

**Derwent Gorge,  
near Castleside  
County Durham**



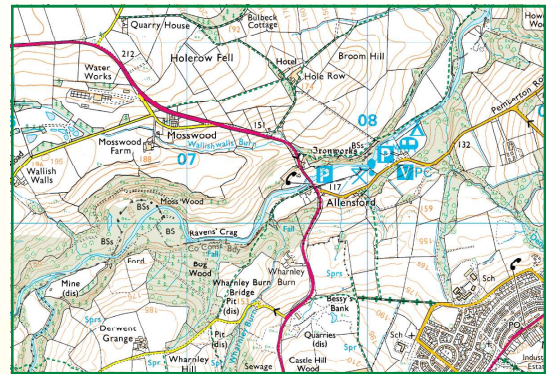
***Landscape Detective:  
Rivers, Waterfalls  
and People***



## INTRODUCTION

The main fieldwork element of this day involves looking at the formation of waterfalls in the upper course of the River Derwent and recording how the river changes downstream. The second half of the day is based around the country park at Allensford and looks at the reasons for people using this area for recreation.

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.



# The Derwent Gorge, County Durham

*Landscape Detective - Rivers, Waterfalls and People*

## SUMMARY OF ACTIVITIES

Activity name	Details of activity
Introductory Activity 1	Detective map work
Introductory Activity 2	Rivers, waterfalls and people
Fieldwork Outline	Waterfall formation River measurements Visitor survey
Follow-up activity 1	River measurements
Follow-up activity 2	Formation of a waterfall
Follow-up activity 3	Visitor survey results
Follow-up activity 4	Design a country park







## 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

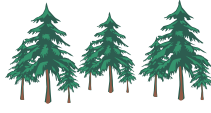



### Introduction to map work

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.

# The Derwent Gorge, County Durham

## Introductory Activity 1 - Teacher Information 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				







# The Derwent Gorge, County Durham

## Introductory Activity 1 - Pupil Resource Sheet 1

### DETECTIVE MAP WORK

Use the O.S. map extract and the 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 Derwent with your finger
- In which direction is the river flowing? What is your evidence?
- There are several streams flowing towards the River Derwent. How many can you find and name? Which ones are tributaries of the River Derwent (that means they join the River Derwent).
- Look at the woodland. Why do you think the woodland surrounds the river and the streams but is not anywhere else? (There could be more than one reason).

2. Derwent Gorge detective work

- The river here runs in a very steep-sided valley called a gorge. Find the hill to the west of Snape Wood. Can you estimate the number of contour lines from the river to the top of the hill? The contour lines are 5m apart. Try and estimate how many metres you would climb from the river to the top of the hill. Share your estimates with the rest of the class.
- Find West Crag and Combfield House in grid square 0549. Imagine you are there. What do you think it looks like?
- Muggleswick Park is in Grid square 0349. What sort of land do you think this might be? Why are there no field boundaries?

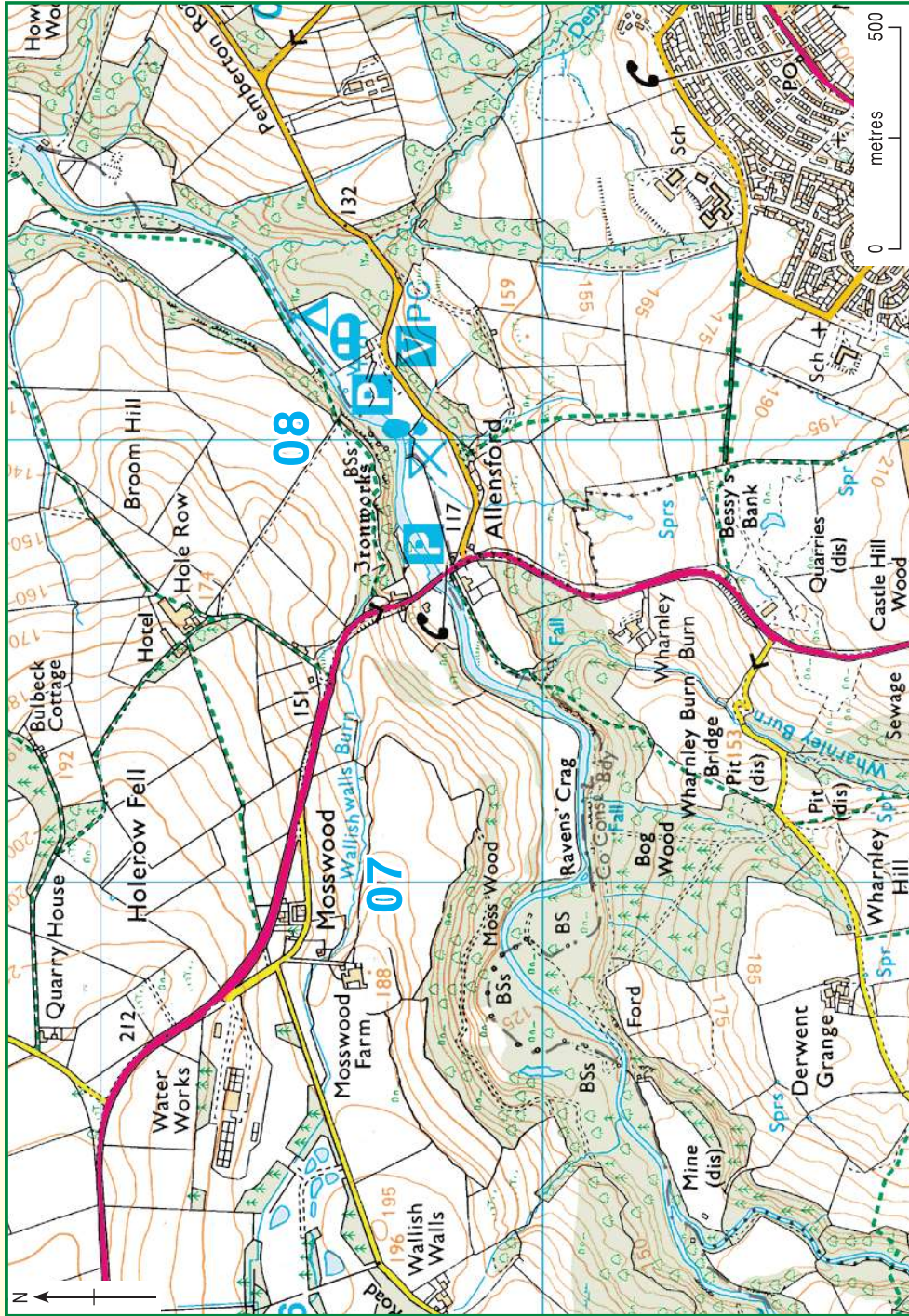
3. Grid references

As a group complete the grid below:.

