

Bowlees & High Force, Teesdale, County Durham



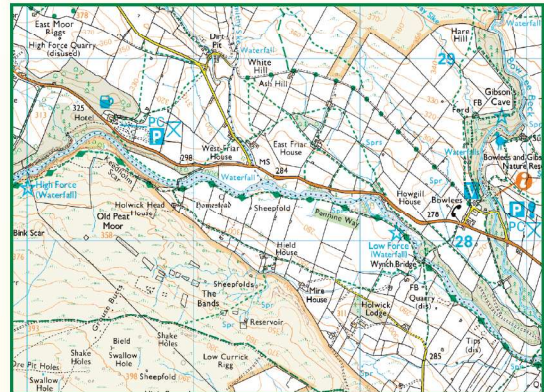
Rock Detective: Rock types and Waterfalls



INTRODUCTION

The fieldwork element of this day involves looking at how the speed or velocity of the river changes downstream and how that influences the work of the river. It also looks at the features of the upper of course of the river and in particular the formation of waterfalls.

All the resources required for pupils to carry out a day of fieldwork are included as well as all the resources required for the introductory and follow-up activities. The table below summarises the activities.



Bowlees and High Force, Teesdale

Landscape Detective - Rock types and Waterfalls

SUMMARY OF ACTIVITIES

Activity name	Details of activity
Introductory Activity 1	Detective map work
Introductory Activity 2	Rivers and rock types
Fieldwork Outline	The rock types of upper Teesdale Waterfall formation
Follow-up activity 1	Formation of High Force waterfall
Follow-up activity 2	Igneous, sedimentary and metamorphic rocks
Follow-up activity 3	Design and advertising leaflet for tourists coming to the area
Follow-up activity 4	Traditional tales







DETECTIVE MAP WORK

It is suggested that this map work should be done before the visit and then comparisons can be made during the visit. Some introduction to O.S. maps will be needed to get the most from this work. This could be done using the map extract used here but it would be more exciting for the children to prepare with a different map and then present this as a challenge!

Key idea – ‘Detective Work’

- Look at the map and discuss together
- Collect as many clues from the map as possible about what the area is like
- Encourage the children to imagine what the place they are going to visit is like?
- In small groups describe what they would expect to find on their visit. Make a note of this description
- Compare their description with what they actually see when they get there





Introduction to map work

Before starting the map work the children will need to know a little about contours, scale, direction, map symbols and grid references. Below is a reminder about grid references.

- O.S. maps have a grid system.
- Each vertical and horizontal line has a number.
- To place ‘My house’ using a 4-figure grid reference take the numbers from the bottom left hand corner of the square with ‘My house’ in it, giving the vertical line number first and then the horizontal line number. In this example it is 2131. The most common way to remember which figure comes first is by the saying “Along the corridor and up the stairs”.
- 6-figure grid references pinpoint features within the squares. This requires the map reader to imagine the grid square is divided in tenths along the horizontal and vertical scale. So ‘My house’ becomes 215315.

Bowlees and High Force, Teesdale

Introductory Activity 1 - Teacher Resource Sheet

	20	21	22	23
33	<p>Wilde’s Woods</p> 		<p>Mt. Fire</p> 	
32		<p>My house</p> 		
31	<p>Our school</p> 			
30				





Bowlees and High Force, Teesdale

Introductory Activity 1 - Pupil Resource Sheet 1

DETECTIVE MAP WORK

Use the O.S. map extract and symbols for this site and in small groups complete the following:

1. As a group discuss and attempt the following and be prepared to feed back to the class:

- Point to north on your map.
- Trace the river Tees with your finger.
- How many bridges – road, rail or footbridges cross the River Wear on the section of map you have?
- Trace the main road with your finger.
- Why do you think that the river and road stay so close?
- Find some field boundaries (thin black lines).
- Look in Grid Square 9027 - put your finger on it. Estimate how many fields are in this square?
- Look at Grid Square 8925 - put your finger on it. How many fields are in this square? Why do you think it is so different? Make a guess.

2. Bowlees detective work

- Find Bowlees (Grid Square 9028). Put your finger on it.
- How many houses do you think there are in the village?
- Is there a telephone box?
- Is there a church?
- Imagine you are walking from Bowlees to Hare Hill (grid square 9029). Look at the map, find the path and then from the clues on the map describe to each other what your walk would be like. What would you pass? What is the scenery like? How far is it? Is it steep? Up hill or down hill? Be prepared to feed back to the rest of the class.

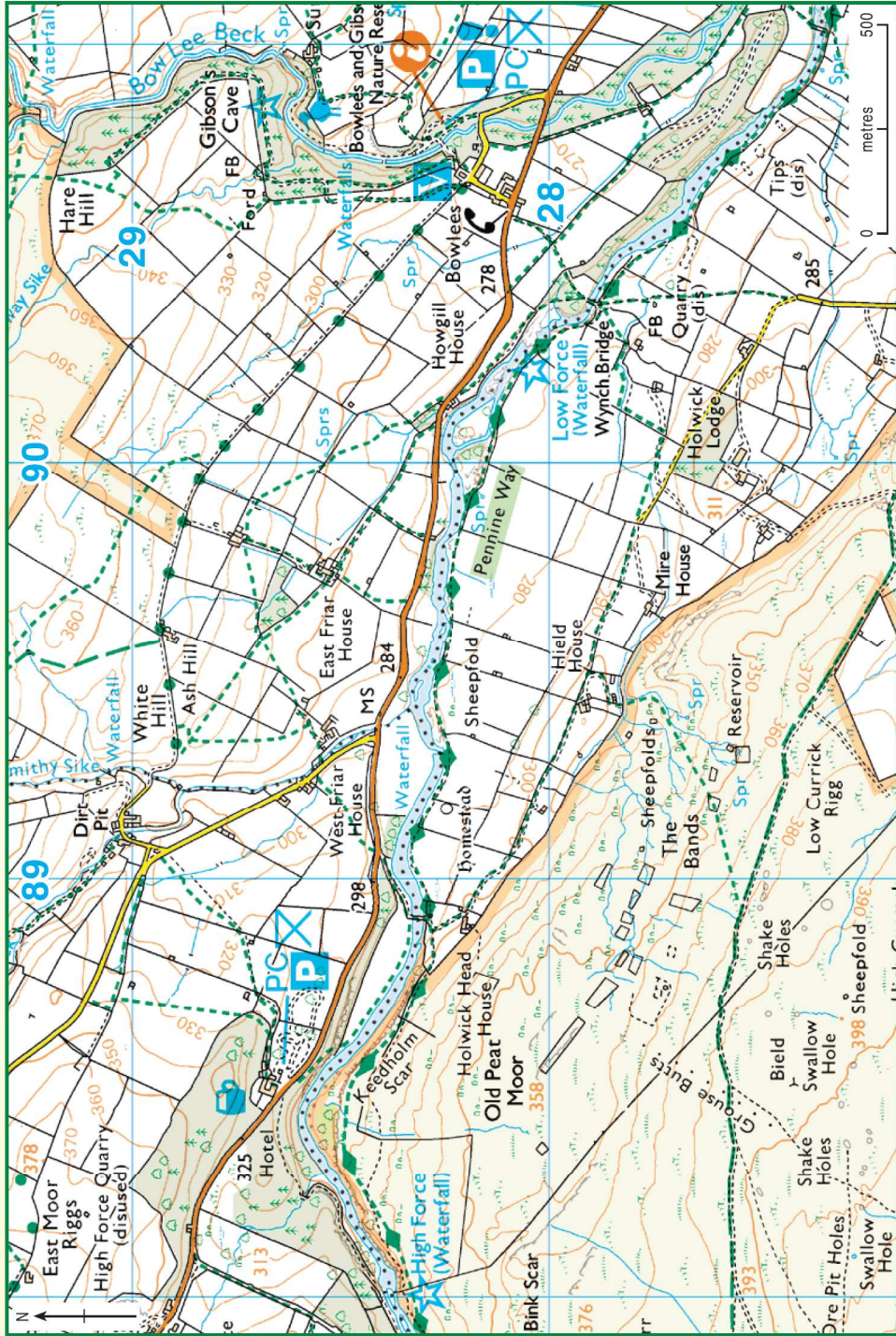
3. Grid references

As a group complete the grid below:

Grid reference	What is there?
9425	
	Camp site
	High Force
	Small reservoir
9027	Name the bridge: _____
	Camping barn
9127	







O.S. Map of Bowlees and High Force





Ordnance Survey Map Symbols

Pupil Resource Sheet

ROADS AND PATHS

	Motorway
	Dual carriageway
	Main road
	Secondary road
	Narrow road with passing places
	Road under construction
	Road generally more than 4m wide
	Road generally less than 4m wide
	Other road, drive or track, fenced and unfenced
	Path

RAILWAYS

	Multiple track
	Single track

PUBLIC RIGHTS OF WAY

	Footpath
	Bridleway

BOUNDARIES

	National
	County (England)
	Civil Parish (CP)
	National Park boundary

SELECTED TOURIST AND LEISURE INFORMATION

	Parking
	Information centre
	Public convenience
	Telephone
	Campsite / caravan site
	Golf course or links
	Public house
	Walks
	Viewpoint
	Picnic site
	Country park

GENERAL FEATURES

	Place of worship
	Building
	Bus or coach station
	Triangulation pillar
	Windmill
	Boundary post / stone
	Clubhouse
	Footbridge
	Monument
	Post Office
	Police station
	School
	Town hall





PURPOSE AND AIMS OF THE VISIT

The main aims of the fieldwork are:

- To look at the main groups of rocks - sedimentary, igneous and metamorphic.
- To look at the rock types in upper Teesdale.
- To look at the how the rocks have helped to make the waterfalls of upper Teesdale.

