

Exploring the Topography of the Eden catchment

Long Profiles and Cross Sections

Summary

This lesson is best carried out after using the ArcGIS resource - [Exploring the Geography of the Eden Catchment](#).

Students can explore the topography of the Eden catchment using a pre-prepared web map, [Topography of the Eden Catchment](#), created using ArcGIS Online. The associated questions and tasks are designed to help students become familiar with using simple online GIS mapping tools to query map-based data and investigate the geography of an area. The web map is accompanied by an associated introductory video to help you learn how to use it.

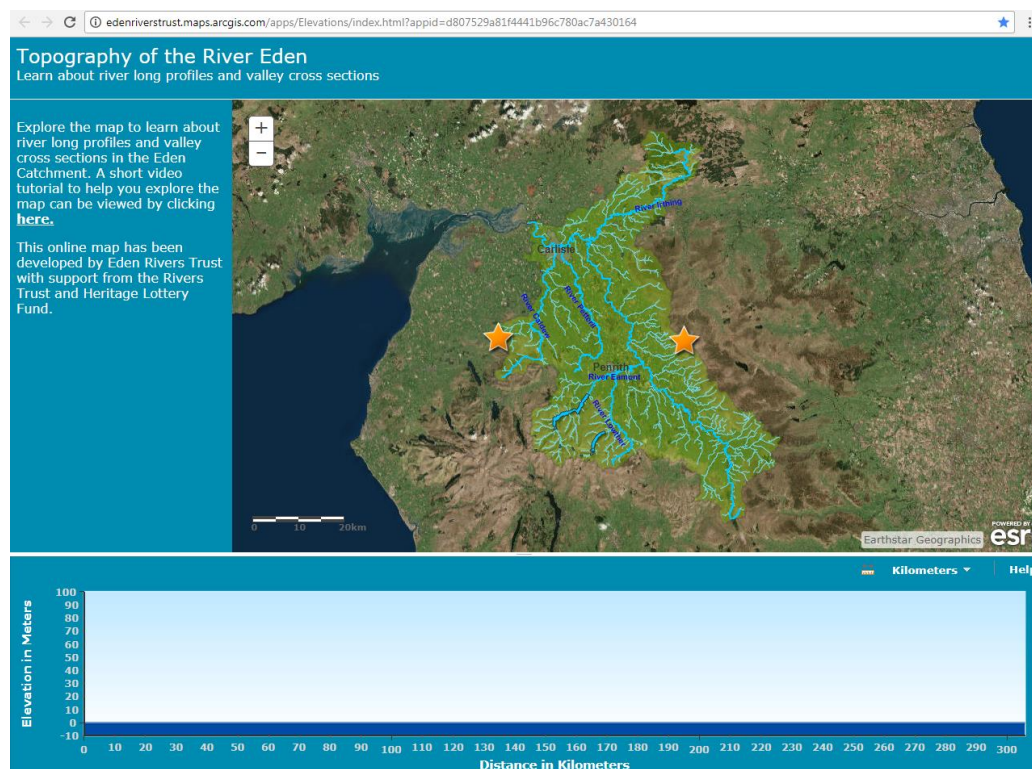
The exercises are also designed to help familiarise students with key river catchment terms such as Long Profile and Cross Section and to understand the topography of an area.

NOTE: The Story Map includes links to Eden Rivers Trust animations / videos which are located on Vimeo, <https://vimeo.com/edenriverstrustcumbria>.

Please ensure all computers being used have permission to access it.

The short introductory video at <https://vimeo.com/154836183> demonstrates the tools available to explore the map.

The web-map can be found at <http://arcg.is/1sWBZN>



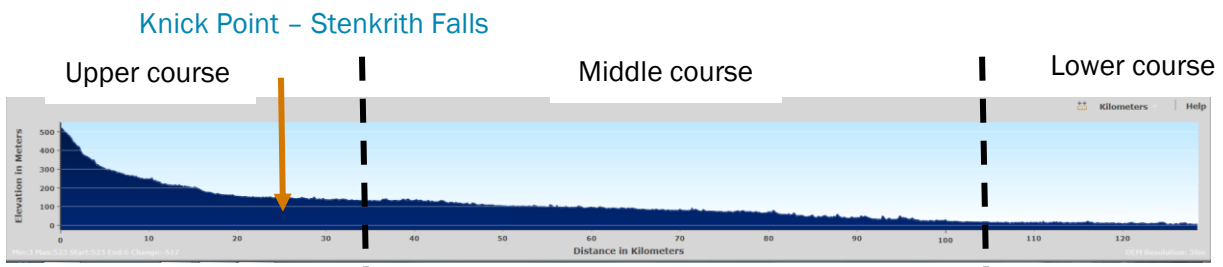
Questions & tasks

A range of suggested questions and tasks for students to complete, based on the web map.

