Physical Geography fieldwork - Revision Notes

Investigation title: How and why does Carding Mill Valley stream's width and depth change down the long profile?

Hypothesis 1: Carding Mill Valley's stream gets wider down its long profile

Hypothesis 2: Carding Mill Valley's stream gets deeper down its long profile

Hypothesis 3: Carding Mill Valley stream will have higher velocity down its long profile

This is a suitable title and hypotheses because:

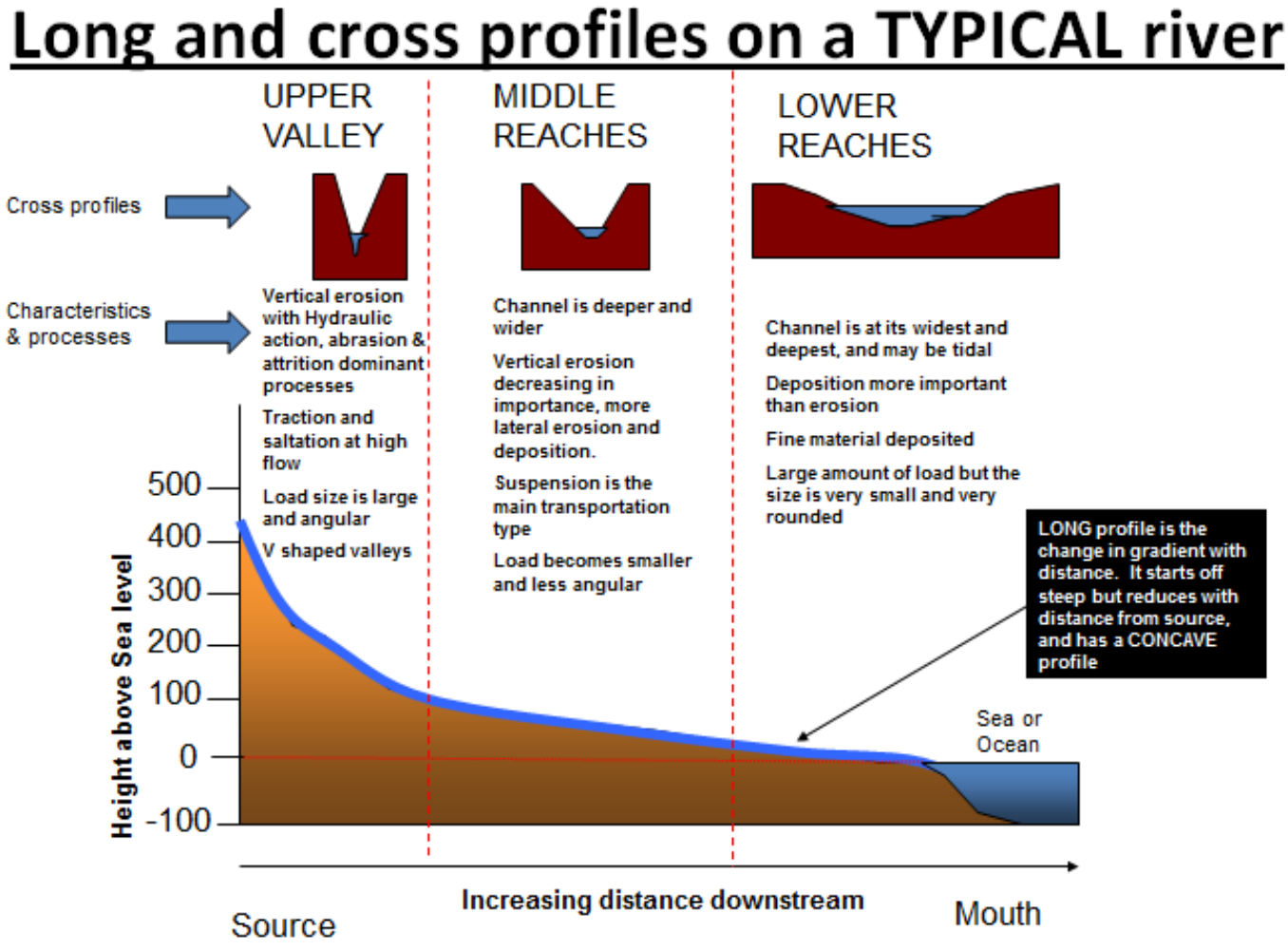
- Scale- enough sites to study and see change.
- Manageable – data can be collected in a day so the prevailing weather conditions will be the same.
- Primary and secondary data to answer the question.