Background Information:

Rocks can be grouped into 3 types based on how they are formed:

- **Sedimentary rocks** - these rocks are formed from sand and mud and the remains of plants and animals being deposited as layers of sediment in the sea or rivers. As the layers build up the sediment is compacted and the grains become cemented together.
- **Igneous rocks** - deep inside the Earth the rocks are so hot they are molten and are called magma. If the magma comes to the surface of the Earth it cools and hardens to form igneous rocks.
- **Metamorphic rocks** - pressure and heat can change rocks. Rocks that have been changed are called metamorphic rocks.

In this study area of Upper Teesdale there are 3 main sedimentary rocks (limestone, shale and sandstone)

an igneous rock (dolerite or Whinstone) and a metamorphic rock (hornfels).

Limestone - Limestone is a sedimentary rock formed in a warm tropical sea from the shells and skeletons of marine animals. It is grey in colour and may contain fossils. The limestone is in layers or beds.

Shale - Shale is made from mud and silt washed into the sea by rivers. The layers of sediment build up and are compacted to form shale. Shale is made up of very small grains of sediment laid in fine layers. It is a very soft and crumbly rock.

Sandstone - Sandstone is made from sand grains washed into the sea by rivers. The layers of sediment build up and are compacted to form sandstone. The sand grains can be seen in the light brown sandstone and the rock is in layers or beds.

Dolerite - Dolerite is an igneous rock formed when magma is intruded into rocks close to the Earth's surface and which then cools and solidifies. It is made of small, dark and pale crystals and often looks as if it is made up of columns. This is called columnar jointing.

Hornfels - Hornfels is a metamorphic rock formed when an intruded igneous rock heats the sedimentary rocks around it. At High Force the dolerite has heated the shale, which has altered to hornfels.

The rocks above all vary in their hardness. It is the relative hardness of these rocks that has resulted in the formation of the waterfalls of Upper Teesdale.

Bowlees and High Force, Teesdale

Introductory Activity 2 - Teacher Resource Sheet

INTRODUCING THE FIELDWORK

Introduce the fieldwork using the North Pennines Rock Box:

a) In groups give the pupils samples of limestone (sample 7), shale (sample 13), sandstone (sample 11), dolerite (sample 5) and hornfels (sample 2) and a hand lens. Use the Rock Key on Pupil Information Sheet 1 to decide whether the rocks are sedimentary, igneous or metamorphic. Complete activity 1 on Pupil Resource Sheet 2.

b) Cut up the cards on Pupil Information Sheet 2 and give a set to each group. Use the cards to decide the rock type of each sample. Complete activity 2 on Pupil Resource Sheet 2.

c) Encourage the pupils to look at and feel the rocks. Complete activity 3 on Pupil Resource Sheet 2.

d) Discuss how rocks are used around us - buildings, road stone, walls, sculptures, cement making etc. Get the pupils to use the internet and other school resources to research the uses of the rocks they will see in upper Teesdale. Complete activity 4 on Pupil Resource Sheet 2.



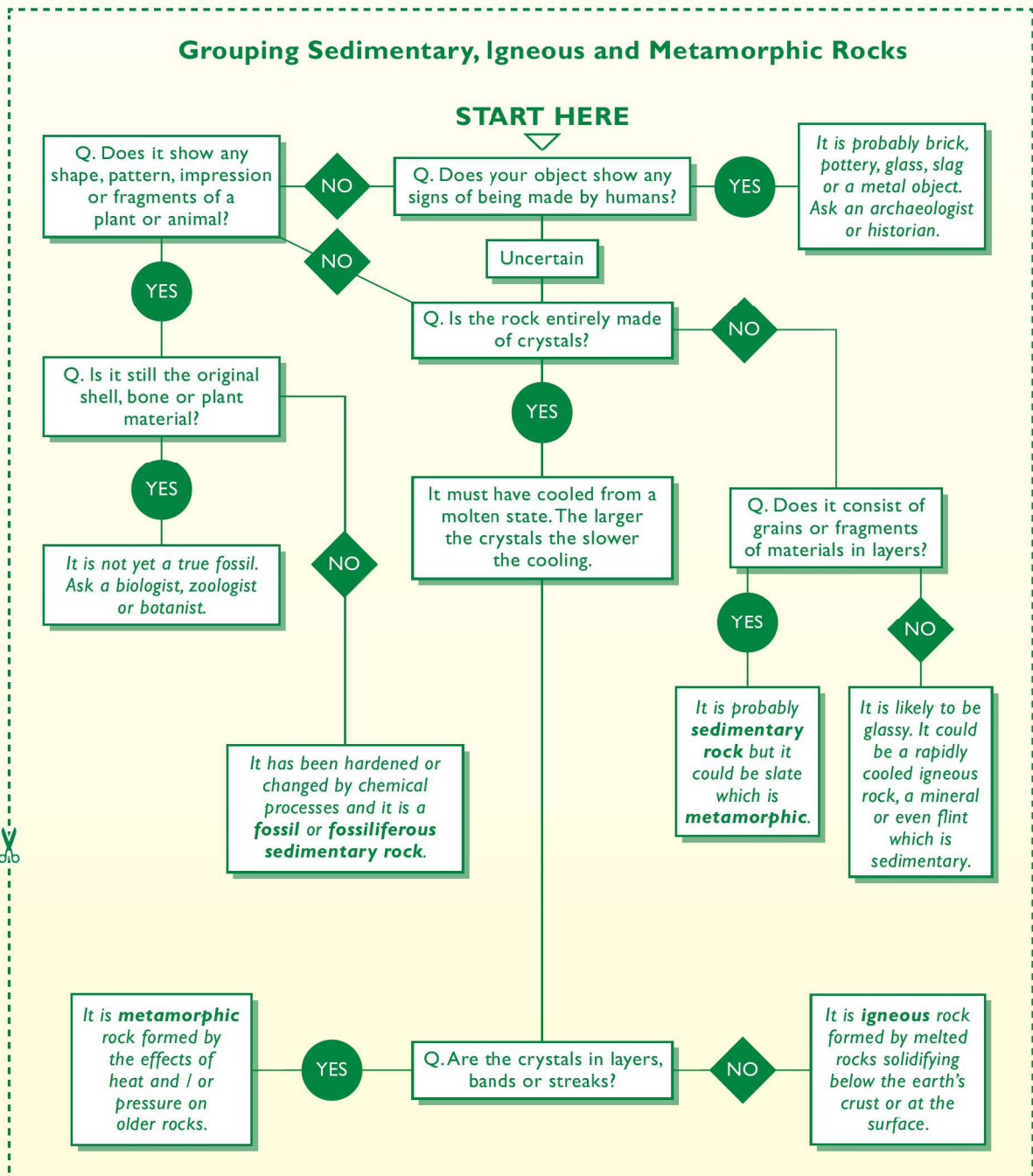


Bowlees and High Force, Teesdale

Introductory Activity 2 - Pupil Information Sheet 1

THE ROCK KEY

If you find something that looks like a stone or piece of rock, follow this key to find out more. If none of the answers fit, ask a geologist.



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Bowlees and High Force, Teesdale

Introductory Activity 2 - Pupil Resource Sheet 2

WHAT ROCK HAVE I GOT?

1. Use the Rock Key to decide whether your rocks are sedimentary, igneous or metamorphic. Complete the first part of the table below.

Rock Sample Number	Rock group (sedimentary, igenous or metamorphic?)	Rock type (limestone, shale, sandstone, dolerite or hornfels?)

2. Use the rock cards to discover which rocks are which. Complete the second part of the table above.

3. Look carefully at each of your rock samples and feel them. Which of the rocks do you think is hardest? Which is softest? In the table below rank the rocks according to their hardness. Give the hardest rock a rank of 1 and continue until you have given the softest rock a rank of 5.

Rock type	Hardness
Limestone	
Shale	
Sandstone	
Dolerite	
Hornfels	

4. Use the internet and any other school resources to find out what these rocks may be used for.

Rock type	Limestone	Shale	Sandstone	Dolerite	Hornfels
Uses:					





Bowlees and High Force, Teesdale

Introductory Activity 2 - Pupil Information Sheet 2

WHICH ROCK TYPE?