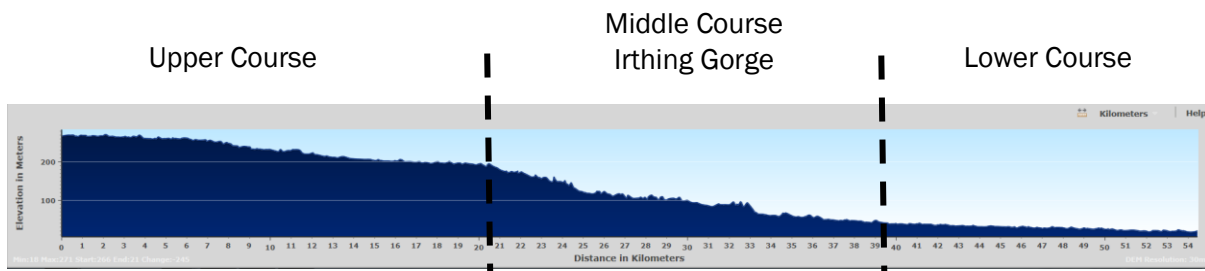
River long profiles

1. Select and click on the River Eden on the map. The long profile of the river will be drawn.
2. Using the long profile graph answer these questions:
 - Q1. At what elevations above sea level does the River Eden start and finish its journey?
A. Start 523m, finish 6m – though this sometimes captures the height of the river bank not the water in the river - see [Footnote 1](#) on the next page
 - Q2. How many metres does the River Eden fall over its entire length?
A. 517m
 - Q3. What is the average gradient of the River Eden over its whole length?
A. 4 %
3. Move your cursor across the graph; a red cross will appear showing your location on the river.
 - Q4. What is the elevation of the river above sea level at Kirkby Stephen, Appleby and Carlisle?
A. Approx. 175m, 128m, 11m
 - Q5. What is a river long profile?
A. The long profile of a river shows changes in the height (altitude) of the course of a river from its source to its mouth.
 - Q6. Describe the long profile of the River Eden in terms of the upper, middle and lower sections of the river.
A. The upper course of the river has a steep gradient, dropping from an elevation of 523m to 155m within the first 10 km of its course. During the next 80km it is less steep, dropping from 155m to 30m elevation. The lower course and final 28km has a very shallow gradient, until it reaches its mouth.
4. Compare long profiles for the River Caldew and the River Irthing. You can use 'Print Screen' or Microsoft's snipping tool to capture each graph and paste into a Word document.
 - Q7. Describe the long profiles of each river. How do they differ and what impact might this have on the rivers?
A. The web map has been created to produce long profiles for the River Eden and five of its major tributaries; the River Caldew, River Petteril, River Irthing, River Eamont and River Lowther. On the next page are examples of some of the outputs (with annotation) to answer this question.

River Eden Long Profile



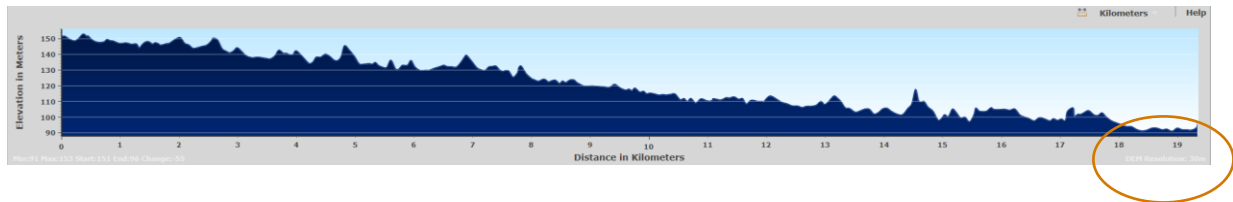
River Irthing Long Profile



In contrast to a typical long profile, the River Irthing's profile is steeper mid-course where it flows through Irthing Gorge (including Crammel Linn Waterfall).

