



# River Landscapes: Long & Cross Profile

## Lesson Plan and Teachers Notes

This GCSE / Key Stage 4 River Landscapes package is designed to support all major examination boards, including OCR, Edexcel, and AQA. However, some content included may not apply to every specification. **Teachers must ensure they follow the requirements of their own exam board's specification when delivering lessons.**

The lessons can be worked through at any pace, and can be split into multiple lessons if needed. This flexibility allows you to adjust the flow based on the class's understanding and time constraints. If some sections require more in-depth exploration, feel free to extend them over additional lessons to ensure students fully grasp the concepts before moving on.

The worksheets can be used in-class or as homework, depending on the pace of the lesson.

### Lesson Objectives:

- Understand what the long and cross profile of a river are
- To be able to calculate the cross profile of a river
- Understand what can affect river discharge
- To be able to calculate river discharge

### Assumed Prior Knowledge:

At GCSE level, students should have already encountered many river landscape concepts, however this lesson will cover long and cross profiles in more depth than students may have previously covered. The lesson will involve mathematical skills as they calculate formulas, and understand and plot graphs and charts.

### Resources:

- Worksheets
- [Eden Rivers Trust's 'journey down the River Eden'](#)

### Notes for each slide:

Teachers should decide what information students record into their workbooks.

#### Slide 1:

- Read through the learning objectives so students are aware of what they will be learning through this lesson.

#### Slide 2:

- Recap the river components diagram from the previous lesson. Ask students if they can call out the correct term before allowing the slide to play and reveal each term in sequence.

#### Slide 3:

- This slide defines the long profile of a river. Read out the definition and show this using the diagram.

#### Slide 4:

- The long profile of a river can be plotted on a graph.



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The X-axis shows the distance from the source (km) and the Y-axis shows the height above sea level (m).

### Slide 5:

- This slide defines the cross profile of a river and shows how it changes. In the upper course, there's a narrow channel with steep sides, but the cross profile widens and deepens as you progress to the lower course.

### Slide 6:

- The cross profile of a river changes due to erosion, laterally and vertically, and deposition.

### Slide 7:

- Analysing the gradient of the long profile graph can help to distinguish the upper course, middle course and lower course. The cross profile diagrams can be shown together with the long profile graph to provide a visualisation of how a river changes in shape from source to mouth.

**The following slides feature mathematical formulas. If needed, allow additional time to guide students through and ensure they fully understand each step.**

### Slide 8:

- Cross-sectional area is the surface area of a river from bank to bank if a vertical slice was taken through it. It is measured in square metres ( $m^2$ ). The formula used for calculating cross-sectional area is provided.

### Slide 9:

- An example methodology which could be used in a fieldwork task is displayed. Note: this fieldwork methodology is provided **solely as an example** to support teaching and learning. It must **not** be used as a standalone guide for conducting fieldwork.

### Slide 10:

- This slide shows example channel depth recordings at each interval and the channel width measurement.

### Slide 11:

- Using the example readings from the previous slide, allow students time to complete the formula before playing the slide through. The mean depth will appear first, followed by the final calculation, with the answer appearing last.

### Slide 12:

- Once students understand how to record and calculate cross-sectional area, this slide explores what is shown. As channel width and depth increases in size downstream, the cross-sectional area will also increase.



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### Slide 13:

- This slide defines river discharge and displays the formula used to calculate it.

### Slide 14:

- The flow of a river can change due to human and physical factors. Before playing through the slide, ask students if they can think of some factors which may sit under either table heading. Following a discussion, the slide can be played and all factors will appear simultaneously.

### Slide 15:

- One component within the river discharge formula must be calculated first. This is velocity. This slide defines velocity and shows the formula for calculating this. There is also a diagram which shows how this can be recorded.

### Slide 16:

- An example methodology for calculating velocity is provided. Note: this fieldwork methodology is provided **solely as an example** to support teaching and learning. It must **not** be used as a standalone guide for conducting fieldwork.

### Slide 17:

- Example velocity recordings from the right bank, left bank and centre of the channel are shown in the table. Ask students to calculate the mean for each column before allowing the answers to appear in sequence. Then, students should calculate the mean of these new figures. The final mean will appear, followed by the distance travelled and the formula. Ask students to complete the formula and calculate the velocity.

### Slide 18:

- Now velocity has been recorded, the formula to calculate river discharge can be completed. Students should use their answers from the previous formulas to calculate the river discharge. Each answer will appear in sequence.

### Slide 19 - 20:

- These practice questions can be completed in class time or as homework, depending on the class ability. If required, a discussion can be held about each question to generate some guidance.

### Slide 21:

- If class time allows, explore [Eden Rivers Trust's 'journey down the River Eden'](#) and allow students to explore key points like the source, upper course, tributaries, confluences, nearby towns and villages, along with landforms which will be covered in future lessons.