

# The river goyt in the peak district essay sample



**ASSIGN  
BUSTER**

Hydrological cycle is the continuous cycle of water between the land, sea and atmosphere. A River is a very important part of the hydrological cycle; it is a form of surface run-off. For this course work I will be studying rivers. The river that I will be study is the river Goyt in the Peak District. The river Goyt is a tributary of the river Mersey.

For this study I will be investigating the discharge of the River Goyt.

Discharge is the volume of water flowing though section of a river at a given time. There are many factors that affect discharge such as:

Soil permeability: if the soil is not able to absorb water there will be more surface run-off, which increases discharge.

Rock type: if the rocks are impermeable then through flow and ground water flow as rainfall will not be able to infiltrate the rock. This creates more surface run-off, which increases discharge.

Natural vegetation: if there is more vegetation the precipitation will be intercepted.

Land Use: if there is tarmac or concrete then the ground becomes impermeable.

Use of river: if water is extracted from the river for domestic and industry uses then there is less water in the river so there is a lower discharge.

Drainage density: if there are fewer streams then less water is collected so the discharge decreases.

Relief: if there are steeper slopes then the water flows faster thus the velocity increases and so does the discharge.

Discharge is measured in Cumecs (cubic meters/ second). My hypothesis is that the discharge of the river increases the further you are down stream.

The formula for measuring discharge is, cross-sectional area multiplied by average velocity. The velocity of the river is the speed at which it flows. To measure velocity we use a device called a flow meter. To prove my hypothesis I will measure the discharge of five sites from the source to the mouth of the river Goyt.

### Methodology

I will first visit the Goyt Valley. I will in turn visit each of the five sights:

- \* Goyt River (01277)
- \* Deep Clough (01723)
- \* Berry Clough (013723)
- \* Packhorse Bridge (016729)
- \* Derbyshire Bridge. (018719)

Berry Clough and Deep Clough are both tributaries of the river Goyt.

Derbyshire Bridge, Packhorse Bridge and Goyt River are sites on the main channel.

I will use two tables to record the data.

On table one I will measure the length and depth of the river at the five sights. I will do this using a tape measure and a meter ruler. I will measure the depth in 50cm intervals.

### Measurements

The second table will show the velocity readings. I will be using a digital flow meter to measure the velocity. The flow meter works when flowing water makes an impellor rotate. The meter records the number of rotations per minute. I will then use a graph to calculate the velocity in metres per second. I will take three velocity readings at each site, the middle the left and the right. From these readings I will calculate the average velocity for the site.

### Flow meter measurements

X X X

The readings will be taken from left to right at three points just below the surface of the water at each site.

After I have collected the data I will draw cross-sections of the river at each site to show the shape of the river channel and to calculate the cross-sectional area. I will also draw graphs and charts to show the information I have collected at each site on the river. To calculate the discharge I will multiply the cross-sectional area by the average velocity. I will measure the discharge in cubic metres/second (CumeCs). I will then draw a map of the river and plot the sites. Because the sites Berry Clough and Deep Clough are tributaries they will add to the discharge of the overall river.

Derbyshire bridge discharge added to the discharge of Berry Clough should equal the Packhorse bridge discharge. The packhorse bridge discharge added to the Deep Clough discharge should equal the Goyt River discharge.

Also In this coursework I will be investigating the factors which can affect the discharge of the river,

- \* Precipitation rate- how precipitation affects the discharge of a river.
- \* Evaporation rate- how evaporation affects the discharge of a river.
- \* Geology- how rock affects the discharge of a river.
- \* Human activities- how humans affect the discharge of a river.

I will then research the Errwood and Fernilee reservoirs. I will investigate the past and present industries in the Goyt Valley.

Finally I will investigate the geology of the Peak District and how the Goyt Valley was formed.

My information will be gathered from the Peak District national website.

Here are my results

Depth of river from left to right at 0.5 m intervals

Location

0

0.5

1

1. 5

(1. 2)

2

2. 5

3

(2. 9)

3. 5

4

(3. 7)

4. 5

5

(4. 8)

River Goyt

10

8

9

13

14

23

38

31

18

15

10

Deep Clough

4

21

19

24

29

12

19

Packhorse Bridge

20

22

20

34

36

38

21

19

19

Berry Clough

26

26

56

56

Derbyshire Bridge

5

15



20

21

22

19

10

The site that was the widest was the River Goyt. The smallest was Berry Clough.

