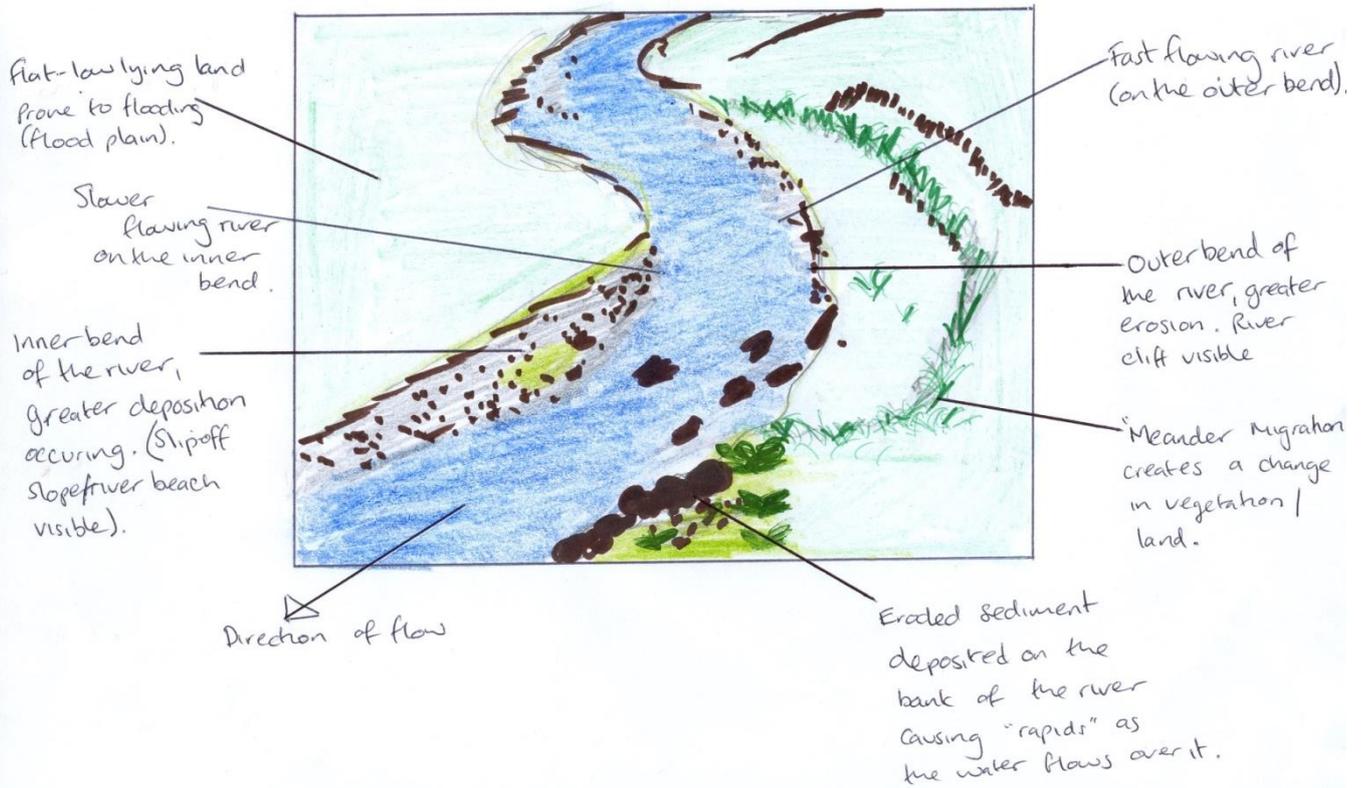
Identifying the characteristics of a river. Using their sketches, ask your pupils to focus on the key features of the river (rather than spending time drawing every duck they might see), and to also label their sketches using appropriate geographical terms e.g. bank, channel, meander, erosion or deposition. Pupils may also take photographs to use for their class work or displays. Ask your pupils to correctly identify the main physical features that they can see. In addition, are they able to identify whether the river they are visiting is in the upper, middle or lower course of a river system. Is the water slow or fast flowing, shallow or deep or clear or murky. (If there has been recent rainfall your river is likely to be deeper, the water look 'muddier' and possibly faster flowing.)

