Candidate 3 evidence

How does the Strathrony River compare to the Bradshaw Model?

Aim

To compare data collected from the Strathrony River to data from the Bradshaw Model

Knowledge + Understanding

Erosion, transportation and deposition are the three main ways a river shapes the landscape. Erosion is when the river wears away and removes land and the stones within it. An example of erosion is hydraulic action, which is the breaking away of the river banks by the sheer force of the water getting into small cracks and forcing pieces of rock to break off. A second example is corrasion, which is the wearing away of the river bed and banks by the rivers load hitting against them and causing the landscape to break up.

Transportation is the movement of rocks and silt by the river, or how it carries it's load. The river will tend to transport material in four ways, these are; traction, saltation, solution and suspension. Traction is when stones are rolled or dragged along the river bed by the sheer force of the water. Saltation is when small rocks bounce off each other and are carried by the water. Solution takes place when the river dissolves minerals from the rocks that the water carries. Finally suspension is when small particles are lifted in the water and carried a long distance.

Finally deposition will take place. Deposition is

When the river dumps rocks and silt wherever it slows down because it no longer has enough energy to carry it's load.

A river typically has three main stages - the upper course, middle course and lower course. The upper course tends to be narrow and steeply sloped. This part of the river is steeply sloped because verticle erosion is greatest in the upper course of the river, and the sides are usually steeply sloped as a result. The depth in this area of the river is usually shallow and the channel is sinuous. In the middle course the slope tends to be quite steep and the channel is usually quite wide. The depth in the middle course is normally rather deep and small meanders begin to develop. Finally the lower course is normally gentle and the channel wide. The depth in this area is typically deep and there is normally many large looping meanders present. Over time these meanders may become cut-off and form an ox-bow lake.

Methodology

In January 2019 the Strathrory River was visited and fieldwork was carried out. The channel width, depth, bank angles, rock size, rock shape, rock roundness, rock type and velocity were all measured and recorded.

The first technique used was river discharge. To work out the river discharge first the channel width was measured using a tape measure. This was done by a person standing on the right hand bank and another stood opposite on the left hand bank. The person on either side of the river held onto either end of the tape and streched it tight across the river channel and the width was measured and recorded. Then the depth of the Strathrory River was measured with 2 people holding a tape measure from one bank to the other. The depth of the river was measured every 0·5 metres using a metre stick. The results collected were used to make a cross section of the river. Velocity was measured by measuring 10 metres down the channel and placing a partly filled water bottle in the river and timing exactly how long it took to travel the 10 metre distance that had been measured out. The bottle was partly filled to ensure that it would stay in the correct place in the river during the time whilst the experiment was being carried out. This experiment was carried out on the left hand side of the channel, the right hand side of the channel and also down the centre of the channel. This was done in order to be able to work out the total discharge of the river.

The second technique used was bedload analysis. First the rock size was measured using a pebbleometer, each rock was placed into the pebbleometer and the A, B and C axis were measured. The rock shape was measured using the power of roundness diagram, where the shape of the rock collected was compared to the diagram and the rock shape was decided. Rock type was then worked out by looking at the colours and minerals within each rock, and also through the expert opinion of teachers who were on the field trip to help decide what type of rock had been collected.

Bank angles were measured using a clinometre. This was done by 2 people the same height, one standing on the right hand bank and the other opposite on the left hand bank. The clinometre was held by one person and aimed at the eye of the person standing on the opposite bank. This was done in order to draw an accurate cross section. This gave the measurement of how many degrees the river banks were. The gradien of the river was also measured by having 2 people stand 10 meters apart down the stream and aiming the clinometer to see what angle the slope was.

Analysis

Graph 1 shows the velocity of the Strathrory River and graph 5 is the Bradshaw Model: anomalies between the river and the model occur when compared. Graph 1 shows that the rivers velocity was at its fastest in the lower course and at its slowest in the middle course of the Strathrory River. This shows an anomaly when compared to graph 5 as the Bradshaw model shows that the velocity should be fastest in the ~~upper course of the river~~ lower course of the river and slowest in the upper course. The results collected from the Strathrory River may differ from those of the Bradshaw model because of the Braiding that is present in the centre of the Strathrory Rivers channel, as can be seen in figure 2. Braiding is typically caused by fluctuation in discharge levels or low river velocity which causes the river to deposit its load, forming braiding. The braiding mentioned is occupying the middle of the channel and causing 2 much narrower channels to form on either side. This results in the water in the channel flowing much slower, reducing the velocity. This may be due to the greater friction along the river bed causing the water to slow down.