Grid reference	What is there?
	Allensford picnic site
0448	Name the bridge: _____
	Smiddy Shaw reservoir
0848 and 0748	Name the village: _____
0749	Name the wood: _____
0250	Name the stream: _____









# 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 how the river changes downstream.
- To look at the processes of waterfall formation in the Derwent Gorge and;
- To find out what facilities are available at Allensford country park and why people visit the area.

### Background Information:

Rivers begin their journey in the hills where there is higher rainfall, and flow onto land that is lower until they eventually reach the sea. As you move downstream away from the source of the river towards the mouth, the amount of water in the river increases as more streams and rivers join the main channel.

The features of a river vary from source to mouth. This fieldwork is being carried out in the upper course of the river close to the river's source. Here the river is smaller with less water

in it. It flows in a very inefficient channel so it is slower due to friction and has less energy for transport. The valley slopes are steeper and are mainly used for farming.

The river has 3 jobs: to erode material from the bed and banks, to carry or transport material or to drop or deposit the material it is transporting. The energy available for erosion, transportation and deposition varies with time and over the course of the river. The more energy a river has the more erosion or wearing away of the bed and banks occurs and the more material it can transport. If the river has only a small amount of energy it will not be able to erode or transport material and this material it is carrying will be deposited.

# The Derwent Gorge, County Durham

## Introductory Activity 2 - Teacher Resource Sheet

### INTRODUCING THE FIELDWORK

a. Introduce rivers by discussing where they start and finish. Use Pupil Information Sheet 1, showing the River Derwent and River Tyne to focus on, and locate the fieldwork area.

b. Develop a 'thought shower' about how rivers might change from their source to their mouth. Think about the size of the river, how much water is in it, how fast it is flowing, how steep are the valley sides, how much erosion the river can generate, how much material can it carry, how do people use the river valley etc. Complete activity 1 on Pupil Resource Sheet 2.

c. Introduce the different terms used to describe a river. Complete activity 2 on Pupil Resource Sheet 2.

d. The pupils are asked to use their detective skills to answer 4 questions. Below the questions, get them to give what they think the answers to the questions will be in a statement form. For example they may say, " the river

flows fastest upstream". The fieldwork results will show if they are right. Complete activity 3 on Pupil Resource Sheet 2.

e. Use the rocks in the Rock Box to look at the 2 main rock types you will see on the field trip – sandstone(sample 11) and shale (sample 13). Divide the class into groups and give each group a sample of each rock type and a hand lens. Complete activity 4 on Pupil Resource Sheet 2.







# The Derwent Gorge, County Durham

## Introductory Activity 2 - Pupil Resource Sheet 2

### RIVERS, WATERFALLS AND PEOPLE

1) *Our thoughts about how a river changes as it flows downstream.*

### 2. River Terms.

*The following words are terms we use to describe rivers, but the terms and their definitions have been jumbled up. Link the term to the correct definition with a line:*

Term	Definition
Source	The bottom of a river
Mouth	A smaller river that joins a larger river
Tributary	The sides of a river
Confluence	The start of a river
River bed	The place where a smaller river joins a larger river
River banks	Where the river enters the sea

### 3. On your field trip you will use your detective skills to answer the following questions:

- Where does the river flow fastest during its journey from source to mouth?
- How does the river change in size?
- How does the amount of material it can carry change as it flows downstream?
- How does the landscape change as the river flows downstream?



In the box below write what you think the answers might be to the questions above and then you can see if you are right after you have done the fieldwork! Write the answers in statement form.

Answer to question a):

Answer to question b):

Answer to question c):

Answer to question d)