Instructions:

Print onto thin card and cut each out



LIMESTONE

Characteristics:

- Light to dark grey in colour
- May contain fossils - brachiopods, crinoids, corals
- Found in layers or beds

SHALE

Characteristics:

- Dark brown or dark grey in colour
- Made of very fine grains
- Made up of fine layers
- Very soft and crumbly

SANDSTONE

Characteristics:

- Light brown in colour
- Made of rounded sand-like grains
- Rough to touch
- Found in layers or beds

DOLERITE

Characteristics:

- Made of dark grey / black crystals
- Crystals are small and can be seen with a hand lens
- Often looks as though it is made of columns

HORNFELS

Characteristics:

- Very dark grey to black
- Often with dark brown spots all over
- Very fine grained
- Very thin layers in rock
- Very tough and can be splintery when broken





1. *Bryozoa*

2. *Bryozoa*

3. *Bryozoa*

4. *Bryozoa*

5. *Bryozoa*



ORGANISATIONAL DETAILS

Aim

To look at the rocks found in Upper Teesdale and to see how they have influenced the landscape.

Target Group

Key Stage 2

Location

This fieldwork day starts at Bowlees, to the west of the hamlet of Newbiggin in Upper Teesdale. There are 4 main fieldwork sites, Bowlees Quarry (GR: NY 908284), Gibson's Cave (GR: NY 906285), Low Force (GR: NY 903278) and High Force (GR: NY 881284). You may want to walk to High Force along the route shown on the O.S. map or use your transport to move between Bowlees Nature Reserve and the car park at High Force.

Practical Details

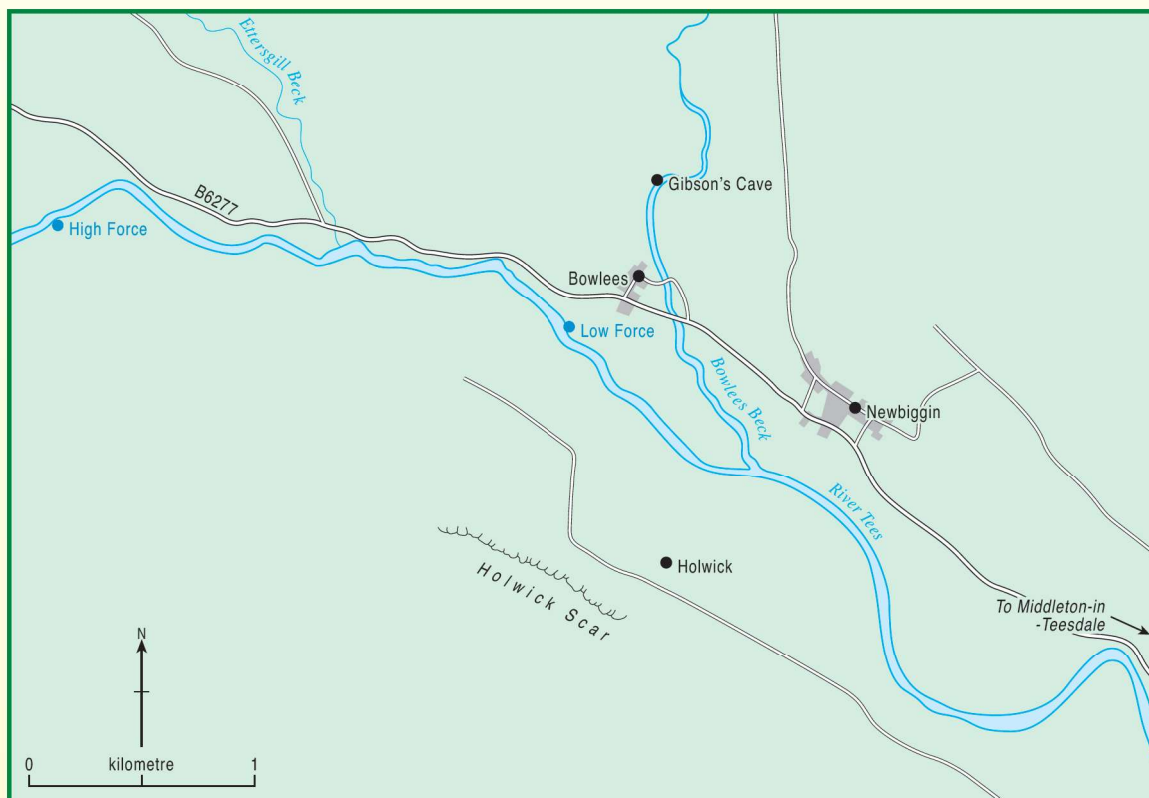
- Parking – There is free parking at Bowlees Nature Reserve. Parking for coaches is on the main road (GR: NY 905281). The three river sites and Gibson's Cave are within easy walking distance. There is a charge for the car park at High Force.
- Charges – There are no charges at Bowlees Nature Reserve but there is an entrance charge for the waterfall at High Force.
- Toilet facilities – There are toilets at Bowlees Nature Reserve and at High Force
- Picnic areas – There are picnic areas at both Bowlees Nature Reserve and High Force.
- Useful map – Ordnance Survey 1:25 000 Explorer OL31 North Pennines Teesdale and Weardale

Safety Issues:

- Hard hats should be worn when working in Bowlees Quarry
- Refer to the Hazard Identification Sheet

Bowlees and High Force, Teesdale

Fieldwork Outline - Teacher Resource Sheet



HAZARDS IDENTIFICATION SHEET

The following notes will help teachers conduct their own risk assessments. This is not a risk assessment and teachers should follow guidelines from the Department of Children, Schools and Families.

Hazard Identified	Risk and to whom	Control measures
Vehicles in the car park	Caution needed when getting off the coach or minibus in the car park as the parking area is narrow and vehicles may be passing. All students and staff.	Supervise students getting off the coach or minibus and gather in a safe place.
Vehicles on the road	Students need to get off the coach at the lay-by on the main road. Cars travel fast along this stretch of road. All students and staff.	Supervise students along the road.
Uneven paths	Paths are uneven and may be slippery in wet weather. Students may slip and fall. All students and staff.	Warn about conditions.
Quarry faces	Rocks in the quarry face may be loose and fall. All students and staff.	Warn about conditions.
Walk to High Force	River bank unfenced. Steep unfenced drop on last section of path before reaching High Force Hotel. All students and staff.	Warn about river. One person on the Wynch Bridge at a time. Keep together as a group.
High Force car park	Traffic in car park. All students and staff.	Supervise students getting off the bus.
High Force	Traffic present when crossing the road. Path to High Force may be slippery and uneven. Falling into a fast flowing river. All students and staff.	Supervise students crossing the road. Warn of conditions. No one allowed beyond the wall at the viewing point to the waterfall.

UNDERTAKING THE FIELDWORK

1. Bowlees - rock types

The main sedimentary rock types of Upper Teesdale can be seen in the face of Bowlees Quarry. The main quarry face is limestone, with layers of shale and sandstone on top.

- Look at the quarry face and describe the different layers of rock that you can see.
- Get the pupils to collect the 3 different types of rock. Use Pupil Information Sheet 3 to help identify the rocks collected.
- Using the background information on the Teachers' Resource Sheet describe how each rock type was formed.
- Use the Pupil Information Sheet 3 to describe the 3 main groups of rocks.
- Complete Questions 1-3 on the Pupil Resource Sheet 3

2. Gibson's Cave – Waterfall formation

Gibson's Cave is an excellent illustration of waterfall formation where a harder rock lies above a softer rock.

- Encourage the pupils to have a good look at the rocks at Gibson's Cave and to work out which layers are limestone, sandstone and shale. (The limestone is on the top and there are layers of sandstone and shale beneath).
- On Pupil Resource Sheet 3 draw a field sketch of Gibson's Cave and label each rock layer on the sketch.
- Using Pupil Information Sheet 3 describe how waterfalls are formed. Complete question 5 on Pupil Resource Sheet 3.

3. Low Force – Rock types

The waterfall at Low Force flows over an igneous rock that has been injected into the sedimentary rocks of the area. This rock type is dolerite or Whinstone.

- Encourage the pupils to have a good look at the rocks at Low Force. Use Pupil Information Sheet 3 to help identify the rock. Answer questions 6 and 7 on Pupil Resource Sheet 3.

4. On the footpath to High Force – Rock types

On the footpath to High Force there is an interpretation board that describes how the dolerite or Whinstone was injected into the surrounding sedimentary rocks. The injection of this igneous rock heated the rocks it came into contact with. The sandstone and shale here have been heated by the dolerite and changed to form another rock called hornfels, which is a metamorphic rock.

- Describe what has happened at this site. Answer questions 8 and 9 on Pupil Resource Sheet 3.

5. High Force – Waterfall formation.

The waterfall at High Force has formed in the same way as the waterfall at Gibson's Cave but the hard rock here is the dolerite or Whinstone and the softer rocks are the limestone and sandstone.

- Look at High Force and describe the rock layers. The dolerite is on top with layers of limestone and sandstone below. Complete question 10 on Pupil Resource Sheet 3.
- Get the pupil to describe how High Force has formed using the names of the hard and softer rocks. Follow-up activity 1 will reinforce this in the classroom.