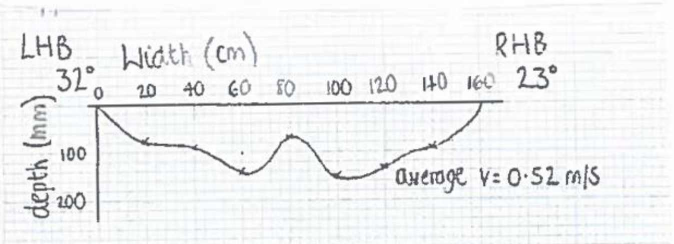
Similarities can be recognised between graph 3 and graph 5. When investigating channel width both graphs show that river channel tends to be at its widest in the lower course, and at its narrowest in the upper course. Graph 2, which shows the Strathrory Rivers average depth, and graph 5 are both in agreement that the deepest point of the river is the lower course. However there ~~was~~ is a slight anomaly between the two as graph 2 shows the shallowest point to be the middle course, whereas graph 5 shows this to be the upper course. The data collected from the Strathrory River may show a different trend of depth ~~[illegible]~~ to the Bradshaw model again due to the braiding present in the channel (figure 2). The braiding is down the centre of the channel which will cause the average depth of the river to be much more shallow than if it wasn't there, proving why both sets of data compared are not in total agreement.

Graph 4 and graph 5 are both in agreement because the Bradshaw model shows that the load particle size in the upper course should be larger than the load particle size in the lower course. The data collected from Strathrory River shows that there are more angular rocks in the upper course than in the lower course. This shows that rocks in the upper course were larger as they were less eroded. When the data is compared it can be seen that they were both in agreement when comparing the load particle size in the middle course. Graph 5 shows that the load particle size in the middle course of the river should be larger than in the lower course but smaller than in the upper course.

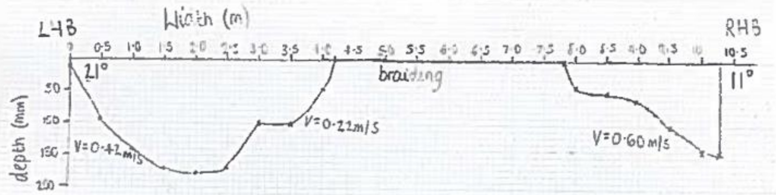
Graph 4 showing data from the Strath-rory River agrees with this statement. This can be seen by most of the rocks present in the middle course being either sub-rounded or sub-angular. In the Strathrorys lower course it can be seen that most rocks present are generally mostly rounded. This is again in agreement with the Bradshaw model which shows that the load particle size should be the smallest in the lower course of the river. Although both graphs are not representing the same data, it has been investigated that in general rounder rocks tend to be smaller and more angular rocks tend to be larger. This is because rounder rocks will have been exposed to more erosion resulting in them being smaller as more of them has been worn away.

Conclusion

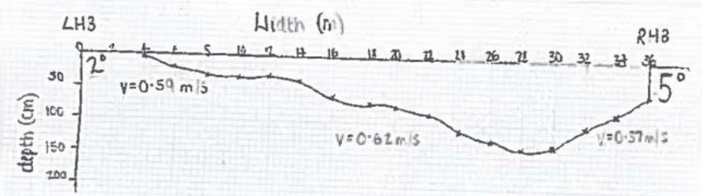
In conclusion when data collected from the Strathrony River is compared to the Bradshaw model there are both anomalies and similarities. The similarities are load particle size and the width. One anomaly is the velocity when both sets of data are compared. However when the depth of the Strathrony River is compared to the Bradshaw model, ~~both~~ there are both anomalies and similarities between the two. Overall there is more similarities than anomalies, this shows that although the Strathrony River is not a perfect model river it still shares many of the features of one.