#### 4. Rock Types.

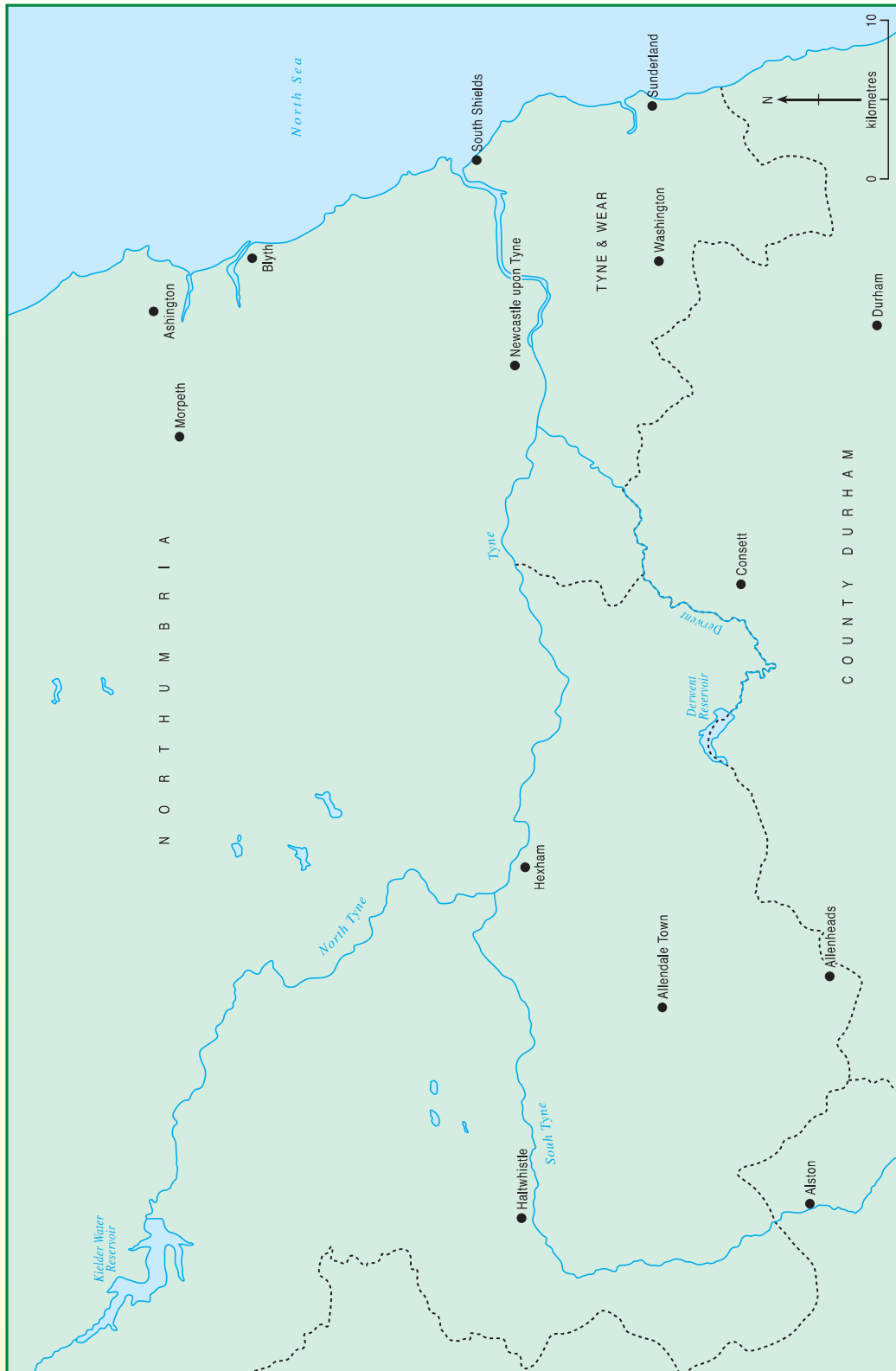
You will see four different rock types on your field trip – limestone, sandstone, shale and dolerite. Using the table below and the rock samples can you tell which one is which? Use the hand lens to help you. Write the sample number found on the rock in the table when you have decided.

Rock Type	Description	Sample number
Sandstone	A light brown rock made up of sand grain that is rough to touch	
Shale	A dark brown rock that crumbles between your fingers	



# The Derwent Gorge, County Durham

## Introductory Activity 2 - Pupil Information Sheet 1



Map of rivers Tyne and Derwent





## ORGANISATIONAL DETAILS

### Location

Allensford Park Country Park, Allensford, Near Consett, County Durham

Ordnance survey Explorer Map 307 Consett and Derwent reservoir

### Aims

- To look at river flow, the work of a river and the landscape of the river's upper course.
- To find out why people use Allensford Country Park

### Target Group

Key Stage 2 geography and science. Some aspects may be suitable for Key Stage 1.

### Logistics

This fieldwork day starts at Allensford Country Park, (GR: NZ 078504). The first location is on the Wharnley Burn, a tributary of the River Derwent, to look at waterfall formation (GR: NZ 076499). Three sites are identified for the river measurements. These are on Wharnley Burn below the waterfall (GR: NZ 076499), on the River Derwent above the tributary of the Wharnley Burn (GR: NZ 075501)

and the River Derwent at Allensford Country Park, which is below the tributary of the Wharnley Burn (GR: NZ 079503). The second part of the fieldwork will be based from Allensford Country Park and will look at visitor facilities and a visitor survey or involve a geological walk and following the Allensford 'Spot the rock' activity.

### Practical details

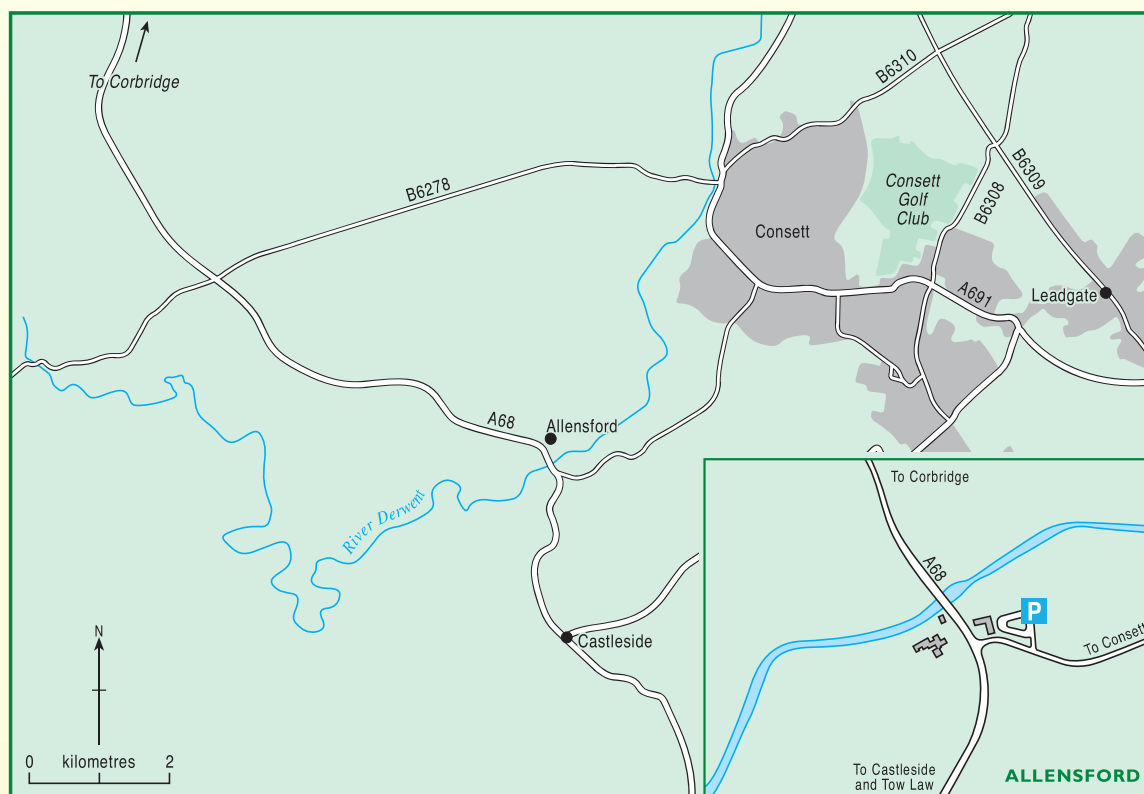
- Parking – there is free parking at the west end of Allensford Country Park (GR: NZ 078504).
- Toilet facilities – there are toilets at the east end of the Country Park.
- Picnic areas – there are picnic areas and a play area at the Country Park.
- Useful map – Ordnance Survey 1:25 000 Explorer 307 Consett and Derwent Reservoir.