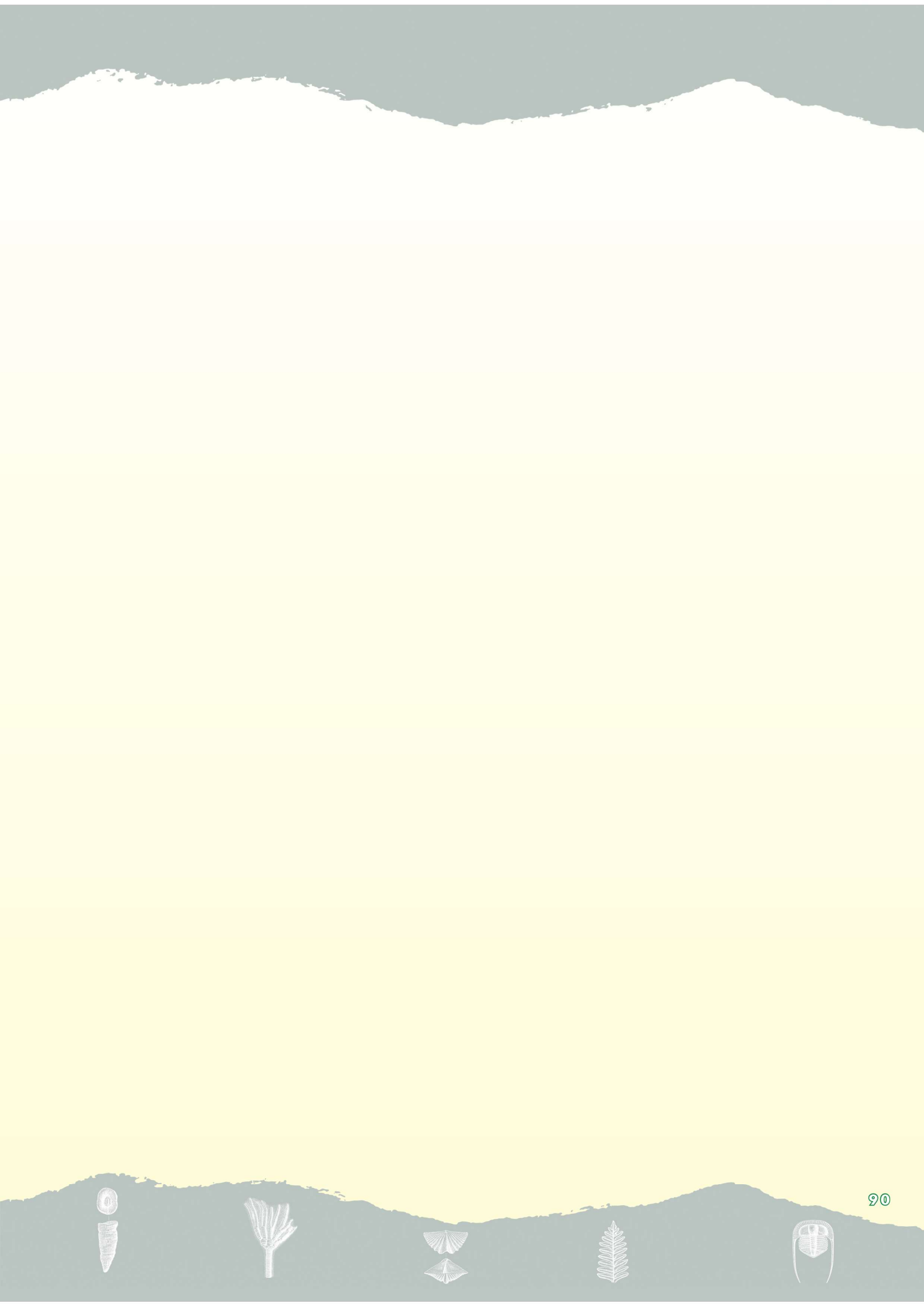
Fieldwork equipment

Hard hats

Pupil Information Sheet 3

Pupil Resource Sheet 4

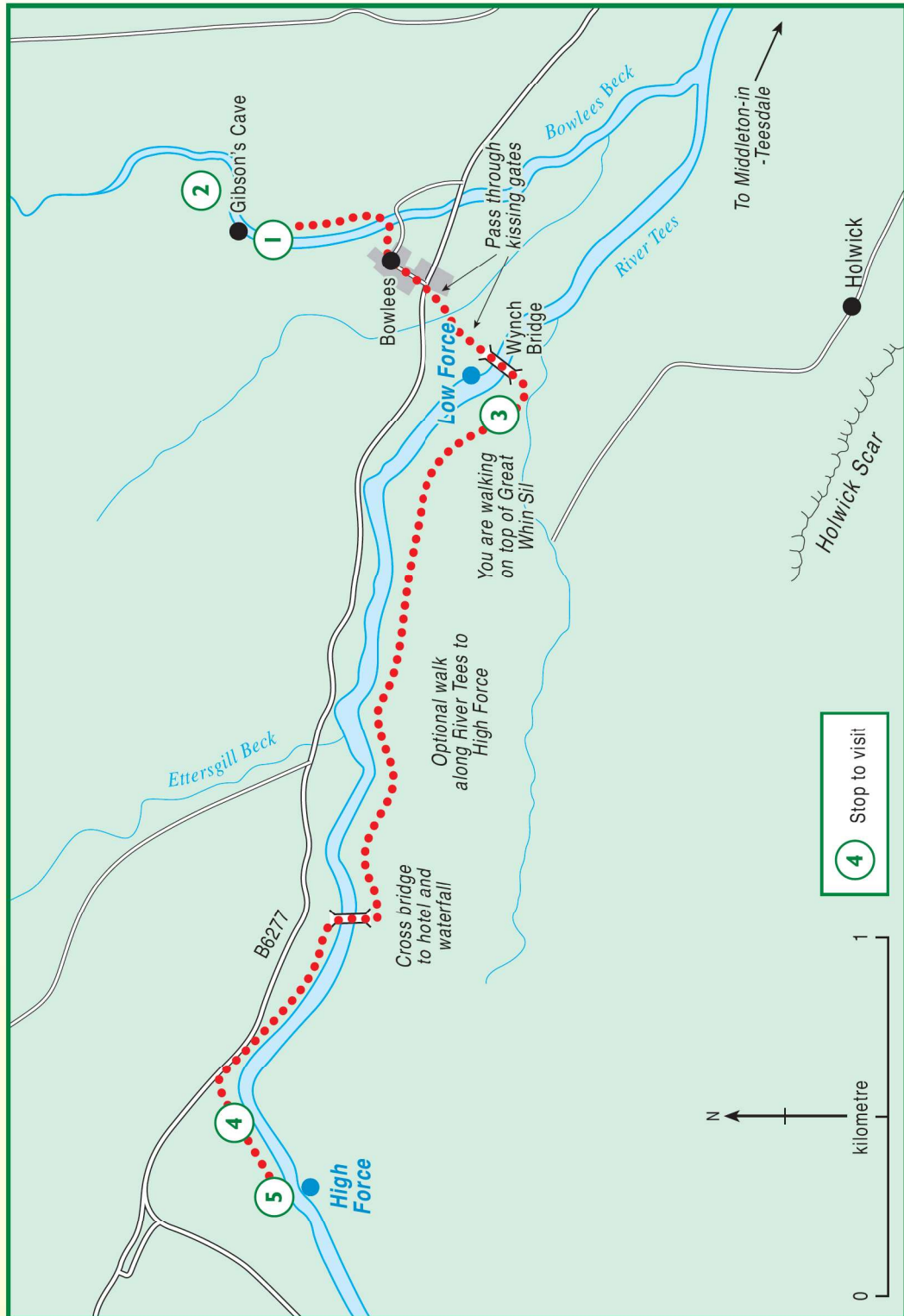






Bowlees and High Force, Teesdale

Field work Activity 2 - Pupil Information Sheet







Bowlees and High Force, Teesdale

The rocks of Upper Teesdale - Pupil Information Sheet 3

1. What rocks are found in upper Teesdale?

LIMESTONE

Characteristics:

- Light to dark grey in colour
- May contain fossils - brachiopods, crinoids, corals
- Found in layers or beds

SHALE

Characteristics:

- Dark brown or dark grey in colour
- Made of very fine grains
- Made up of fine layers
- Very soft and crumbly

SANDSTONE

Characteristics:

- Light brown in colour
- Made of rounded sand-like grains
- Rough to touch
- Found in layers or beds

DOLERITE

Characteristics:

- Made of dark grey / black crystals
- Crystals are small and can be seen with a hand lens
- Often looks as though it is made of columns

HORNFELS

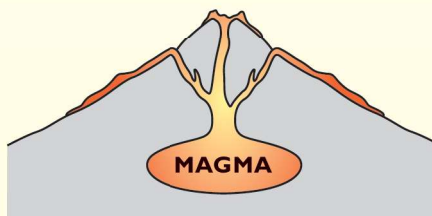
Characteristics:

- Very dark grey to black
- Often with dark brown spots all over
- Very fine grained
- Very thin layers in rock
- Very tough and can be splintery when broken

2. How were the rocks in upper Teesdale formed? Are they igneous, sedimentary or metamorphic?

IGNEOUS ROCKS

Deep down inside the earth the rocks become so hot they melt. Melted rocks are called **MAGMA**. If magma comes to the surface of the earth it cools to form **IGNEOUS ROCKS**.