Example: drawing a river sketch

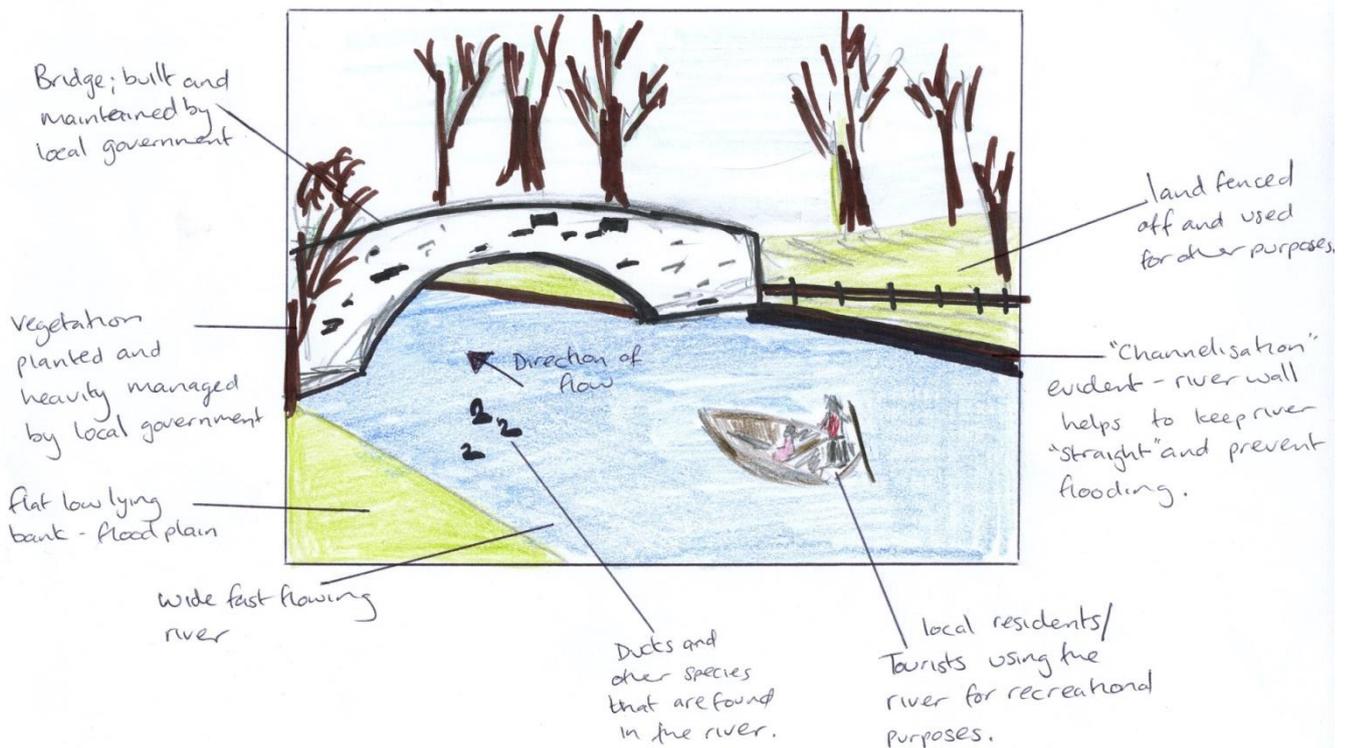
### Fieldsketch 1: Upper Course



Field sketch 2: Middle Course



Field sketch 3: Lower Course



How people interact with the river. Your pupils might then also identify how people have altered the natural features of a river. For example, have the river banks been reinforced or raised, are their bridges, weirs or fords, has the channel been culverted or diverted and are there signs of any flood defences or actions to prevent erosion? In addition, how is the land around your river used? Does the land-use include housing or shops, green spaces, areas for recreation, footpaths or farmland? What vegetation can your pupils identify in the areas around their river, is it natural or has it been planted, are there plants which are commonly found in wetland areas e.g. reeds or willow trees.

Geographical change. If you can source historical maps and photographs of your local river you can use these to explore how the course of the river has changed, how people have altered the banks and surrounding vegetation and land-use, and also how people have used the river in different ways throughout time. In addition, local signs and street names (e.g. Mill Lane or Lock Cottage) may also indicate people's local connection with the river.

**Activity two:** how fast is our river flowing?

To record and calculate how quickly the water in your river is flowing. You will need the following equipment:

- Floats – dog biscuits are a cheap source of floats and will degrade safely
- Tape measure
- Stop watch
- Metre ruler – or a ranging pole (to mark a start and stop point)
- Map of the river (investigated area) and/or old photos
- Clipboards, data collection sheet and pencils

Firstly, ask your pupils to measure a 10 metre stretch of the river. If you have a number of groups they could do this at different points along the river and subsequently compare their results.

Mark the start and end of your 10 metre stretch with your metre rulers.

Following a count down with a pupil ready with the stop watch (who should be stood at the down-stream 10 metre mark), ask another pupil to drop a dog biscuit into the river at the upstream 10 metre mark. Once the biscuit passes the 10 metre mark down-stream stop the stop watch. Ask your pupils to repeat this exercise a number of times so that they can calculate an average speed for how quickly the water is flowing.

You can use the following table to collect your results.

	Time (seconds)
First recording	
Second recording	
Third recording	
etc	
Average time	

(Sum total ÷ number of recordings = average time)

Your pupils could display this information as a bar chart showing their multiple recordings.

If you have a number of groups making different recordings at different points along a river, such as in straight sections or around a meander, do their recordings indicate any differences in the speed of the water along the different sections?

In addition, you can also calculate the speed the river is flowing as recorded in metres/second using the following calculation

$$\text{Speed (in metres/second)} = \text{distance (10 metres)} \div \text{average time (seconds)}$$