### Safety issues

- The fieldwork activities will involve the students working in the river and the fieldwork should only be undertaken at low flow conditions.
- The A68 is a very busy road and extreme care should be taken.
- Refer to the Hazard Identification Sheet.

# The Derwent Gorge, County Durham

## 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. All students and staff.	Supervise students getting off the coach or minibus and gather in a safe place.
Vehicles on the road	Extreme caution should be taken when crossing the A68 and pupils should always be supervised crossing the road. All students and staff.	Supervise students crossing 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.
Working in rivers	Rocks in the rivers may be slippery and there is the risk of falling into the river. All students and staff.	Warn about conditions and the possibility of hypothermia if getting wet.
Walk to Wharnley Burn	River bank unfenced. Steep unfenced drop on last section of path. All students and staff.	Warn about river. Keep together as a group.

## UNDERTAKING THE FIELDWORK

### 1. Wharnley Barn

The two rock types looked at in the 'Introductory Activity 2' session can be seen at the waterfall at Wharnley Burn. The sandstone is on the top with layers of shale underneath.

- Try and identify the 2 different rock types from the work done in the classroom.
- Complete activity 1 on Pupil Resource Sheet 2 by drawing and labelling a sketch of the waterfall.
- Introduce how waterfalls are formed and complete activity 2 on Pupil Resource Sheet 3.

### 2. Wharnley Burn and the River Derwent – river measurements

River measurements are to be carried out on 3 sites. The first is on the Wharnley Burn, a tributary of the River Derwent, the second is on the River Derwent but above the point where the tributary enters the river and the third is below the tributary in Allensford Country Park. See O.S. map extract. Use Pupil Information Sheet 2 on fieldwork methods to introduce the work.

At each site the following measurements are to be carried out in groups:

- Width – use a tape measure to measure from one side of the bank to the other. Record the width in metres (m).
- Depth – use a metre rule to make 5 depth measurements across the width of the stream. Record the depth in centimetres (cm).
- 5 velocity measurements – use a tape measure to measure out a distance of 10m downstream. Upstream (0m on the tape measure), place a float in the water next to the right hand bank and record how long it takes to reach the 10m mark using a watch or stopwatch. Repeat this 4 more times moving across the river from the right bank to the left bank. Boneos or oranges make good floats and the boneos have the advantage of being eaten by sheep if left behind.
- Energy test (indicates how much material the river can carry) – place a 10cm x 10cm piece of white laminated hardboard on the bed of the river in the centre. Pick a small pebble and place at the upstream edge of the board and see if it is easily carried across the board. If the pebble moves quickly across the board choose a larger pebble until you find a pebble that slowly moves across the board. Using a spring balance (or scales back at school), weigh the pebble. The heavier the pebble that the river can move

across the board, the more energy the river has. Record the weight of the pebble in grams (g).

- Field sketch and description of the river features - look at the river and the valley it is in. Draw a field sketch or take a photograph to show what it looks like. The main features to observe are the shape of the valley, steepness of the valley sides, the vegetation or plants that are on the valley sides and the uses that people make of the valley.

All measurements can be recorded on Pupil Resource Sheet 4.

### Fieldwork equipment

The following equipment will be needed by each group:

- Tape measure
- Metre rule
- Boneos or oranges
- Stopwatch or watch
- 10 cm x 10 cm white laminated board
- Spring balance or scales
- Pupil Resource Sheet 3
- Pupil Information Sheet 2
- Pupil Resource Sheet 4

### 3. Allensford Country Park – visitor survey

Use Pupil Resource Sheet 5 to record the facilities available at Allensford Country Park. A sample questionnaire is also included on Pupil Resource Sheet 5. Use copies of the questionnaire or make your own questionnaire to survey the views of visitors to Allensford. The questionnaires should help you to find out about where people have come from, the type of people using the Country Park (families, young people etc) why they come here, what facilities they like and what else they may like in the area.







# The Derwent Gorge, County Durham

## Rock Types and Waterfalls - Pupil Resource Sheet 3

### 1. Rock types

Can you recognise sandstone and shale at the waterfall on Wharnley Burn? Once you are sure which rocks are which draw a sketch of the waterfall and add the labels below:

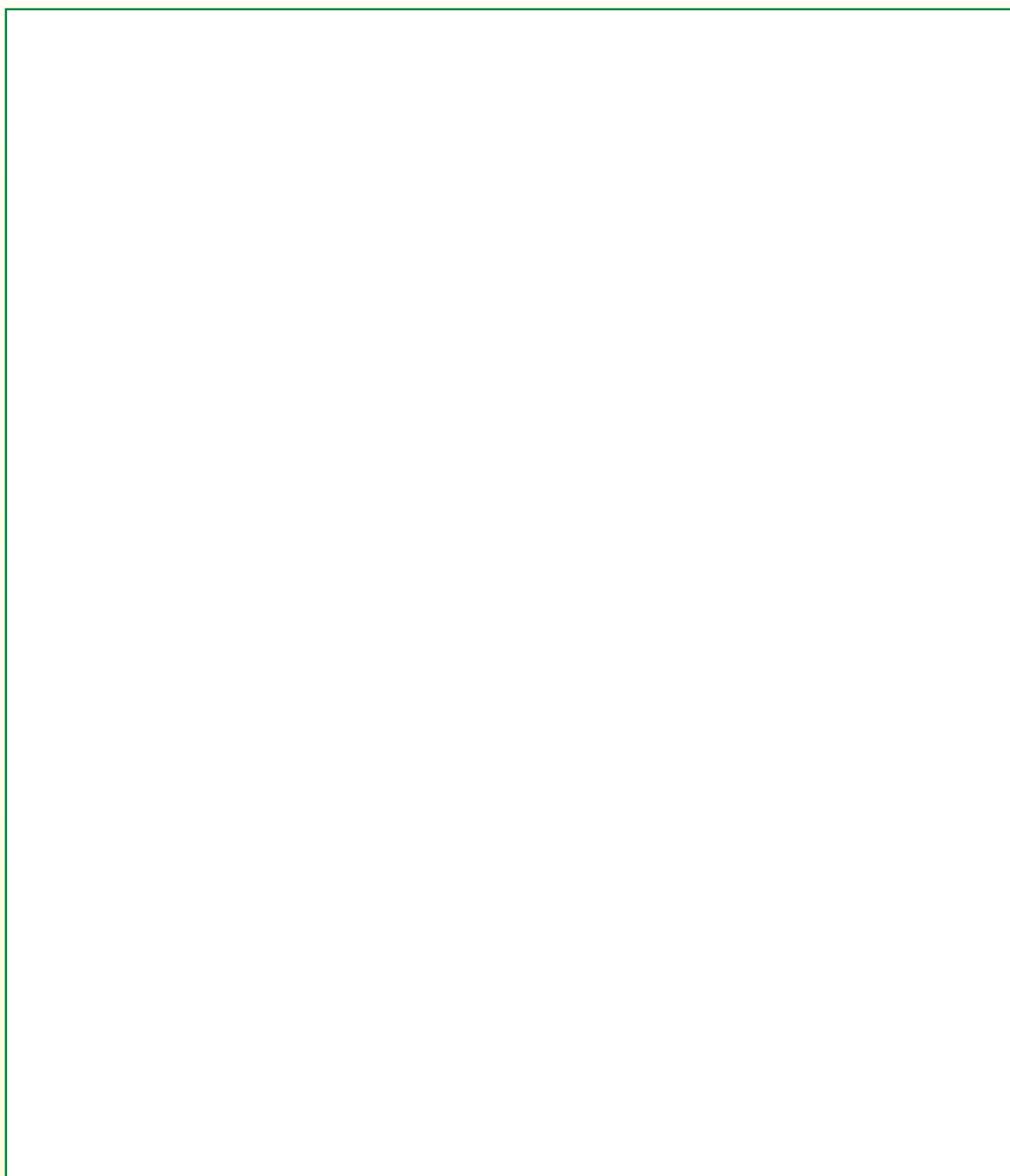
**Sandstone**

**Shale**

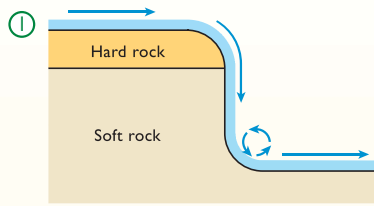
**Waterfall**

**Rocks undercut by river**

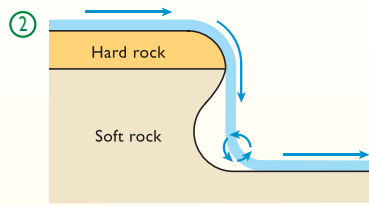
**Wharnley Burn**



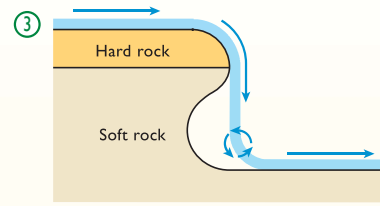
## How are waterfalls formed?



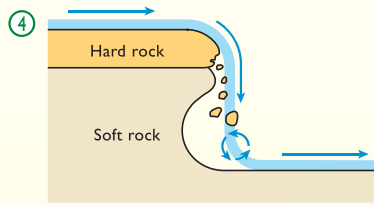
STEP 1: Most waterfalls are formed when the river meets a band of softer, less resistant rock after flowing over a harder, more resistant rock.



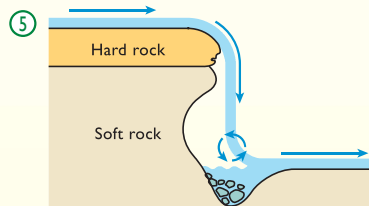
STEP 2: The softer rock is worn away more quickly to form a step in the bed of the river.



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.

From your understanding of how waterfalls are formed which rock type is the hardest and makes the cap of the waterfall?

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Which rock type is softer and has been eroded away by the Wharnley Burn?

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In your own words explain how waterfalls are formed:

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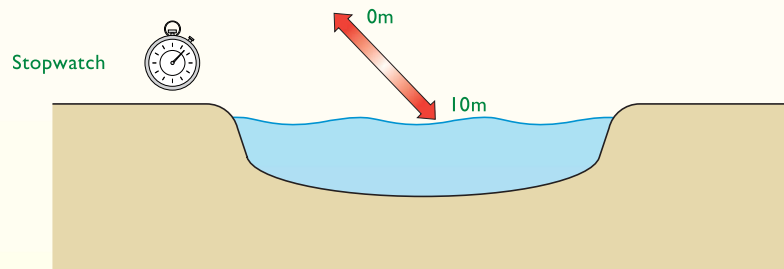
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# The Derwent Gorge, County Durham

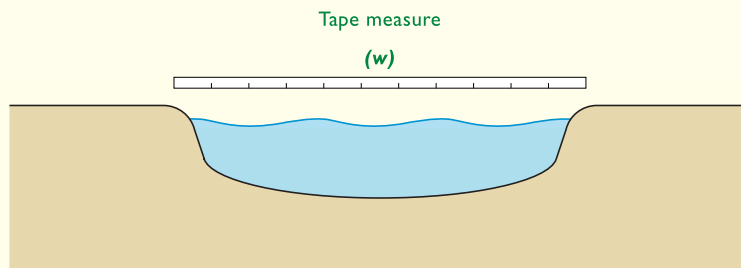
## Fieldwork Methods - Pupil Information Sheet 2