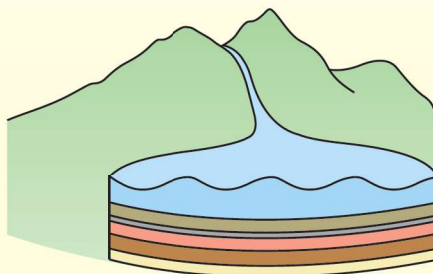


CHARACTERISTICS

Made of crystals.
No fossils.
No layers or beds.

SEDIMENTARY ROCKS

Sand and mud and the remains of plants and animals are laid down as layers in the sea as **SEDIMENTS**. As the layers build up the sediment is compacted and the grains cemented to form **SEDIMENTARY ROCKS**.

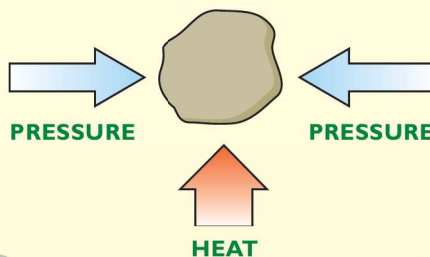


CHARACTERISTICS

Made of grains or fragments.
May contain fossils.
The rock has layers or beds.

METAMORPHIC ROCKS

Pressure and heat can change rocks. Rocks that have been changed are called **METAMORPHIC ROCKS**

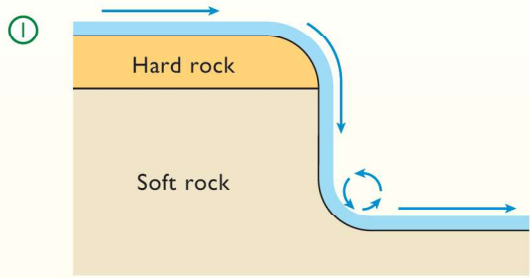


CHARACTERISTICS

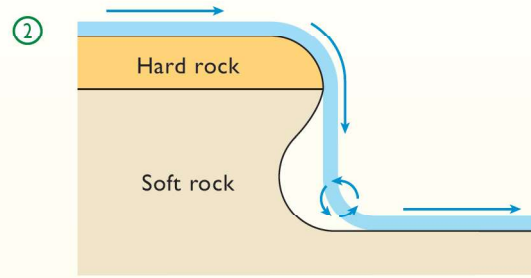
Made of crystals.
Crystals are in layers, bands or streaks.



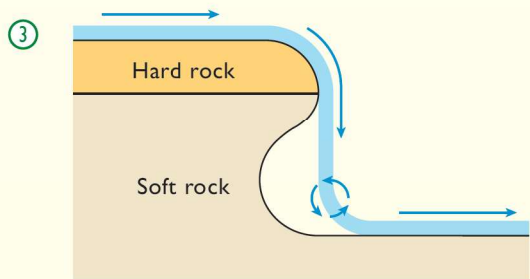
3. How are waterfalls formed?



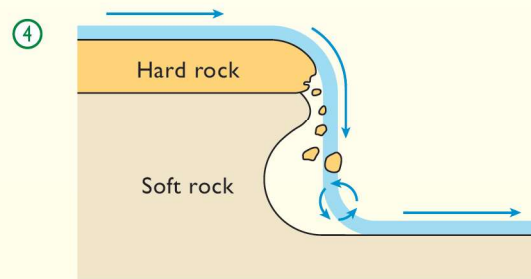
STEP 1: Most waterfalls are formed when the river meets a band of softer, less resistant rock after flowing over a harder, more resistant rock.



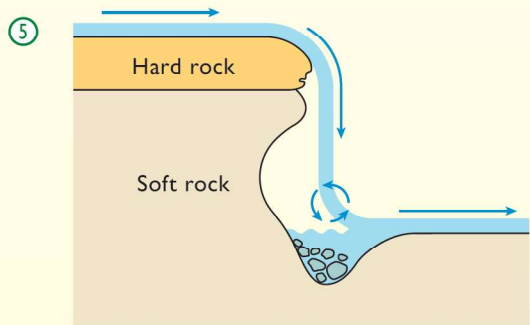
STEP 2: The softer rock is worn away more quickly to form a step in the bed of the river.



STEP 3: The harder rock is undercut by the river.



STEP 4: The undercut rock is left unsupported and will collapse.



STEP 5: The rocks that have collapsed will swirl around at the foot of the waterfall and create a plunge pool.

This process will be repeated and the waterfall will move upstream leaving a steep-sided gorge in front of it.

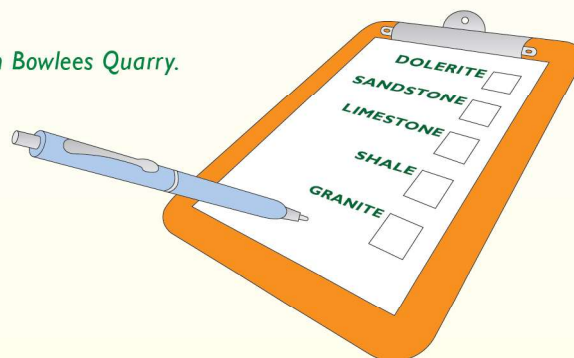


Bowlees and High Force, Teesdale

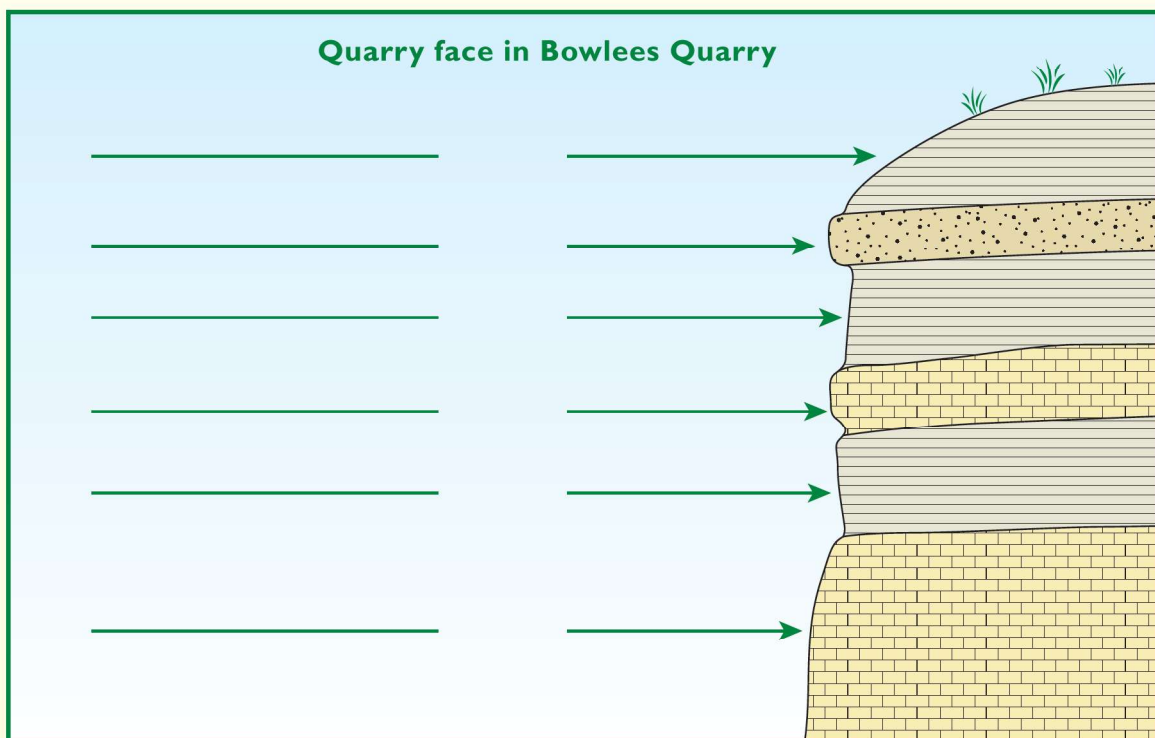
Rock Types and Waterfalls in Upper Teesdale - Pupil Resource Sheet 3

STOP 1: BOWLEES QUARRY

1. Tick (✓) the boxes to show which rocks you found in Bowlees Quarry.



2. Label the rocks on the diagram of the face at Bowlees Quarry.



3. Are the three rock types found in Bowlees Quarry igneous, metamorphic or sedimentary?



Now follow the path to Gibson's Cave at Stop 2.