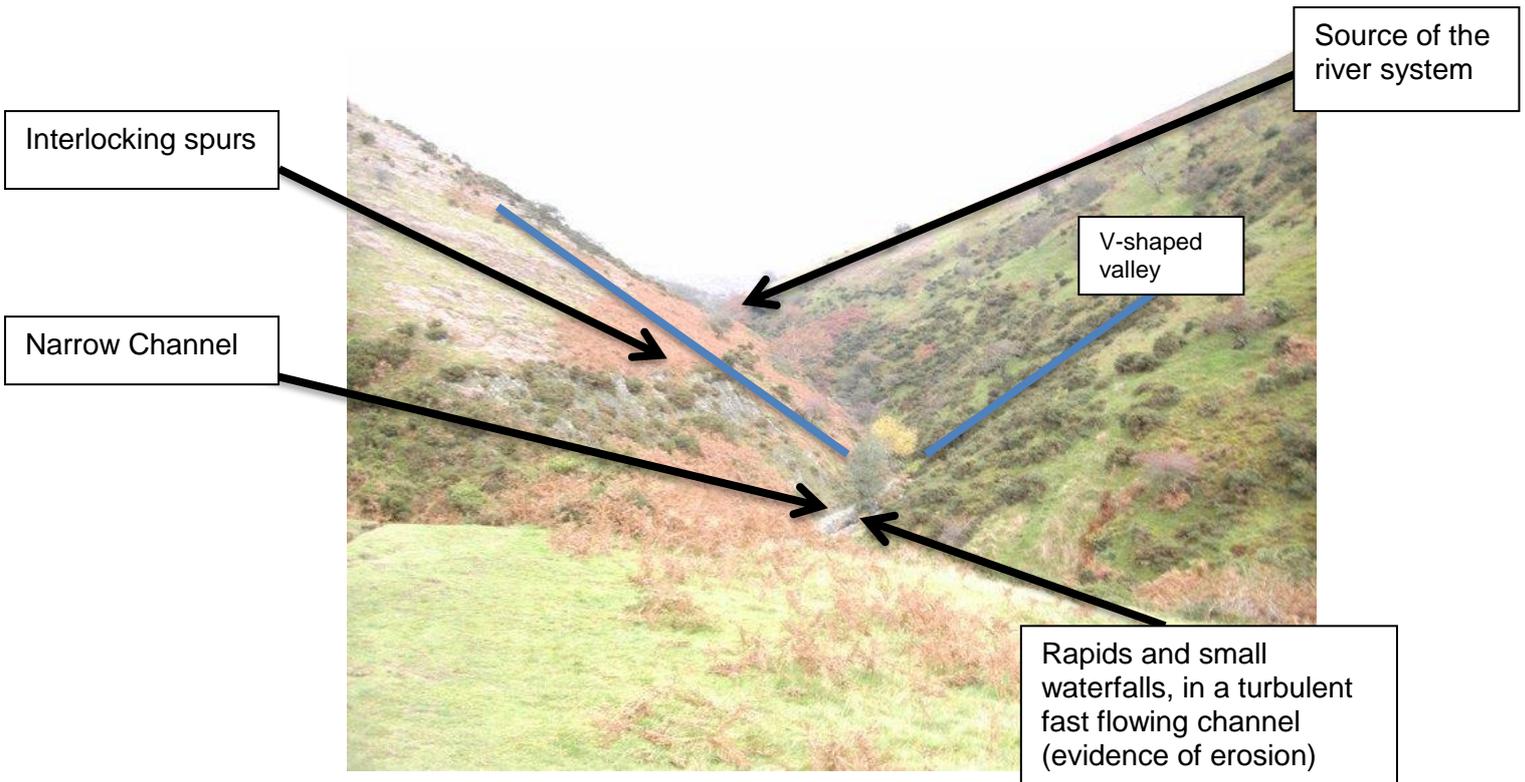
**Activity three: Presenting your Findings :**

There are many different and creative ways for your pupils to share the information they collected through their fieldwork. These might include the following:

A river display. Create a class display using a map and your pupils' field sketches, supplemented by photographs and also any historical images, to illustrate the main features of your local river, how people use it and its surrounding land and how this has changed over time. You pupils could also draw and label their own 'top trump' cards to identify the different features of the stages of a river.

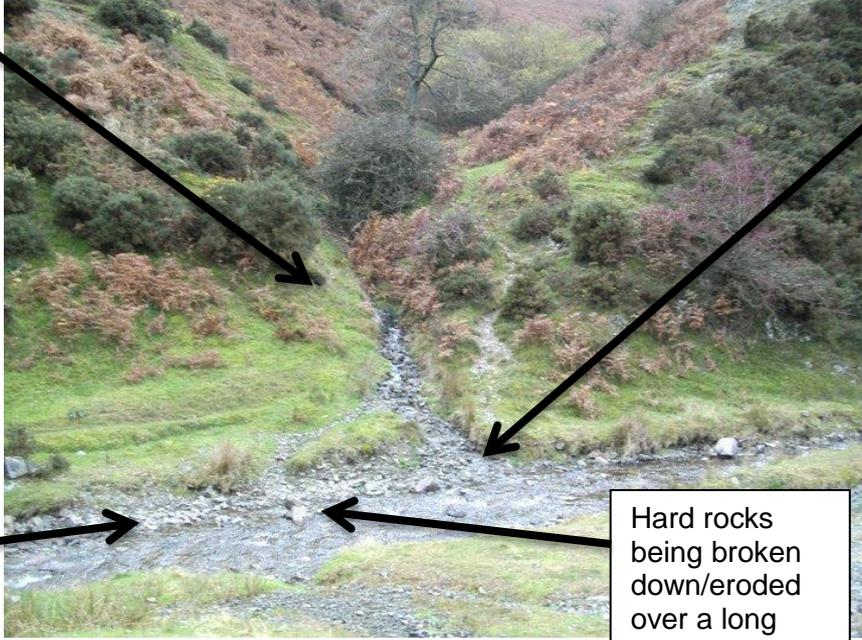
Example: Annotating photographs (identifying the main characteristics of a river.)

Example 1a: Upper course of a river





Steep valley sides and interlocking spurs



Confluence- a point where two rivers meet. Here you can see a tributary joining the main stream

Small rapids and small waterfalls, in a turbulent fast flowing channel (evidence of erosion). River flows around hard rock.