I used this table to record the depths of the different sights of the river.

I then used this information to draw cross-sections of the river at these points.

I drew my cross on graph paper and then counted the squares.

These were m results.

Location

Cross-sectional area

R. Goyt

1. 9 sq/m

Deep Clough

1. 5 sq/m

Pack Horse Bridge

2. 1 sq/m

Berry Clough

0. 9 sq/m

Derbyshire Bridge

1. 4 sq/m

I will now calculate the velocity.

When we arrived at the Goyt Valley the flow meter was not working.

We then had to improvise.

First of all we measured 5 meters down the river. We then threw in a twig and timed how long it took for the twig to travel 5 meters. We did this for the left, right and middle of the sight. We did this for all sited there were my results.

Time taken for twig to float 5m (s)

location

Left

Middle

Right

Average Speed

R. Goyt

11

7

10

9. 6

Deep Clough

6

7

7

6. 6

Pack Horse Bridge

11

7

9

9

Berry Clough

20

15

17.5

Derbyshire Bridge

8

7

8

7.6

The Middle of the river seems to flow fastest in the centre.

I then converted my 5 meter velocity into 1 meter velocity.

There were my results.

location

Average Speed for 5m

Average speed for 1m

G. River

9.3

0.537634

Deep Clough

6. 6

0. 757576

Pack Horse Bridge

9

0. 555556

Berry Clough

17. 5

0. 285714

Derbyshire Bridge

7. 6

0. 657895

I then calculated the discharger for each site using the formula

Discharge = cross-sectional area \* average velocity

Location

Cross-sectional area

Average velocity

Discharge

R. Goyt

1. 9 sq/m

0. 537634

1. 0215046

Deep Clough

1. 5 sq/m

0. 757576

1. 136364

Pack Horse Bridge

2. 1 sq/m

0. 555556

1. 1666676

Berry Clough

0. 9 sq/m

0. 285714

0. 2571426

Derbyshire Bridge

1. 4 sq/m

0. 657895

0. 921053

As I had said in my introduction Derbyshire bridge + Berry Clough = packhorse bridge.

And, Packhorse Bridge + Deep Clough = River Goyt

As you can see from my diagram, the discharge of Derbyshire Bridge is 0. 92 cumecs. The discharge for Berry Clough is 0. 25 cumecs. Both of these discharges added together almost equal Pack Horse Bridge's discharge of 1. 15 cumecs.

The discharge of Pack Horse Bridge is 1. 15 cumecs. This added to Deep Clough's discharge of 1. 13 cumecs, does not equal the discharge of River Goyt.

Factors that affect discharge

\* Precipitation rate- this affect discharge because if there is more precipitation the volume of water in the river increases which in turn increases discharge

\* Evaporation rate- if more water is being evaporated from the river then the volume of water in the river decreases which in turn decreases discharge

\* Geology- if the bed rock is porous then more water will infiltrate the rock decreases the volume of water in the river. Where as if the rock was Impermeable this would not happen.

\* Human activities- in the Goyt Valley there is a man made stream situated near Deep Clough. This increases the volume entering the river, which increases discharge.

### Reservoirs

In the early 20th century there was an increased demand for drinking water. This led the Stockport Water Corporation to for building two reservoirs. In 1920 empty farmhouses were demolished to provide an uncontaminated cater catchment area. The Fernilee reservoir was built in 1938, and cost around £480, 000 and holds 4940 million litres of water.

### The Fernilee reservoir

The second Errwood was built in 1967 and cost £1. 5 million and holds 4215 million litres. North West Water now own much of the Valley and surrounding moorland, which is the water catchment area for the two reservoirs. These two reservoirs supply an average of 7-8 million gallons of water a day, some direct to Whaley Bridge and the rest to the Stockport region.

### The Errwood Reservoir

### Industry



The earliest history of the Goyt Valley belongs to Neolithic farmers around 3,000 BC, who were the first to start felling trees and clearing the ground for cultivation. Farming continued to be the predominant use of the Valley for centuries. Following the Norman Conquest the Goyt lay between two Royal Hunting Forests (Peak Forest and Macclesfield Forest).