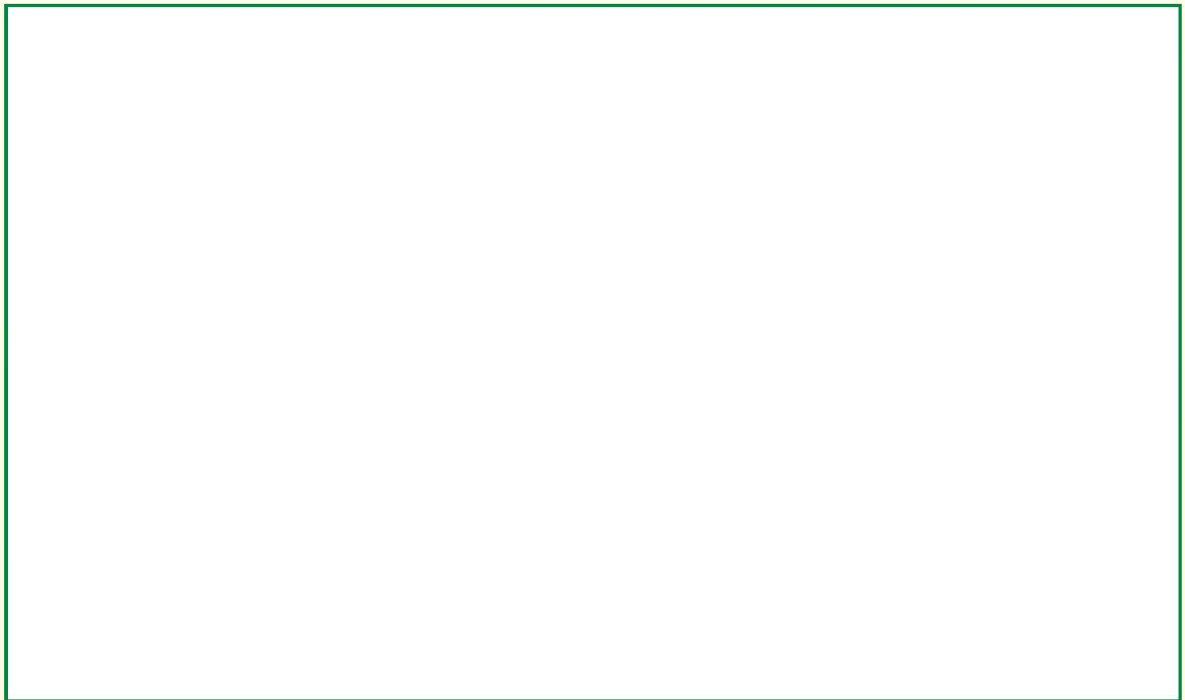


STOP 2: GIBSON'S CAVE

4. Draw a field sketch Gibson's Cave and label the layers of rock.



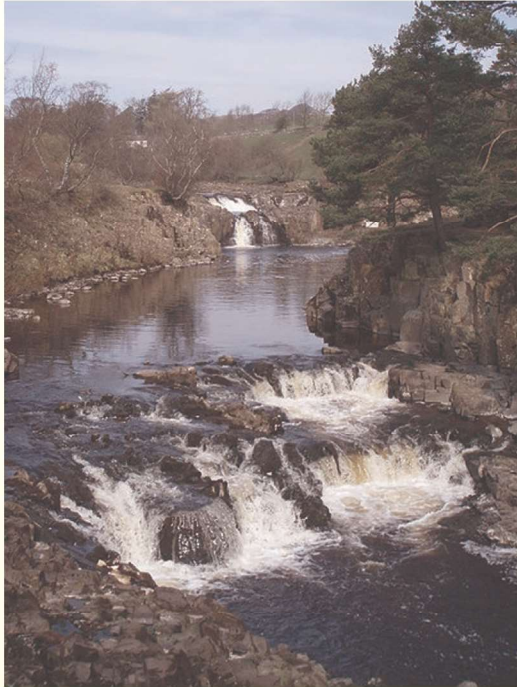
5. In the box below describe how the waterfall at Gibson's Cave was formed naming the hard and softer rock types.



Following the map walk to Stop 3 at Low Force. Be very careful next to the fast flowing River Tees.



STOP 3: LOW FORCE



6. What rock type does the River Tees flow over at Low Force?

7. Is this rock igneous, metamorphic or sedimentary?



You can now follow the footpath along the River Tees (40 minutes walk) or return to Bowlees and drive to High Force.

STOP 4: ON THE FOOTPATH TO HIGH FORCE

8. What has happened to the sandstone and shale below the Whin Sill?

9. Are these rocks now igneous, metamorphic or sedimentary?



STOP 5: HIGH FORCE

10. On the photograph of High Force label the following:

Whin Sill

Plunge pool

River Tees

Limestone / Sandstone





Bowlees and High Force, Teesdale

Follow-up Activity 1 - Pupil Resource Sheet

FORMATION OF HIGH FORCE WATERFALL

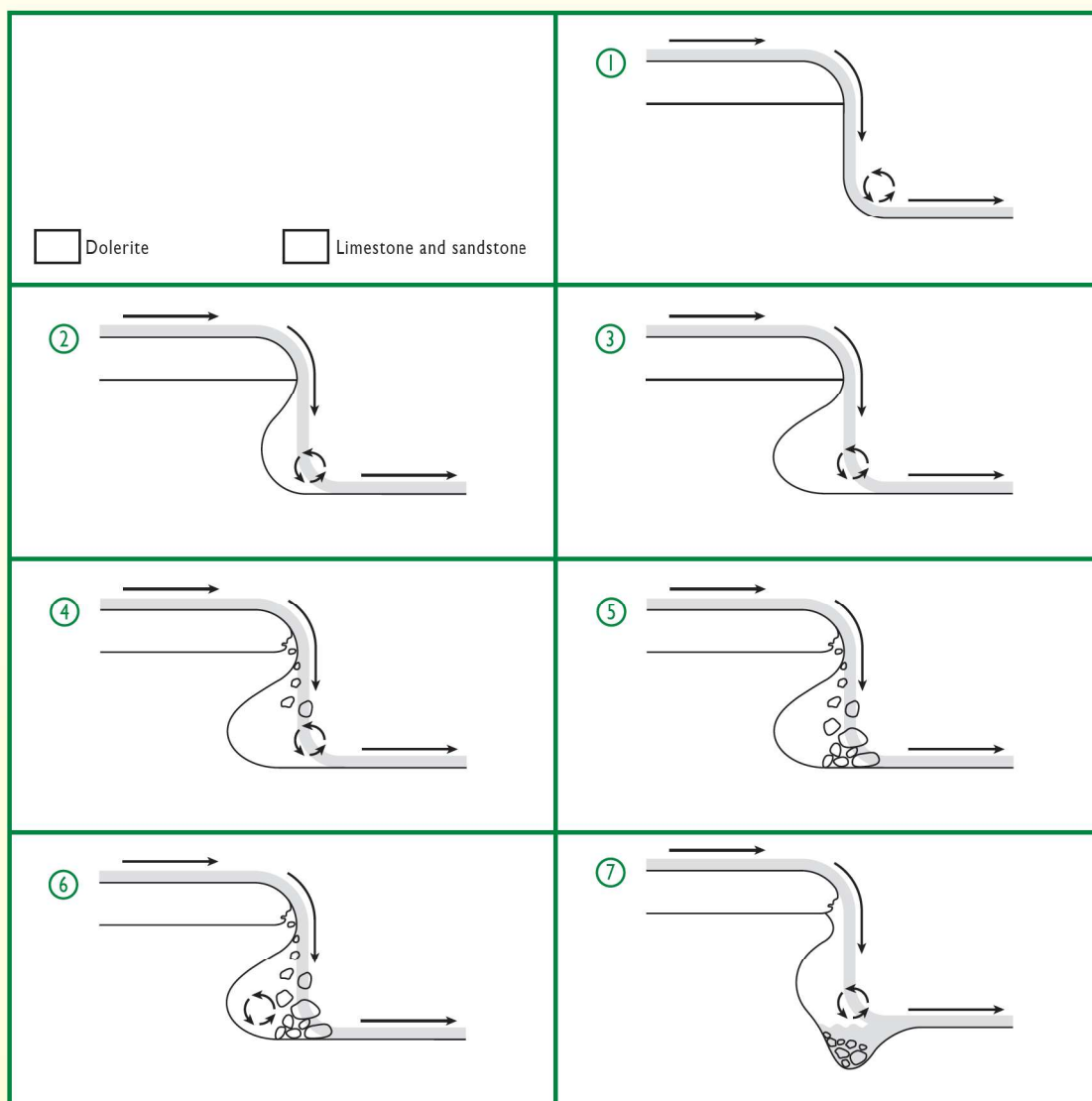
Produce your own explanation of how the waterfall and gorge were formed at High Force following your visit.

Instructions:

1. In the blank box below put the title 'How High Force waterfall and gorge were formed'. Under the title describe how the waterfall and gorge were formed. Here are some words to help you:

Dolerite	Whin Sill	Recedes	Sandstone and limestone
Hard resistant rock	Less resistant rock	Water wears away	Boulders Plunge pool

2. Colour the diagrams below with the Whin Sill a dark colour and the limestone and sandstone a light colour.
3. Cut your title box and diagrams out and make them into a booklet by stapling the edges.
4. If you now flick through your booklet you will see the waterfall moving upstream to leave a gorge.