Hard rocks being broken down/eroded over a long period of time

Example 1b: Waterfalls picture from Flickr (creative commons)

Upstream

Vegetation



Hard rock

Soft rock

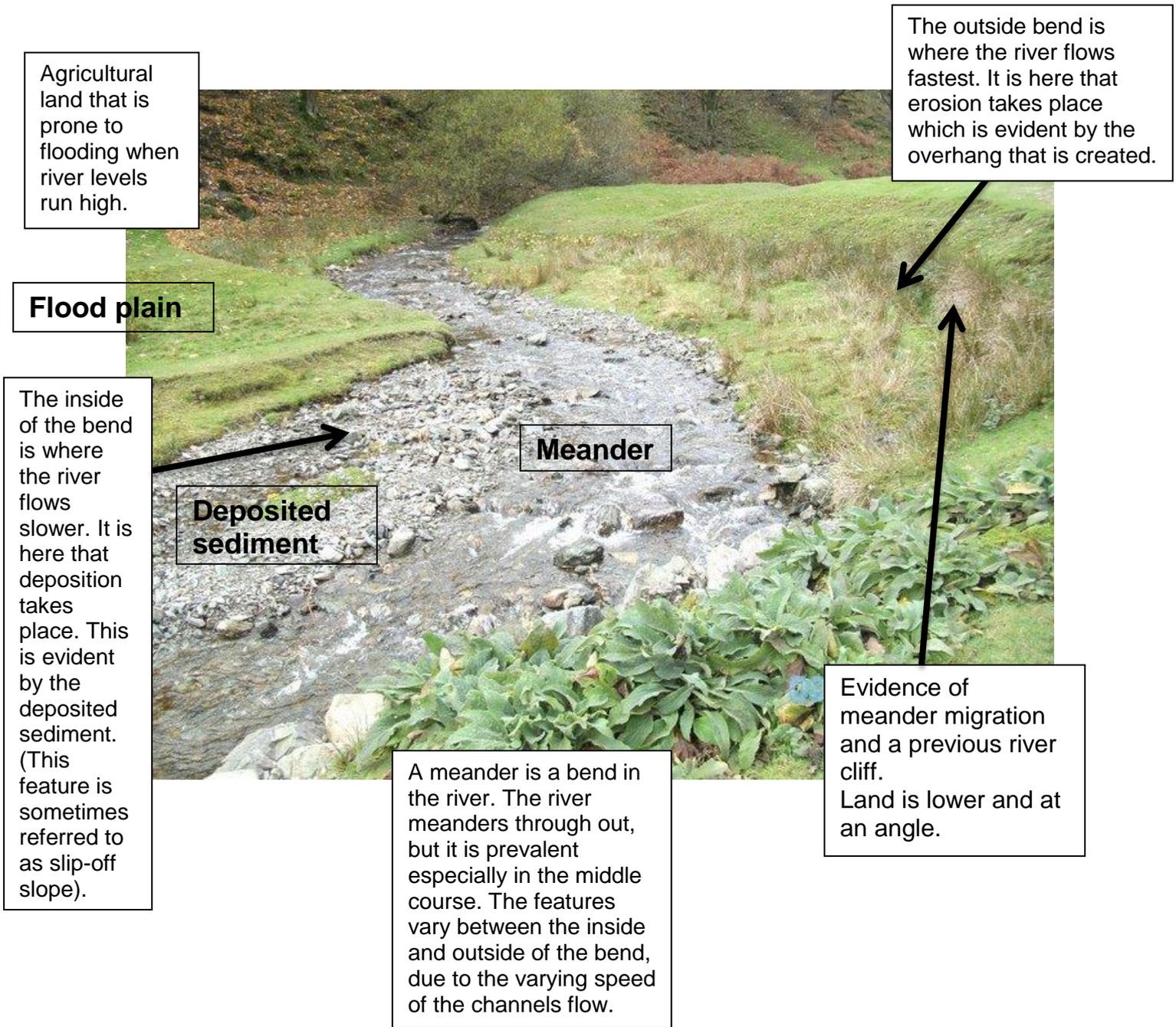
Downstream

Plunge pool

The waterfall is a river feature created due to erosion, where hard rock lies on top of soft rock. Over a period of time, soft rock is eroded away which then results in a waterfall.

The formation of a gorge: This occurs over a period of time, as the waterfall recedes backwards after period continual erosion has taken place. It results in a deeper section of the river with steeper sides of the bank.

Example 1c: Middle course of a river



Agricultural land that is prone to flooding when river levels run high.

**Flood plain**

The inside of the bend is where the river flows slower. It is here that deposition takes place. This is evident by the deposited sediment. (This feature is sometimes referred to as slip-off slope).