River Eamont Long Profile

Digital Elevation Model (DEM) Resolution is only 30m



Footnote 1:

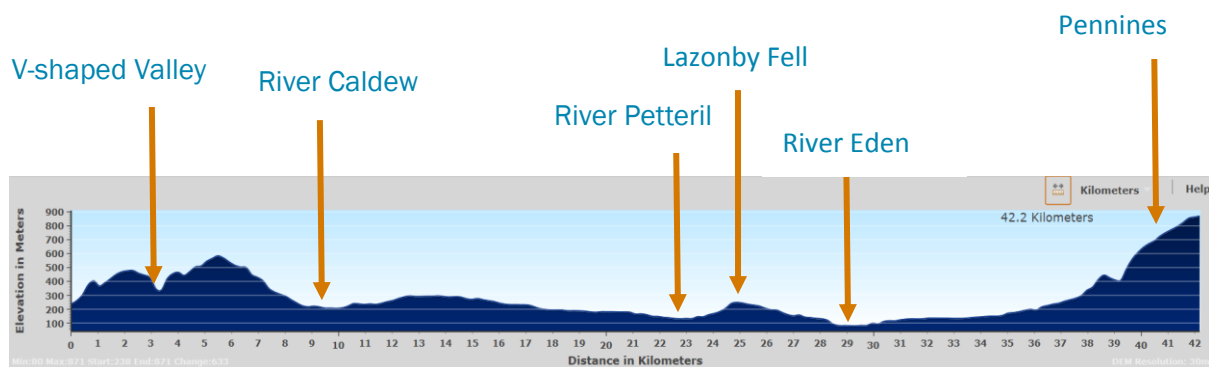
NOTE: The ArcGIS Online software uses a digital elevation model (DEM) with a resolution of 30m to produce the long profiles. This means that the earth's surface is divided into a grid of 30m x 30m cells each given an elevation above sea level, derived from satellite imagery.

This limits the accuracy of the long profile calculation, as it may sometimes capture the height of the river bank not the channel resulting in undulations in the profile. These become more visibly exaggerated on the shorter rivers or those with many cliffs e.g. the River Eamont as above. This would give an opportunity to discuss data accuracy with more advanced students.

Valley cross sections

1. Select the **ruler tool** located above the graph and draw a straight line on your map from the orange star on the western edge of the catchment to the orange star on the eastern edge, making sure your line crosses through the River Caldew, River Petteril and River Eden.
2. You will now have drawn a cross section of the Eden Catchment. Move your cursor across the cross section graph to help locate the three river valleys. Describe the cross section of the Eden Catchment and the different valley shapes for the rivers crossed.
3. Using [print screen](#) or [Microsoft's Snipping Tool](#), take a copy of the valley cross section and paste it into Word or another similar programme. Identify and label the topographic features, e.g. river valleys and hills.

An example, is shown below:



Advanced Study – suggestions for further work

1. Develop your own web map for the Eden Catchment (or another location). Link to the [Create Your Own Map – Hydrology of the Eden](#) lesson plan for more details and an example of how to do this.
2. Write a short report, or make a presentation about the Geography of the River Eden Catchment using information from the web maps and other online sources. Students can print off different maps to use in their report. This exercise could be linked with the [Journey down the River Eden](#) Story Map which contains more information about the places, history, features and wildlife of the River Eden.
3. The River Eden has been designated a Special Area of Conservation and Site of Special Scientific Interest due to the value of its habitats and wildlife. Use the Internet to research the river and find out some more information about why it is so special. Give a short presentation on your findings.

**You can download more free ArcGIS resources to use in the classroom
from the Eden Rivers Trust website,**

www.edenriverstrust.org.uk/arcgis-resources-secondary-schools



This series of ArcGIS resources for Secondary Schools have been developed by Eden Rivers Trust in conjunction with The Rivers Trust with support from the Heritage Lottery Fund.
Thank you to all of the teachers who helped with the development of these resources.