Location: Carding Mill Valley found in Church Stretton, Shropshire. This is in the West Midlands. Ash Brook is the river studied. The land is very steep here and there is a clear v shaped valley.

Reasons why it was a good location:

- Carding Mill Valley was a good location because the water levels were (at the most) 30 cms high so it meant that it was safe for all students to enter the river and the risk of drowning was low and the flow wasn't too fast to enter the river.
- The National Trust owns this area so there was full public access.
- We were also able to test sites across 2km along the long profile of the stream – in 3 different sites: upper, middle and lower course.

What geographical theory is used to create these hypotheses?



Why will the stream get wider and deeper with distance downstream?

Tributaries join the main channel as it flows down the long profile so there is more water in the river. This means less water is in contact with the sides and bed of the channel, so less friction. So, the water can flow at a higher velocity and will have more power to erode laterally as well as vertically. This means the river channel becomes wider and deeper as you travel down the long profile.

Risk Assessment:

Risk	**How can it be minimised?**
Slips/ trips falls on the paths around the river	Be careful, watch where walking, wear sensible footwear.
Contamination of water on hands – Leptospirosis or E.coli	Cover any cuts on hand with waterproof dressing. Wash hands before eat and at the end of the day. Don't touch eyes or mouth/face if hands been near water/water equipment.
Change in weather – hyperthermia or heat exhaustion	Wear coat, sun hat, suncream.
Drowning	Don't go anywhere near the water alone – stay in groups.

Methodology (methods) –

Primary data:

First hand data collection – (you collect it yourself): width and depth measurements to see how the cross profile has changed. Velocity measures to see if this can explain the changes to width.

Secondary data:

Second hand data collection (you get from another source of information): Data taken from the National Trust about stream velocity over time.

Methods:

- **River width** was measured with a tape from the left hand side bank to the right. The tape was pulled tight and the measurement recorded in cms. STRATIFED SAMPLING – because chose 1 location in each course of the river.
- **River depth** was measured using a systematic sample every 25cms. This was measured with a metre ruler stick from valley floor to the water level and recorded in cms. SYSTEMATIC SAMPLING
- **River velocity** - two ranging poles were put in the river, ten metres apart. Then one person dropped a cork in while someone else timed its movement. The stopwatch was stopped when the cork passed the second ranging pole. STRATIFED SAMPLING – because chose 1 location in each course of the river.

Data collection methods were appropriate because we could compare the characteristics of the river downstream to our hypotheses. All things we measured were part of our three hypotheses and using geographical theory.

Evaluation of methods

Strengths –

- Used the correct equipment to measure accurately, e.g. ruler with cm and width with tape measure.
- Depth values taken at regular intervals across the stream width to get more accurate data.
- Cork used for velocity allowed the distance travelled over time to calculate the speed.

Weaknesses –

- Human error – people/visitors to the stream moving the stones around so disrupting the natural pattern of bedload.
- Cork got stuck in bedload rocks so made the velocity slower than natural water flow.

What could be done differently?

1. Laser measuring tool for distances.
2. Use a flow meter for measuring velocity.

Other limitations to data collection –

1. Distance from source: Using paper on a map can be inaccurate as it cannot measure the tight turns in the river, could have used a pedometer.

2. Seasonality: Return in the winter when there has been more rain, so therefore higher water levels and faster velocity.

3. Small scale: Be realistic – a snapshot view – only first 2 km of a 351km River, 1 time of day, 1 season. Our conclusion on represents a small section of the long profile, at one time of year.

What extra data could I have gathered?

Data presentation – what used and why?

1. Channel width – bar chart. Used to allow us to compare the width of sites very easily.

2. Channel width and depth - Line graph cross sections- one per site. Allowed us to compare the changes in the shape of the channel (width and depth across the sites).