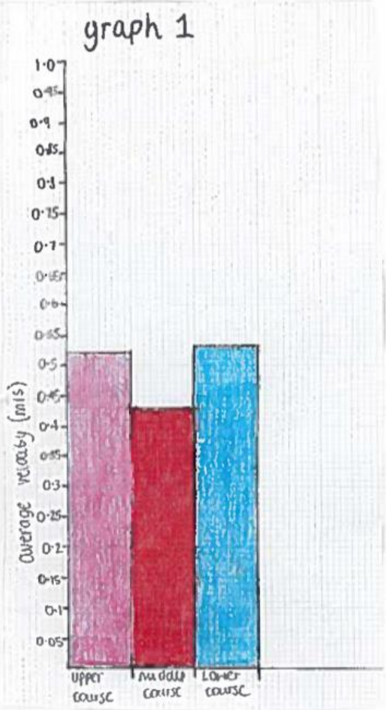
upper course 2019 figure 1

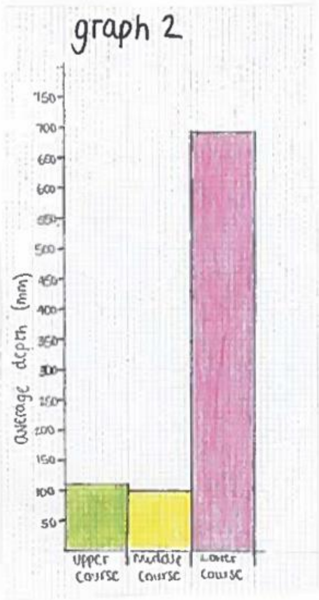


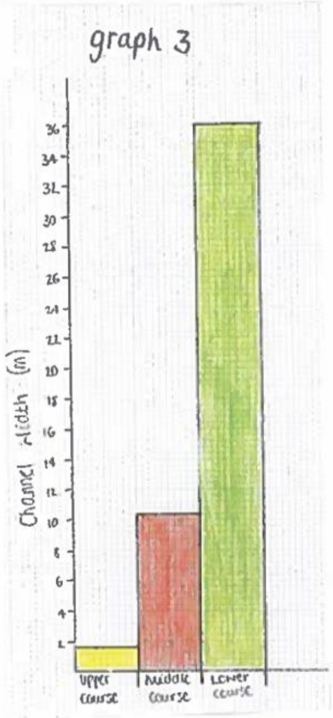
middle course 2019 figure 2

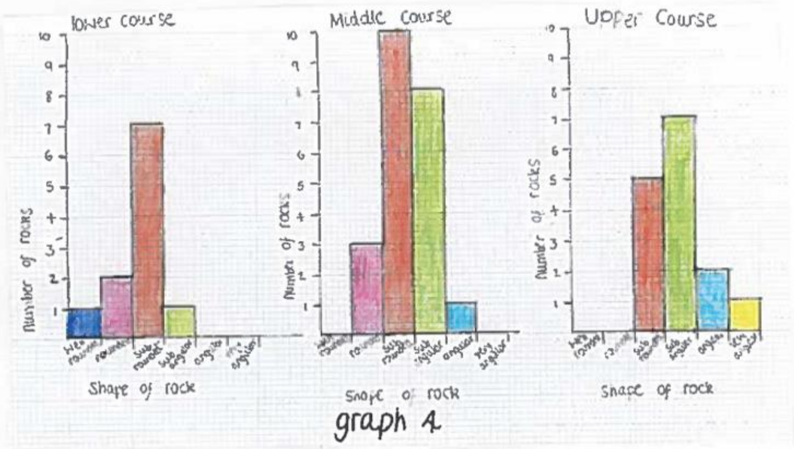


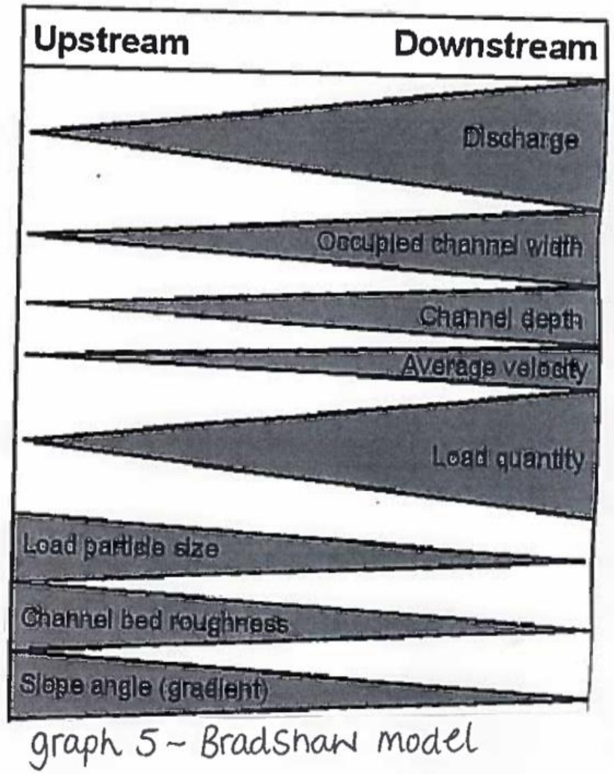
Lower course 2019 figure 3


graph 1
Average velocity (m/s)
upper course
middle course
lower course


graph 2
average depth (mm)
upper course
middle course
lower course


graph 3
Channel width (m)
upper course
middle course
lower course


lower course
Middle Course
Upper Course
Number of rocks
Shape of rock
graph 4


Upstream
Downstream
Discharge
Occupied channel width
Channel depth
Average velocity
Load quantity
Load particle size
Channel bed roughness
Slope angle (gradient)
graph 5 ~ Bradshaw model