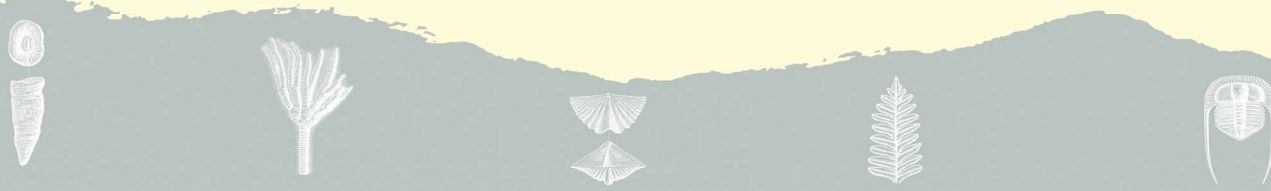
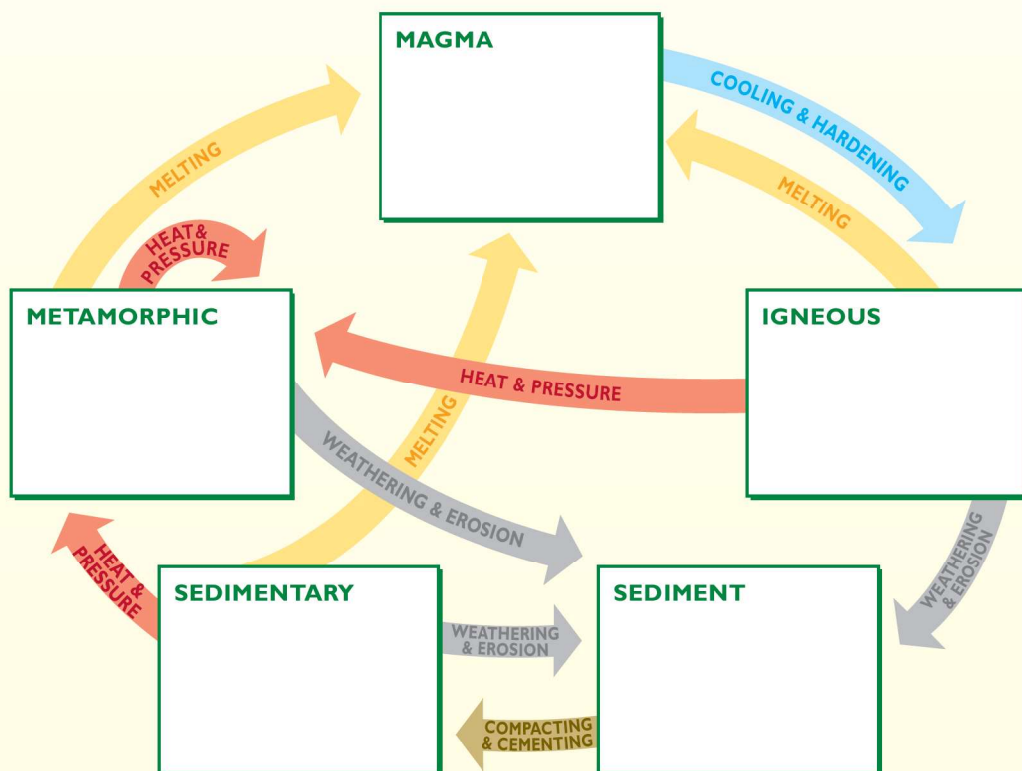
Bowlees and High Force, Teesdale

Follow-up Activity 2 - Pupil Resource Sheet 5

IGNEOUS, SEDIMENTARY AND METAMORPHIC ROCKS

The Rock Cycle – The rock in the Earth's crust is being continually destroyed and recycled. Rock on the surface is worn down to fragments and is eventually deposited to form new sedimentary rock. Rock underground is melted to form igneous rock or squashed and cooked to form metamorphic rock.

1. Use the diagram below to explain how igneous, sedimentary and metamorphic rocks are formed. Write your answers in the box below:



2. Make your own igneous, sedimentary and metamorphic rocks!

IGNEOUS ROCKS - MAKE A VOLCANO!

Materials

A jug

Baking soda

Flour

Stirring rod

Funnel

Vinegar

Red food colouring

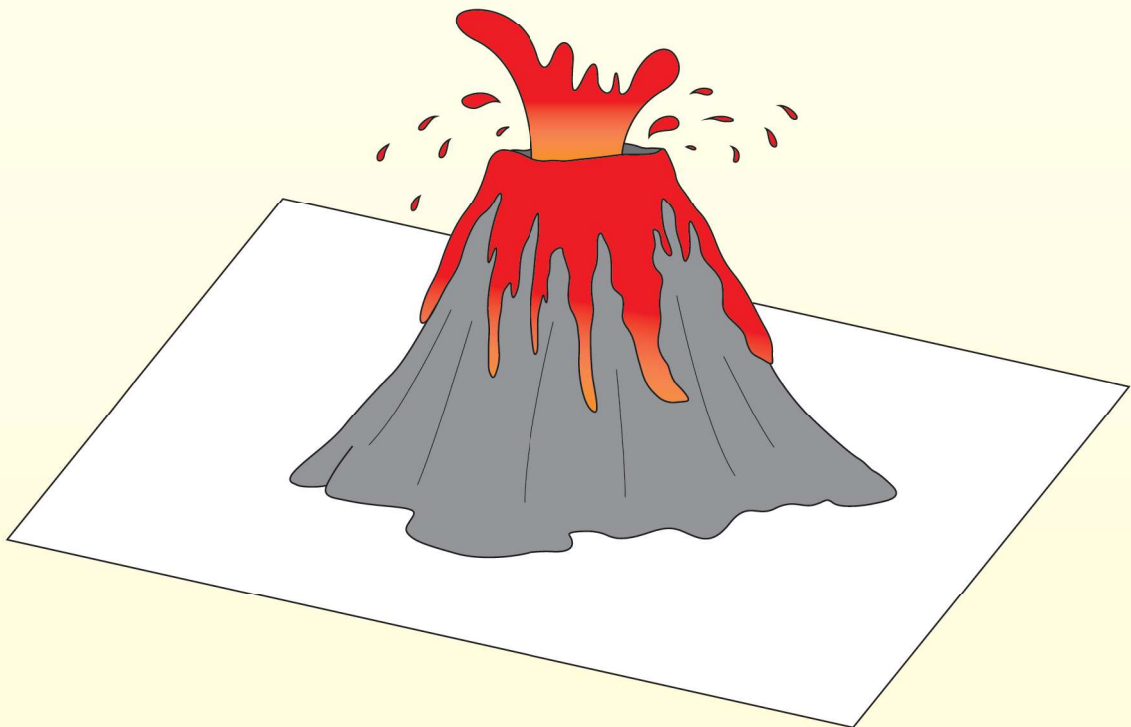
Tray

Sand

Plastic bottle

Instructions

1. Empty the baking soda and 3-4 spoons of flour into the jug. Mix with the stirrer.
2. Place the funnel into the neck of the plastic bottle. Pour the mixture of baking soda and flour into the bottle.
3. Put wet sand on the tray.
4. Stand the bottle with the baking soda and flour mix in the centre of the tray and pack the wet sand around it. Make the sand into a cone shape.
5. Pour the vinegar into the jug and add red food colouring to make it a rich red colour.
6. Place the funnel into the mouth of the plastic bottle and pour the vinegar into the bottle. Quickly remove the funnel from the bottle.
7. The sandy volcano you have made will begin to erupt. The vinegar and soda mix to give off carbon dioxide. This makes the flour turn frothy and forces it out of the bottle as red lava!



SEDIMENTARY ROCKS - MAKE YOUR OWN SEDIMENTARY ROCK!

Sedimentary rocks are made up of layers of different types of sediment as the sediment is deposited in the sea or lakes. The layers are called strata. In this activity you will make your own sedimentary rock with different strata.

Materials

A large jar Spoon Kidney beans Rice Modelling clay Flour
Brown sugar Lentils

Instructions

1. Press one edge of a large jar into a piece of modelling clay, so that the jar sits at an angle. Carefully spoon a layer of flour about 2cm thick into the jar.
2. Carefully add layers of kidney beans, brown sugar, lentils and then flour again, until they nearly reach the top of the jar.
3. Remove the jar from the clay and stand upright. The differently coloured layers are like a section through a sequence of natural sedimentary rocks.

MAKE FAKE SHELLY LIMESTONE!

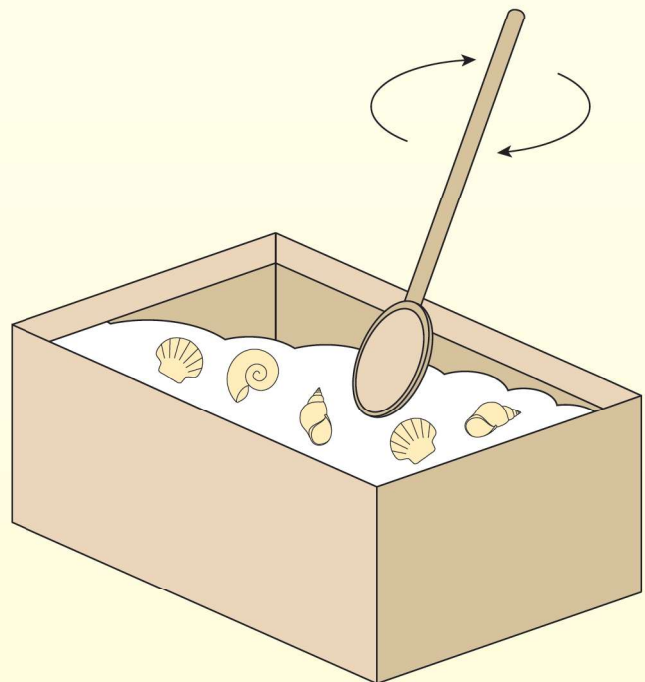
Limestone often contains fossils as it is formed in warm seas where the hard parts of marine animals are buried in the sediment when they die. If you split open shelly limestone you can find beautifully preserved seashells. See if you can make some convincing fake shelly limestone to fool your friends!