### 1. Float velocity (time taken to travel 10m)

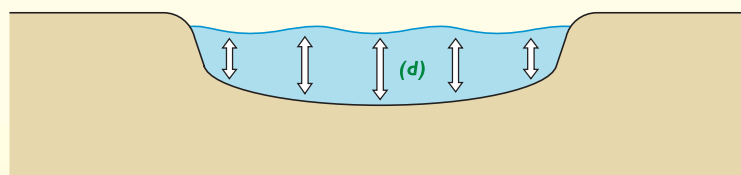


Complete five times across the river

### 2. Width (m)

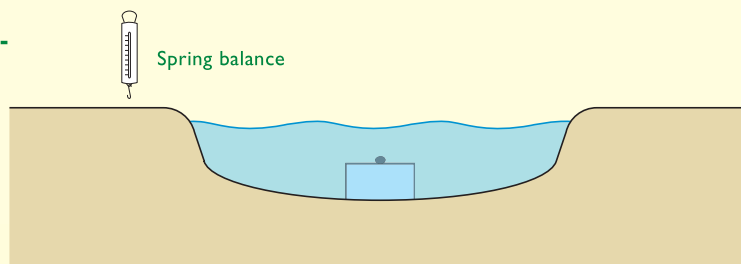


### 3. Depth (m)



Take five measurements across the river

### 4. Energy test - mass of pebble (g)





# The Derwent Gorge, County Durham

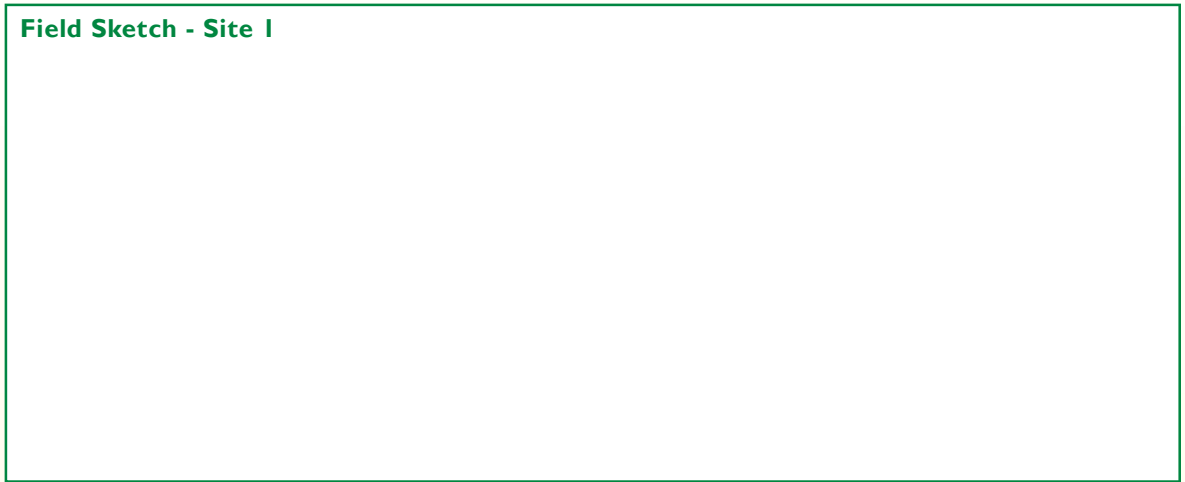
## Pupil Resource Sheet 4

### RIVER RECORDING SHEET

Results	Site 1	Site 2	Site 3
Grid reference			
Float velocity (time taken to travel 10m in seconds)			
1			
2			
3			
4			
5			
Width (m)			
Depth (cm)			
1			
2			
3			
4			
5			
Mass of pebble (g)			



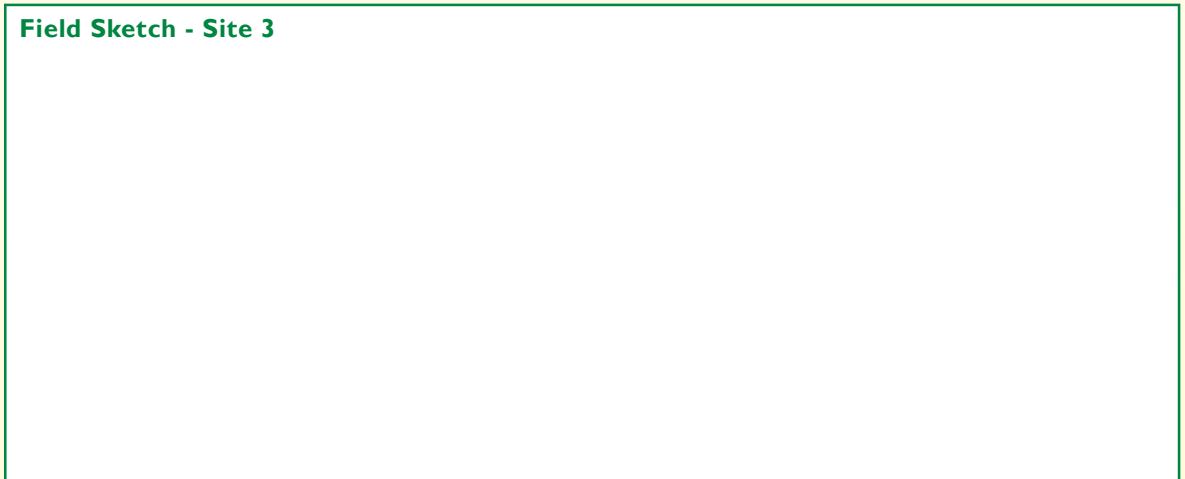
**Field Sketch - Site 1**



**Field Sketch - Site 2**



**Field Sketch - Site 3**



# The Derwent Gorge, County Durham

## Facilities and Visitors to Allensford Country Park - Pupil Resource Sheet 5

Complete the table below to show what facilities Allensford Country Park has:

Facilities	Present or absent (X/✓)
Toilets	
General store	
Gift shop	
Visitor café	
Camp site	
Caravan site	
Walks	
Walk leaflets	
Information on the area	
Interpretation panels	
Nature reserve	
Events and activities	
Car park	
Cycle stands	
Cycle hire	
Public transport	
Picnic areas	
Barbeque areas	
Access to river	
Play areas	
Dog bins	
Open areas for games	
Other	