**Deposited sediment**

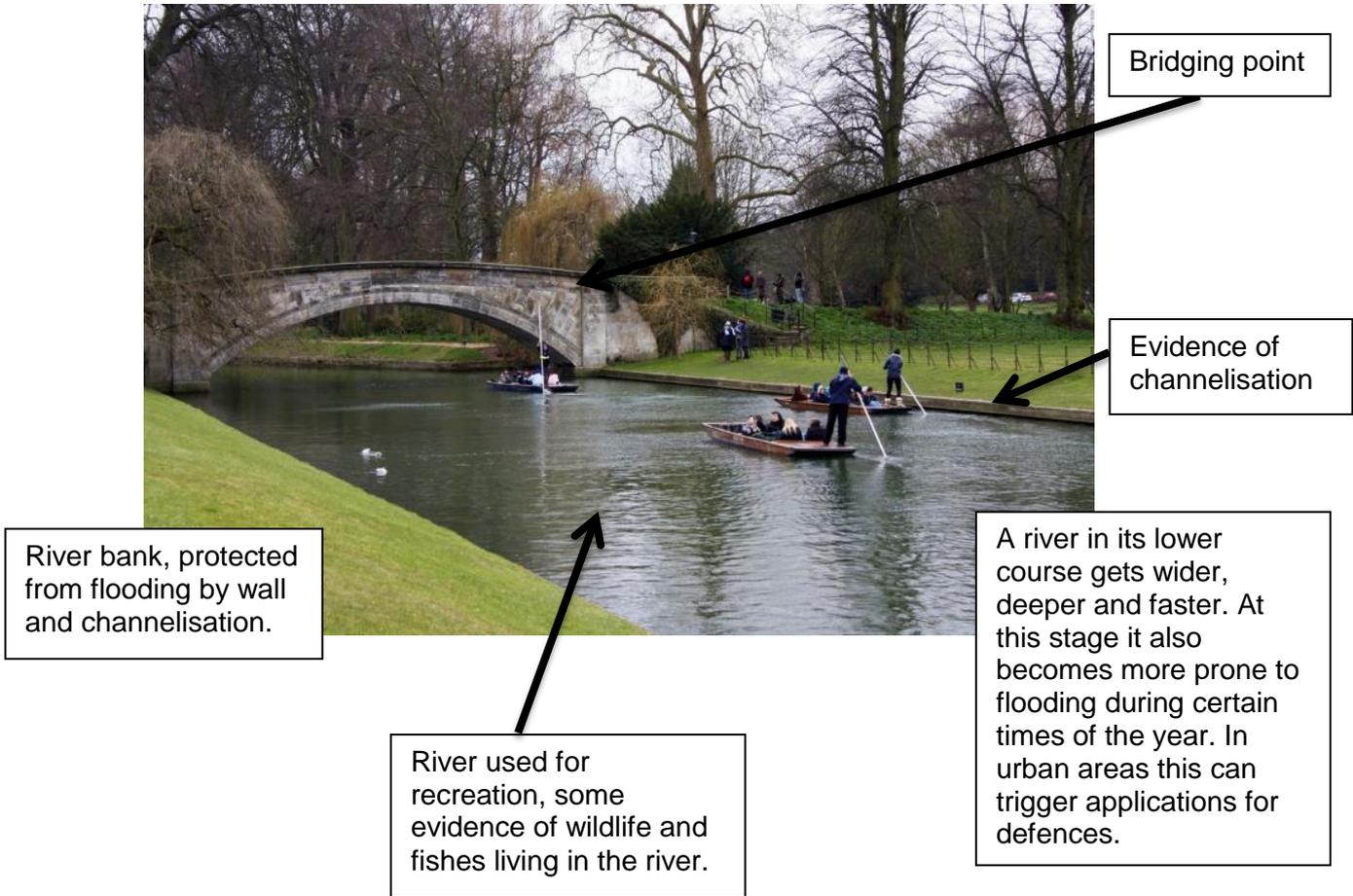
**Meander**

The outside bend is where the river flows fastest. It is here that erosion takes place which is evident by the overhang that is created.

Evidence of meander migration and a previous river cliff. Land is lower and at an angle.

A meander is a bend in the river. The river meanders through out, but it is prevalent especially in the middle course. The features vary between the inside and outside of the bend, due to the varying speed of the channels flow.

Example 1d: Lower course of a river picture from Flickr (creative commons)



Bridging point

Evidence of channelisation

River bank, protected from flooding by wall and channelisation.

River used for recreation, some evidence of wildlife and fishes living in the river.

A river in its lower course gets wider, deeper and faster. At this stage it also becomes more prone to flooding during certain times of the year. In urban areas this can trigger applications for defences.

Example 1e: Lower course of a river leading to mouth picture from Flickr (creative commons)



The river itself is tidal, and has a series of defences along its edge called the Thames wall. The wall, acts as a barrier against flooding (see the lion below).

Thames estuary is the point at which the river meets its end (the mouth) and drains into the North Sea.

The land on either side of the river in its lower course is flat and prone to flooding. The government have invested in hard management techniques and zoning to ensure that in cases of flooding the cost is not too damaging.

River was used to transport goods, making London a trading centre, and a capital city. Now recreational boats are amongst the vessels that

The river Thames flows through the City of London and has a great deal of historical links. The river is an integral part of its history. It's origins as a water source, bridging point, and trade route, make it one of the most recognised and influential rivers in the world.

Some of London's most expensive real estate is found around the river's edge, which makes defending it crucial.

Bridges along the length of the river links the North and South of the city.



During the 19th century the Thames used to be a dirty, smelly and horrible place as raw sewage was being pumped into the river. In 1957 the river was declared biologically dead however today the river holds more than 125 species of fish. The increase in fish has also led to seals and dolphins being spotted in the river in central London.

- Some River Trivia:**
- The lion's head mooring rings on the Embankment are said to be significant as when the Thames rises and covers them, water will flow over the retaining wall and flood London. "When the lions drink, London will sink, when it's up to their manes, we'll go down the drains".
  - The stretch of river in front of the Houses of Parliament is the only restricted area on the Thames.
  - Lambeth Bridge is painted red to match the benches in the House of Lords and Westminster Bridge is painted green to match the benches in the House of Commons.

The annotated urban examples below is a picture of the River Thames barrier from Flickr (creative commons)

The Thames Barrier was built in 1982 on the eastern side of the capital at Woolwich, along the Thames. It was designed to protect 125 sq. km of central London from flooding caused by tidal surges.