Materials

Seashells
Plastic container (or old shoe box)
Mallet or hammer
Cold black coffee or yellow food colouring (optional)
Plaster of Paris
Plasticene
Chisel
Old plastic bag

Instructions

1. From your collection of seashells break some up into smaller pieces.
2. Make a rough 'rock-shaped' mould with the plasticene.
3. In the plastic container mix the plaster of Paris with water according to the instructions on the packet. Stir in your seashells. If you want to make a more sandy coloured limestone mix the plaster of Paris with cold black coffee or yellow food colouring instead of just water. You can also add some sand to make it feel gritty.
4. Pour the mixture into the plasticene mould, or use a plastic bag inside an old shoe box.
5. Let your plaster harden overnight. Ask an expert to identify your rock! Will you manage to fool them?



6. With care you can now use your mallet and chisel to discover the fossils in your rock

METAMORPHIC ROCKS - MAKE YOUR OWN FUDGE!

Metamorphic rocks have been changed by heat and pressure. You are now going to make sedimentary fudge and then turn it into metamorphic fudge!

Materials

300ml milk	100g butter
450g granulated sugar	2.5ml vanilla essence
Saucepan	Scales
Wooden spoon	Help from an adult

Instructions

To make sedimentary fudge:

1. Pour milk into a saucepan. Bring it slowly to the boil.
2. Add sugar and butter.
3. Heat slowly, stirring all the time, until the sugar dissolves and the butter melts.
4. Bring to the boil. Cover pan with lid. Boil for 2 minutes.
5. Uncover and continue to boil steadily, stirring occasionally, for a further 10-15 minutes or until a little of the mixture, dropped into a cup of cold water, forms a soft ball when rolled between finger and thumb.
6. Remove from heat. Stir in vanilla essence. Leave mixture to cool for 5 minutes.
7. Beat fudge until it just begins to lose its gloss and is thick and creamy.
8. Transfer to a 18cm square tin.
9. Mark into squares when cool and cut up when firm and set.

Taste the fudge and note down what it tastes like and its texture. Do not eat all the sedimentary fudge as you now need to change it by heating it again to make it a metamorphic fudge!

To make metamorphic fudge:

1. Heat the oven to 200 °C.
2. Place the spare sedimentary fudge into the oven.
3. Watch the sedimentary fudge heat and flow in the oven. Do not let it burn.
4. Take out of the oven when it is light brown on top. Care is needed as this will be a very hot liquid.
5. Allow to cool and then taste the metamorphic fudge to compare the taste and texture with the sedimentary fudge.





Bowlees and High Force, Teesdale

Follow-up Activity 3

Design an advertising leaflet for tourists coming to the area

This activity is based on designing an advertising leaflet or flier for High Force and provides good opportunities for literacy genres and oracy.

- Collect examples of tourist advertising leaflets and fliers from local Tourist Information Centres.
- In groups of 3-4 look at the example leaflets and fliers and list the essential kinds of information they contain. For example maps, photographs, drawings website and other contact details, background information about the place, persuasive sections encouraging the tourist to visit, opening times, facilities etc.
- As a class feedback the essential details needed to produce a leaflet or flier and list the information on the board.
- Orally with the whole class consider the different styles of writing that are used, for example persuasive, factual, bulleted etc. Key to this is to:
Remember the purpose
Consider the audience
Make it informative but also tempting to read, easy to read in small 'bites' and clear
- In groups decide on the sections and styles that your leaflet will contain. Divide up the sections so that individuals in the group write different sections.
- As a group, design your leaflet or flier (use the examples to help you decide on the style).
- Each group presents their leaflet to the class explaining why they chose their design.







Bowlees and High Force, Teesdale

Follow-up Activity 4

TRADITIONAL TALES

Literacy, Writing and Genre

Folklore is often based around natural features in the landscape such as caves and waterfalls. The traditional tale of the 'Stanhope Fairies' in Weardale in the North Pennines is a tale about fairies that live in the caves that run into the hillsides. The tale of the Stanhope fairies is reproduced below.

- Read the tale of the Stanhope Fairies
- Produce your version of a traditional tale based on the area around Gibson's Cave

The Stanhope Fairies

Once Weardale was full of fairies. Often at night they could be heard plish-plashing in the river, and singing in tune to the water as it ran over the pebbles. They lived in the little caves, which run into the hillsides, and held their court there every night; but they were a secretive people, and did not like anyone to see them at their sports.

One day, however, a little girl who was gathering primroses by the waterside near the town of Stanhope heard sounds coming from one of the little caves, and ventured in. To her delight she saw the fairies feasting and dancing, and she hurried home to tell her father. But her father could not join in her pleasure, for he knew that the little folk would come for her. They liked to guard their secrets closely, and if any mortal spied on them, they would spirit him away to live with them.

The farmer loved his daughter very dearly, so he did not tell her what punishment the fairies would inflict on her for spying on them, but went immediately to consult with a wise old woman who knew how to outwit the little folk.

"They will come for your daughter at midnight tonight," she told him, "but they will have no power to take her away if you preserve a perfect silence. There must be no noise. The smallest sound will break the spell."

The farmer went home, and when his daughter had gone to bed, he couped-up all the hens and the turkeys. Then he took the chains from the cows' necks, and locked the doors of the stables and byres. He fed all the dogs on juicy bones and porridge until he made them full and sleepy. Then he came in and stopped all the clocks in the house so their ticking would not break the spell, and put out the fires so that the wood would not splutter and crackle; and then he sat down to wait for the fairies.

At midnight they came. He could hear them click open the garden gate, and ride up on their little ponies. Finding all so silent and still, they were taken aback and paused, but alas the farmer had forgotten a little spaniel, which slept at the foot of his daughter's bed. When it heard the tiny horse-hoofs under the window, it leapt up and barked. The spell was broken, and when the farmer ran upstairs, his daughter was gone.

He was full of grief at the loss of his daughter, but he decided not to rest until he had won her back. So he went again to consult the wise old woman.

"I can help you even now," she told him, "but it will not be easy to win back your daughter. You must go yourself to the cave where the fairies live, and take with you a sprig of rowan. But before you go you must find something that will give you a light without burning. Secondly you must take with you a chicken that has no bone in its body; thirdly, you must find an animal that will give you part of its body without shedding one drop of blood. If you take those 3 things with you, the King of the Fairies cannot keep your daughter."



The farmer left the old woman with renewed hope. But when he asked himself – what will show me a light without burning? And where will I find a chicken without a bone in its body? And what animal will give me part of its body without shedding a drop of blood? – he could find no answers.

However, as he walked slowly homeward musing on these 3 questions he met a beggar. “Can you help me, sir?” said the beggar, “for I am old and poor and have nothing to eat.” “That I can, and will,” replied the farmer, “for I have troubles of my own.” And he gave the beggar a sixpence. “Thank you sir,” said the beggar, “now I will help you. The answer to your first question is – a glowworm will light your way, but never burn.”

The farmer looked at the beggar with astonishment, but as he looked the old man smiled and vanished.

Farther on, he was passing a little copse when he saw a thrush fleeing before a sparrowhawk that was ready to pounce on it. Forgetting his own troubles, he picked up a stone and threw it at the sparrowhawk. The hawk flew away, but the thrush turned back, and perching on the branch of a thorn, said to him, “Thank you sir. You have saved my life. Now I will help you. The answer to your second question is – put an egg under a sitting hen for 15 days, and it will hold a chicken with never a bone in its body.” The farmer looked at the thrush with amazement, but it sang 3 lovely notes for him, and vanished like the beggar.

“Now I have the answers to 2 of my questions,” said the farmer, “but there still remains the third, and how shall I answer that?”

But as he walked on musing on the third question, he heard a pitiful crying in the hedge. It was a rabbit caught in a snare. Stooping down he freed the rabbit gently, but instead of running away it looked at him and said, “Sir, you have done me a good turn. Now I will help you. The answer to your third question is – if you grasp a lizard by its tail it will run away and leave the tail in your hand without shedding one drop of blood.” Then the rabbit, too, vanished like the beggar and the thrush.

Overjoyed at his good fortune, the man ran home and put an egg under a hen that was brooding. When 15 days had gone he went out into the woods and gathered 3 glowworms. Then he went up onto the moors to find a lizard. When one came out to bask on the stones he seized it by the tail. The lizard wriggled away and left the tail in his hand.

Then he put a sprig of rowan in his hat, and took his 3 gifts to the cave of the fairies. They were vexed to see him, but they could not harm him because of the rowan sprig; and when he presented his 3 gifts they were forced to give him back his daughter. She returned home with her father, and never again did she try to spy on the fairies in the caves.