Since at least the 1500s and until earlier this century, the Goyt Valley supported a flourishing community. Tenanted farms, coal mines, a water mill, a railway and a gunpowder mill were all part of the landscape. The flooding of the Valley to form the Errwood and Fernilee reservoirs changes its use dramatically.

The Chilworth Gunpowder factory (which may date back to the 16th century) now lies under the waters of Fernilee Reservoir. A serious explosion in 1909 killed three men, but the factory was still very active during the First World War (1914-1918).

Near Goytsclough Quarry are the few remains of a Paint Mill operating in the 19th century, where a water powered wheel crushed barytes (mined locally) to a powder, which was used in the manufacture of paint.

Around Derbyshire Bridge are the remains of dozens of old coal mining shafts, which provided coal for homes and for the local lime burning industry.

At the height of activity, the population of the Goyt Valley supported about 15 farms, mainly stocked with sheep but also some herds of Shorthorn cattle. The Derbyshire Gritstone sheep, one of the oldest native breeds, was

commonly known as the Dale o'Goyt in the past - indicating that it may well have originated in this part of the Peak District.

Sheep farming is still the most common form of agriculture in the Valley, although enclosed farmland now occupies only the lower land around Fernilee Reservoir. The hardy hill sheep graze the large areas of moorland throughout the Valley in all weathers and contribute to the shaping of the moorland landscape.

#### Farmers hay making

The Goyt has been a popular area for visitors throughout this century but growing car ownership has increased the pressure on the valley. The greatest visitor pressure is around Errwood reservoir with Derbyshire Bridge as an attraction for the more active visitor.

The National Park Plan confirms that, " The recreation facilities in the Goyt work at maximum capacity and any increase in facilities could cause great harm to what is at present a finely balanced mix of land uses".

#### Sailing on the Errwood Reservoir

#### Geology of the Peak National Park

The Peak National Park landscape is strongly influenced by the rocks that lie underneath the soil. These are sometimes exposed on the surface as well. These rocks, and the soils formed from them, partly determine which plants will grow on the land and which animals can live there. The rocks also affect

the industries that have been important in the Peak District and those that are important now.

### Geology of the Peak District National Park

Most of the rocks that now form the surface of the Peak National Park were laid down in the Carboniferous period of geological time. The three main rocks are:-

Limestone, in the south and centre of the Park, forming the White Peak;

Millstone Grit, forming a horseshoe shape around the Park, which is called the Dark Peak;

Shale, a softer rock which lies at the foot of the Millstone Grit edges and forms the fertile Valleys of the Park.

### Formation of the Goyt Valley

Around 280 to 350 million years ago, mud gravel and sand were washed down to the Peak District area by a vast river from what is now the highlands of Scotland.

These layers of mud and sand were laid down in the sometimes deep and sometimes shallow waters of the estuary of the river. Over millions of years the mud and sand were compressed to become layers of shale and gritstone rock.

Vegetation growing in the river delta formed the pockets of coal found in the Valley. The lower coal measures exposed at the southern end of the Valley

make this an area of special geological significance and contribute to its designation as an SSSI (Site of Special Scientific Interest).

Movements of the earth tilted and folded these rocks to form the Goyt syncline - a downward fold in the rocks.

Successive Ice Ages shaped the exposed shales and gritstones and later still the river Goyt started to carve out the Valley as we see it today. The layers of carboniferous grits and shales reach their highest point at Shining Tor (559 metres).

#### Evaluation

My hypothesis seems to be incorrect when looking at the discharge for pack horse Bridge, deep Clough and river Goyt discharges. This is because the Packhorse Bridge and deep Clough discharges do not equal the river Goyt discharge.

When we were measure the velocity of the river Goyt it was raining. But when we were measuring the others it was not. This may have affected the speed at which the twig travelled.

Our method for measuring the velocity was not very reliable, because the twigs may not have all been the same size and weight, this too will have affected the speed at which it travelled.

We used a stopwatch time how long it took for the twig to travel five meters. We used a tape measure the five meters. Because the tape measure wasn't straight the distance may have been different at the different sites. And

because the stopwatch was stopped after the twig had passed five meters then the timing may not have been accurate. The velocity would have been more accurate if we would have used a flow meter

When drawing my cross- sections not all the squares were complete so I had to put two half squares together and count them as one. This too is not a reliable method for measuring the cross-sectional area.