The Thames Barrier consists of 10 gates which open and close in response to tidal activity. All the gates are hollow and made of steel up to 40 millimetres (1.6 in) thick. The gates are filled with water when submerged and empty as they emerge from the river.

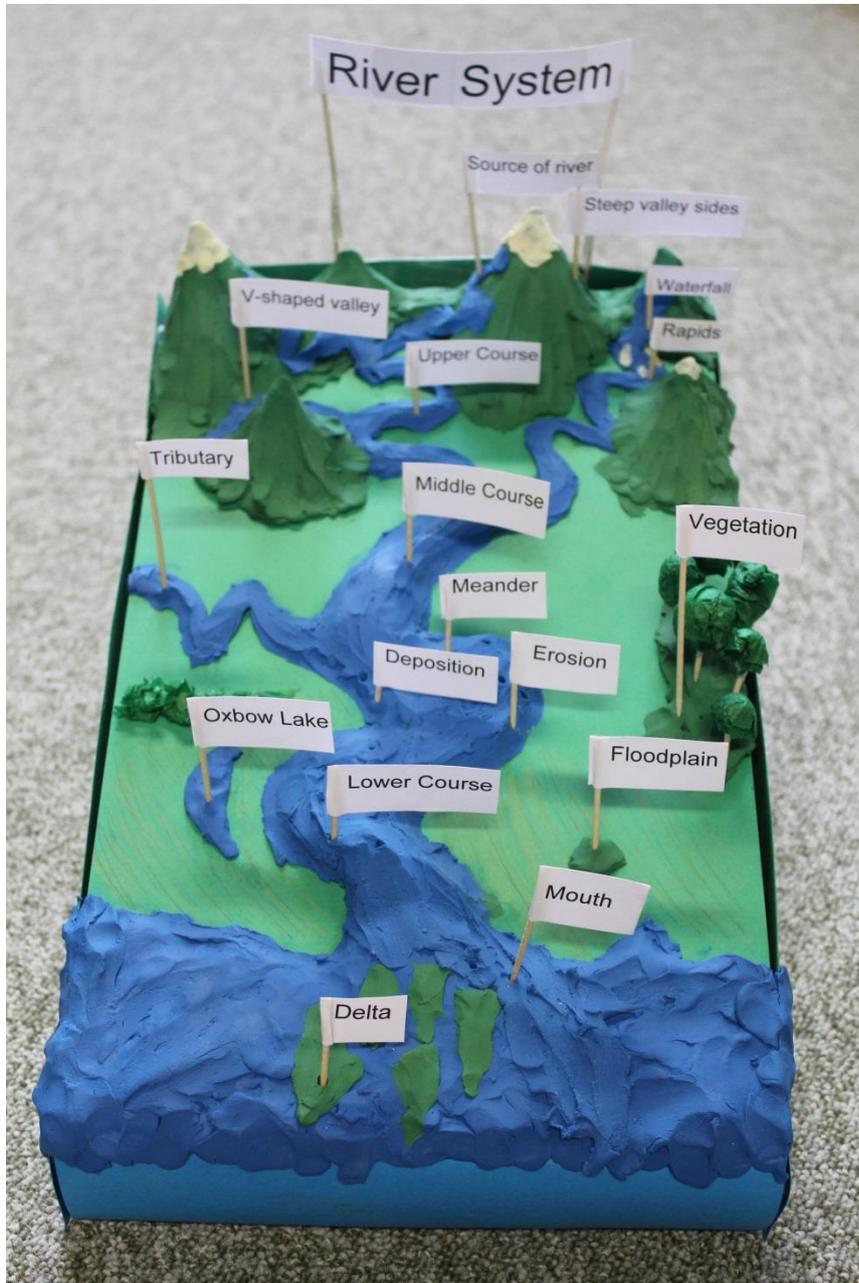
See:  
[http://en.wikipedia.org/wiki/Thames\\_Barrier](http://en.wikipedia.org/wiki/Thames_Barrier)

The Thames Barrier is made up of 10 steel gates, reaching 520m (1,700ft) across the river. When opened, the gates lie flat on the river floor and close by being rotating upwards until they block the river.

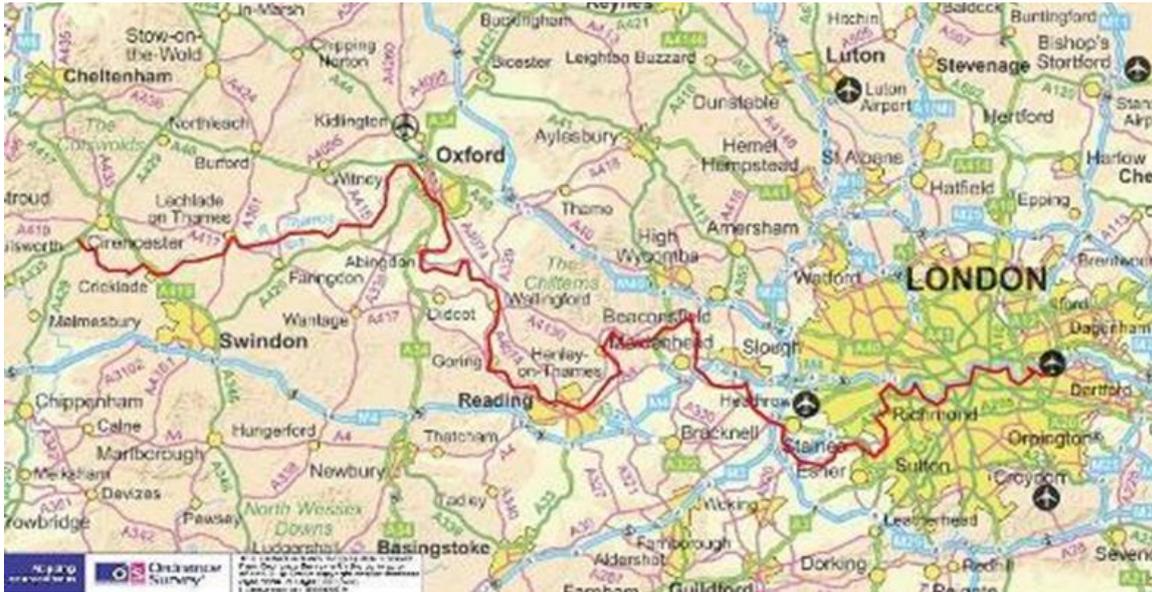
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Build your own river. You can ask your pupils to build and label their own river system, identifying the main characteristics of the upper, middle and lower courses using plasticine or play dough.