3. Average velocity. Primary data = Scatter graph. Used because data was continuous, allowed us to apply a line of best fit. Secondary data = Proportional symbol map on Arc GIS for the mean velocity, allows us to see a visual representation in the change in velocity and link to shape of land or other physical features.

Evaluation of Methods of Data Presentation

Appropriate because…

- Can see change of width, depth & velocity over distance.
- Easy to compare locations.
- Scatter graph - can add best fit line to see strength of positive correlation.
- Bar graph - can be located on a map to help show change of river width over the long profile.
- Can identify any anomalies (exceptions).

Limitations of methods of data presentation

- Data is subjective – graph is only as good as the data collected.
- Problems with the data collection methods are reflected in the results.
- No indication of reasons behind the data (causation).

Data analysis

Mean calculated – add up the data for each site and divide by how many there are.

Mean depth – Upper course = 6.4cm, Middle course = 5.2cm, Lower course = 5.8cm.

Mean width - Upper course = 1.59m, Middle course = 2.7m, Lower course = 4.85m.

Mean velocity – Upper course = 0.29m/s, Middle course = 0.37m/s, Lower course = 0.57m/s.

Justification of data analysis techniques

I am using mean averages to analyse my data because it simplifies the data making it easier to identify changes to width, depth and velocity down the long profile.

Data interpretation: using graphs and averages to understand what the data shows

Hypothesis 1: What happened to width along the long profile?

In the upper course of the stream the average width was 1.58m. In the lower course the average width was 4.84 m. There has been a clear increase in the width of the stream. This is because there is more water so a higher velocity so more lateral erosion.

Hypothesis 2: What happened to depth along the long profile?

In the upper course the average depth was 6.4cm but in the lower course it was 5.8cm so the depth decreased. This was not what we expected. This could be due to human interference, for example, people moving the stones around so changing the depth of the channel.

Hypothesis 3: What happened to velocity along the long profile?

In the upper course of the river the average velocity was 0.289m/s. In the lower course the velocity is higher, with an average velocity was 0.57 m/s.

This links to the width data as increasing width down the long profile can be explained by the velocity increasing.

Evaluation of methods of **Data Analysis**

Useful because…

- **Mean** - gives one figure for each location making comparisons easier to make.
- **Range** - shows whether or not there is significant variation within locations rather than just between them

Limitations of usefulness

- does not show **causation,**
- data analysis is only as good as the data used,
- a mean or range can be skewed by anomalies in the data

Conclusions - Draw evidenced conclusions in relation to original aims of the enquiry.

Hypothesis 1: Carding Mill Valley's stream gets wider down its long profile

- The hypothesis about width increasing can be **accepted**. This is because the width data shows that the stream did get wider with distance downstream from the upper to lower course.

Hypothesis 2: Carding Mill Valley's stream gets deeper down its long profile

- The hypothesis about depth increasing **cannot be accepted**. This is because the data shows that the depth did not always get bigger with distance downstream.

Hypothesis 3: Carding Mill Valley stream will have higher velocity down its long profile

- The hypothesis about velocity increasing can be **accepted**. This is because the data shows that velocity did increase with distance downstream.

Overall:

- The increase in width can be linked to the increase velocity. There is a **positive correlation** between velocity and distance down the long profile. This **links** to the width data. The lower course sites were widest and also fastest.
- Higher velocities lead to a wider channel **because there is more lateral erosion.**

Extent to which conclusions are reliable (LINK TO ACCURACY and SCALE OF DATA COLLECTED).

Reliability of conclusions

- Range of data – data from 4 sites in each course so able to see change down the long profile and identify any anomalies that could skew conclusions.
- Accurate methods – steps were taken to make data collection accurate e.g. measuring width 2cm above the water so results were accurate and therefore conclusions about change to width would also be correct.

Limitations to reliability of conclusions

- Issues with accuracy of methods – overhanging banks led to us underestimating the width at some sites particularly in the upper course therefore conclusions about how much width changed down the long profile may not be completely accurate. When the cork got stuck the velocity measurements became inaccurate therefore conclusions about the change in the velocity and therefore erosion in the river are also unreliable.
- Scale of data collected – data came from only 2km of the river and was collected at one time of year. Conclusions are therefore limited to that section of the river at that time of year.