## VISITOR SURVEY AT ALLENSFORD COUNTRY PARK

Location: \_\_\_\_\_ Day: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

### 1. How far do you live from Allensford?

- Within a mile     Half a mile to 1 mile away     1-5 miles away   
5-10 miles away     10-40 miles away     More than 40 miles away

### 2. How often do you visit Allensford Country Park?

- Most days     Once a week     Once a month   
A few times a year     A one-off visit

### 3. Who have you come to Allensford Country Park with?

- On your own     With a group of friends     As a family   
With an educational group

### 4. What do you like best about Allensford Country Park?

- The landscape     The walks     The woodlands   
The nature reserve     The river     The shop   
The play area     Other

### 5. What improvements would you like to see at Allensford Country Park?

- More extended walks     More events and activities     More educational visits   
More leisure facilities     More shops     More interpretation   
Other (please specify) \_\_\_\_\_

### 6. Are there any other comments you would like to make about Allensford Country Park?

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**Thank you for your co-operation**



# The Derwent Gorge, County Durham

## Follow-up Activity 1 - Pupil Resource Sheet 6

### RIVER MEASUREMENTS

1) Complete the following table using your river measurements collected in the field

Measurement	Site 1	Site 2	Site 3
<b>Grid reference</b>			
<b>Width (m)</b>			
<b>Mean depth (cm)</b> Add the five depth measurements together and divide by five			
<b>Mean float velocity</b> (time taken for the float to travel 10m together for each site and divide by five)			
<b>Mass of pebble (g)</b>			

2) Make neat copies of your field sketches in the boxes below and label them:

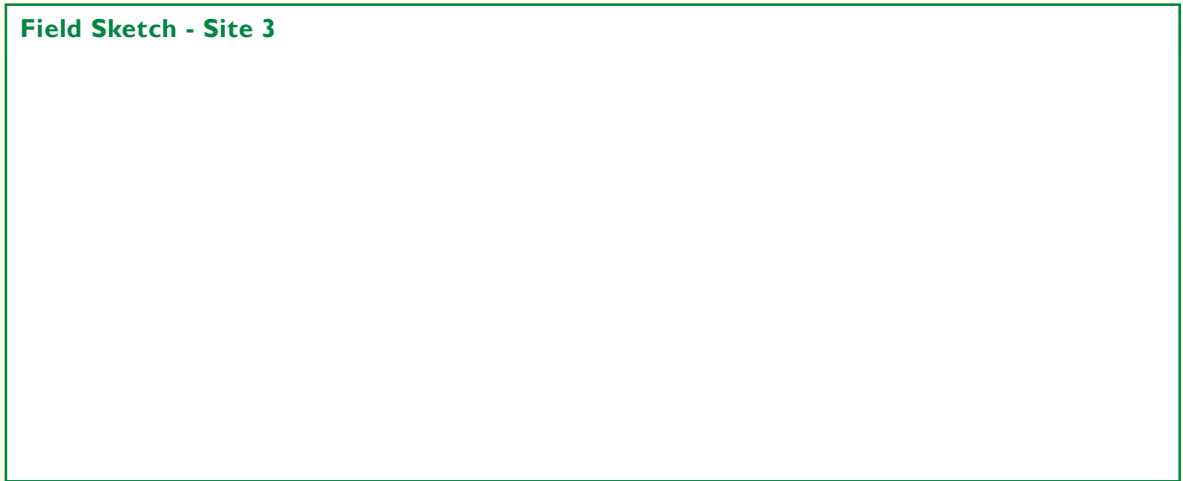
**Field Sketch - Site 1**



**Field Sketch - Site 2**



**Field Sketch - Site 3**



3) *From your results answer the following questions:*

- a) What happens to the width of the river as you move downstream?
- b) What happens to the depth of the river as you move downstream?
- c) Where is the river flowing fastest?
- d) What happens to the weight of the pebble that the stream can transport, as you move downstream?
- e) Where does the river have the most energy to transport material?
- f) Describe how the landscape changes as you move downstream?
- g) Were the statements you made on Pupil Resource Sheet 1 correct?