In addition, your pupils might also make a model of their own local river identifying its physical features and how people have both altered the river and used the local land for different purposes.



Tracing the course of your river. You will need a map of your local area and beyond if you are to trace the course of the river you visited from its source to its mouth. You can source maps from the Ordnance Survey through their Digi Map for Schools programme and also through Esri UKs ARCGIS online mapping. For example, the following Ordnance Survey map extract shows the course of the Thames starting from its source at Thames Head near Cirencester in Gloucestershire and flowing eastwards toward London, before finally entering the Thames Estuary and North Sea. The Thames has a length of 364 KM (215 miles) and is the second longest river in the UK.

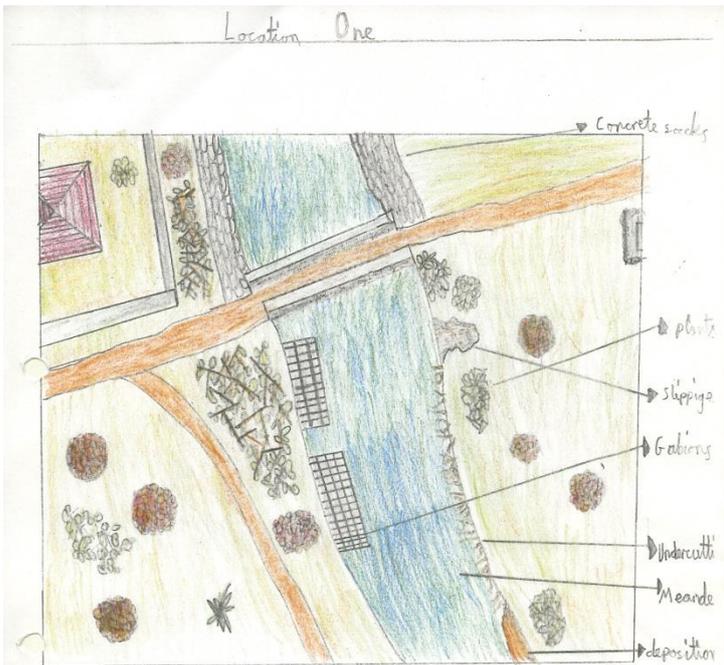


Flooding and how we protect ourselves. There may be evidence of flooding at your local river and the website listed below can be searched by your local area to see if your river presents any flood risk.

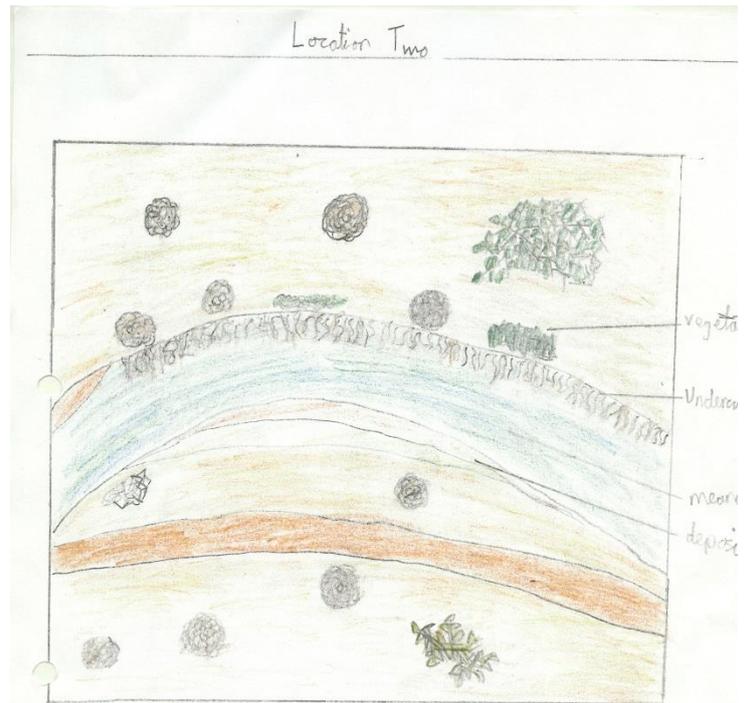
Write a walk along the river. Using local maps, photographs and sketches your pupils could write their own guided walk along their local river that others could use to find out about it. Pupils can make good use of directional language and key geographical vocabulary in their piece of writing. The Society has developed a wide range of guided walks around their UK through its Discovering Britain Project and an example of a guided walk along the River Quoile, Downpatrick Northern Ireland can be seen on this link <http://www.discoveringbritain.org/walks/region/northern-ireland/downpatrick.html>

How does the river influence our lives? Use the information your pupils collected to explore how the river in many different ways influences the lives of people who live near it. How does it influence where people live, what they do, how they manage or use the river or the different types of land-use around the river's course.