# The Derwent Gorge, County Durham

## Follow-up Activity 2 - Pupil Resource Sheet 7

### FORMATION OF A WATERFALL

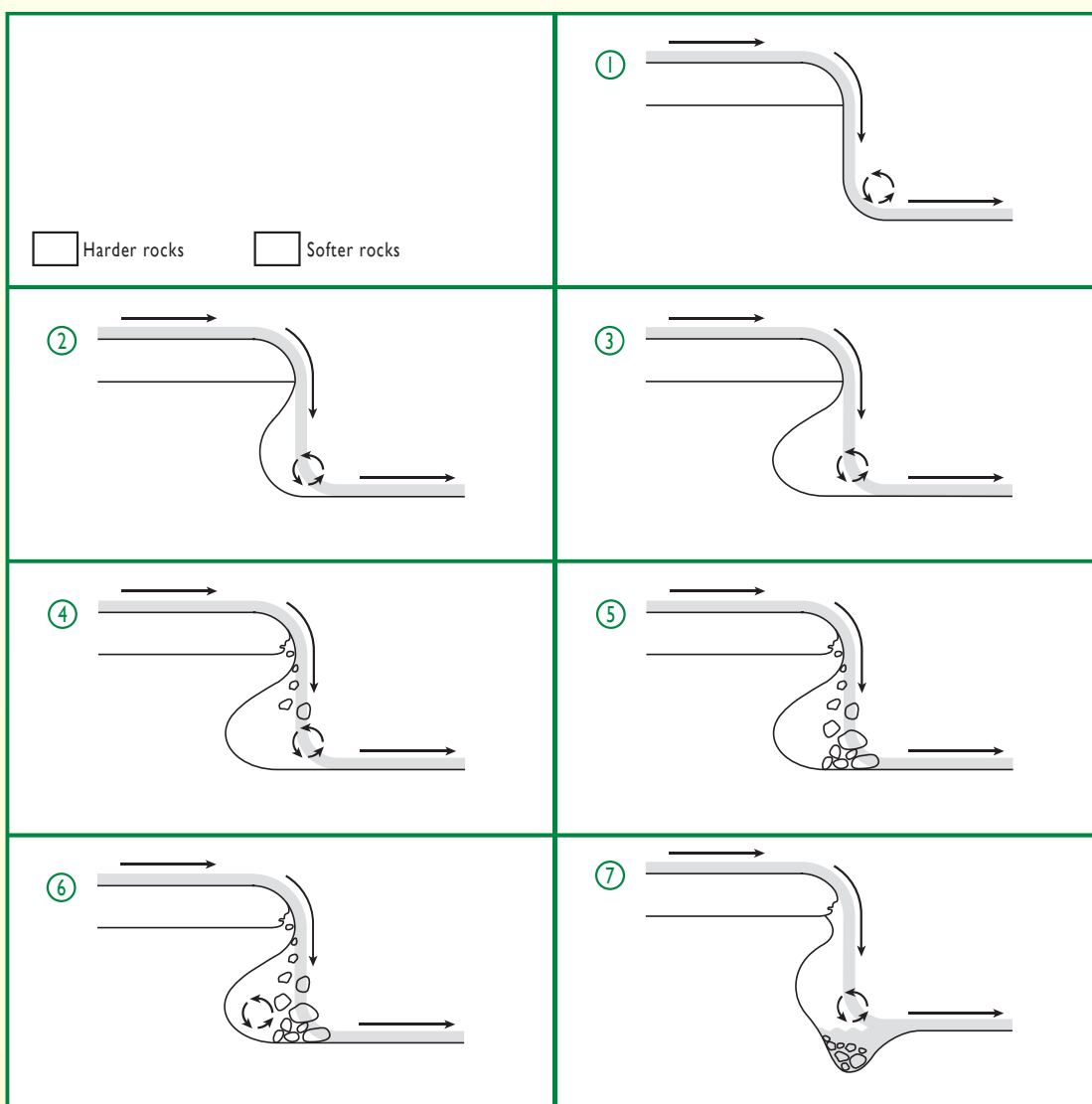
Produce your own explanation of how the waterfall was formed at Wharnley Burn following your visit.

#### Instructions:

1. In the blank box below put the title 'How Wharnley Burn waterfall was formed'. Under the title describe how the waterfall formed. Here are some words to help you:

Recedes      Hard resistant rock      Less resistant rock      Water wears away  
 Boulders      Plunge pool

2. Colour the diagrams below with the hard rock a dark colour and the softer rocks 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.







# The Derwent Gorge, County Durham

## Follow-Up Activity 3 - Pupil Resource Sheet 9

### VISITOR SURVEY RESULTS

a) Use the boxes below to compile the results of your responses. You may also want to produce a set of class results. Use tally marks as you go through each questionnaire and after you have gone through all your results add a total to the box at the end.

	Tally box	Total
<b>1. How far do you live from Allensford?</b>		
Within a mile	<input type="text"/>	<input type="text"/>
Half a mile to 1 mile away	<input type="text"/>	<input type="text"/>
1 - 5 miles away	<input type="text"/>	<input type="text"/>
5 - 10 miles away	<input type="text"/>	<input type="text"/>
10 - 40 miles away	<input type="text"/>	<input type="text"/>
More than 40 miles away	<input type="text"/>	<input type="text"/>
<b>2. How often do you visit Allensford Country Park?</b>		
Most days	<input type="text"/>	<input type="text"/>
Once a week	<input type="text"/>	<input type="text"/>
Once a month	<input type="text"/>	<input type="text"/>
A few times a year	<input type="text"/>	<input type="text"/>
A one-off visit	<input type="text"/>	<input type="text"/>
<b>3. Who have you come to Allensford Country Park with?</b>		
On your own	<input type="text"/>	<input type="text"/>
With a group of friends	<input type="text"/>	<input type="text"/>
The woodlands	<input type="text"/>	<input type="text"/>
As a family	<input type="text"/>	<input type="text"/>
With an educational group	<input type="text"/>	<input type="text"/>
<b>4. What do you like best about Allensford Country Park?</b>		
The landscape	<input type="text"/>	<input type="text"/>
The walks	<input type="text"/>	<input type="text"/>
The woodlands	<input type="text"/>	<input type="text"/>
The nature reserve	<input type="text"/>	<input type="text"/>
The river	<input type="text"/>	<input type="text"/>
The shop	<input type="text"/>	<input type="text"/>
The play area	<input type="text"/>	<input type="text"/>
Other (list)	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>



**5. What improvements would you like to see at Allensford Country Park?**

More extended walks	<input type="text"/>	<input type="checkbox"/>
More events and activities	<input type="text"/>	<input type="checkbox"/>
More educational visits	<input type="text"/>	<input type="checkbox"/>
More leisure facilities	<input type="text"/>	<input type="checkbox"/>
More shops	<input type="text"/>	<input type="checkbox"/>
More interpretation	<input type="text"/>	<input type="checkbox"/>
Other (list)	<hr/> <hr/> <hr/>	

**5. Are there any other comments you would like to make about the future plans for Allensford Country Park?**

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b) Write a short report on what visitors would like to see at Allensford, presenting your results as graphs.





# The Derwent Gorge, County Durham

## Follow-up Activity 4

### **Design a country park**

In groups pupils have the opportunity to design a perfect country park! The idea is for the pupils to use their survey results and their own experience of being out in beautiful countryside. However, we also want them to use their imagination! Try to encourage informal discussion reminding pupils that there are all kinds of leisure facilities and theme parks, but the park they are imagining should be a country park. What is unique about a country park? To do this:

- Use the class set of results for the visitor survey to see what visitors liked and disliked about Allensford Country Park.
- Discuss what the survey results show and decide on 10 things that should be present in a perfect country park. List these as bullet points.
- Draw a map to scale showing your perfect country park. Use at least A2 sized paper and add your main features to the map as pictures.

Remember: A good map should have a title, a key, a scale and a direction arrow!

- When your map is complete, talk together about exactly how you imagine the country park to be. Be ready to give a 5-minute presentation to the class.