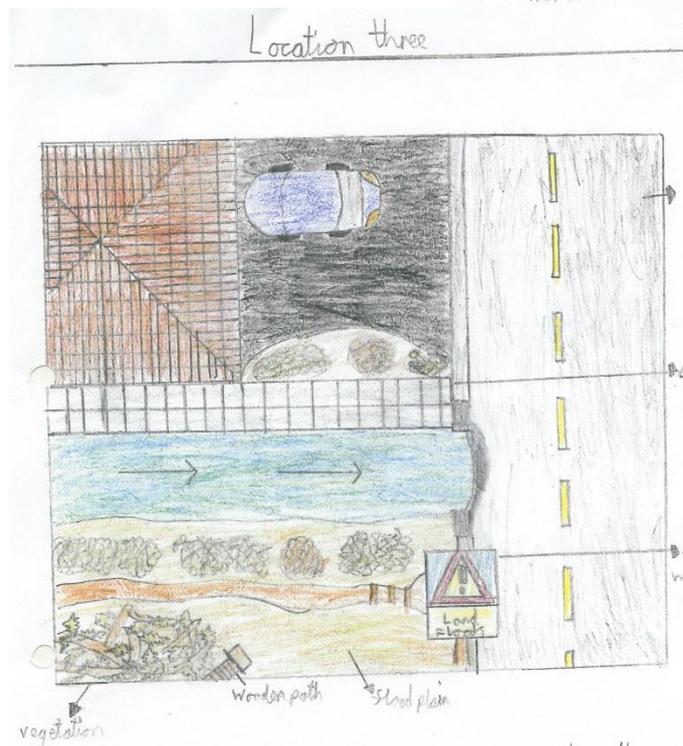
Example of pupils' work (field sketches of a river and surrounding landscape at different locations)



In location one There is undercutting, slippage, a meander and deposition. The meander shows that this is the middle course. The water level is low compared to the height it has been because you can see the undercutting above the water level. The slippage has been caused because of the undercutting, the river bank is weakened and the land falls into the river. On the meander the water on the outside of the bend is deeper and flows more quickly causing erosion and on the inside of the bend the water is shallower and flows more slowly causing deposition.



At this location undercutting and deposition in the meander are visible. The water level is lower than it has been before because the undercutting is above the water level. The water level can be affected by rain, sleet and snow. On the meander the water on the outside is deeper and flows more quickly whereas on the inside the water is shallower and flows more slowly so deposition is left there.



The concrete wall is built to stop undercutting causing slippage. This protects the house from falling into the river. The vegetation grows here because of the saturated soil. The warning sign is there because the land around the river can flood. The wooden path is used when the flood plains flood so you have a place to walk.

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## **Information Sheet. The three stages of a river: upper, middle and lower**

Sections of a river can be categorised into three different stages. The upper, middle and lower courses. As a river flows from its source to its mouth it changes gradually between these three courses; these are gradual changes and there is not an abrupt difference between one course and the next.

The three courses can be broadly categorised by their accompanying landscapes, types of river channels, speed and nature of the flow of the river, how or whether it is eroding or depositing sediment.



Upper course



Middle course



Lower course

For more information on sites and characteristics of a river, see earlier in presenting your findings.

### Useful links

- Royal Geographical Society (with IBG)
  - Fieldwork units on weather, rivers and woods: [www.rgs.org/rlq](http://www.rgs.org/rlq)
  - KS2 units on studying the UK, mapping, weather and climate, rivers and water, settlement and land use, Mountains, Volcanoes and Earthquakes, and The Mediterranean can be found on: [www.rgs.org/resources](http://www.rgs.org/resources) (available from late 2014/early 2015)
  - A photographic overview of Britain's natural, built and managed environments is provided by the Society's Britain from the Air online exhibition, which has accompanying educational activities. Please see [www.rgs.org/bfta](http://www.rgs.org/bfta)
  - The Society's Discovering Britain has published over 130 short geographical walks spanning Birmingham's industrial heritage to a river walk in Northern Ireland. [www.discoveringbritain.org/](http://www.discoveringbritain.org/)
- Ordnance Survey. You can view a map of your local area through the Ordnance Survey's Open Data mapping view <http://www.ordnancesurvey.co.uk/oswebsite/opendata/viewer/>. Schools can access much more extensive OS data through Digi Maps for Schools <http://digimapforschools.edina.ac.uk/cosmo/home>.
- Esri produce lessons around GIS which can be found on: <http://www.esriuk.com/products/arcgis-schools>. (Also see: <http://www.arcgis.com/home/webmap/viewer.html>)
- Google Earth can be used to help explain spatiality and locality: [http://www.google.co.uk/intl/en\\_uk/earth/](http://www.google.co.uk/intl/en_uk/earth/)
- Flood risk maps <http://maps.environment-agency.gov.uk/wiyby/wiybyController?value=N21+1AL&lang=e&ep=map&topic=floodmap&layerGroups=default&scale=11&textonly=off&submit.x=11&submit.y=10#x=531311&y=195850&lq=1,&scale=11>
- The Field Studies Council provides informative and educational opportunities for people of all ages to better understand the environment: <http://www.field-studies-council.org/>