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## Silurian rocks

The Silurian Period extended from 443 to 417 million years ago. Named after a British tribe, the Silures, who lived in southern Wales and the Welsh Borderland, where rocks of this age dominate the exposure, the Silurian is divided into four series: Llandovery, Wenlock, Ludlow and Prídolí. Only rocks from the Wenlock Series, dating from 428 to 422 million years ago, are exposed in the district. Now used internationally, the Wenlock Series was first described from the wooded scarp of Wenlock Edge in Shropshire.

### Silurian rocks in Great Britain

The Silurian rocks found in Great Britain were deposited mostly within the deep Iapetus Ocean (p. 18). Thick layers of mud accumulated on the ocean floor, together with substantial amounts of muddy sands, deposited from vigorous turbidity currents carrying sediment from the adjoining continental shelves. As Avalonia began to impinge on the Laurentian continent during early Silurian (Llandovery) time, continental crust started to choke the northward-dipping subduction zone beneath Laurentia, which had formerly subducted only Iapetus oceanic crust. By late Silurian (Ludlow) time, the last remnant of the Iapetus Ocean had been destroyed and the Laurentian margin was being overthrust onto the British segment of Avalonia. As the continents eventually collided, the muds were compressed to form hard mudstones and slates; the muddy sands were compacted to form the sandstones we know today as greywackes.

The fauna of Silurian times evolved rapidly. As a result, the Silurian can be divided into a series of zones according to the changes in the organisms preserved as fossils. Brachiopods, are relatively common in the rocks, but graptolites and conodonts have yielded the most refined Silurian zonations.

The Silurian is extremely well represented in the British Isles, and as the 'type' area for the geological period is important throughout the world.

### Silurian rocks in the district

#### Geological SSCI

Whitelee Bridge Road Cutting [NT 715 049]

The basement rocks to the Cheviot Hills igneous complex consists of a steeply dipping sequence of green shales and greywackes that has been assigned to the Silurian Period. The largest outcrop of these rocks is the Coquet Head Inlier, which straddles the Scottish border. The Silurian sequence is unconformably overlain by the basal Old Red Sandstone (Devonian) in the east, and by Carboniferous sediments in the south and west, though much of this boundary is faulted.

The first evidence of a Silurian age for these rocks was the discovery in 1867 of graptolites indicative of a Wenlock age in rocks near Ramshope [NT 73 04].

The Silurian age was confirmed when graptolites were discovered shortly after from a locality in the Coquet valley, although these were believed to be of a younger Ludlow age. However, nearly a hundred years later the evidence was reassessed and these beds were also considered to be Wenlock in age. In 1982 the beds were assigned to the top of the *Monograptus riccartonensis* zone of the Wenlock Series. The greywackes are similar to those found in the Silurian inliers southeast of Hawick. Sedimentary structures, including flute, prod, and groove casts are common and examples can be found at many outcrops in the Coquet valley, and in the upper reaches of the Kale Water tributaries. The thickness of this sequence, now assigned to the Riccarton Group, is approximately 600 metres.

At the eastern edge of the National Park, two small inliers of steeply inclined sediments, consisting of alternations of greywacke and greyish-green laminated shales, occur amongst lavas on the eastern slopes of Fawdon Dene. These sediments appear in every way comparable to those in the Coquet Head Inlier, and are considered to be of the same

age. They represent the easternmost exposure of the Silurian platform in the district.

### **Influence on the landscape**

Because of their limited outcrop these rocks have little impact on the landscape. Much of the outcrop is concealed beneath thick deposits of glacial till and peat.

### **Influence on biodiversity**

Because of their limited outcrop these rocks have little impact on the biodiversity.

### **Economic use**

These rocks are not known to have had any economic use within the district and future commercial interest is extremely unlikely.

### **Conservation issues**

None of the outcrops has SSSI protection. Most of the exposures within the district are not thought to be under any significant threat, other than those normally associated with the weathering of natural outcrops and stream sections.

### **Wider importance/significance**

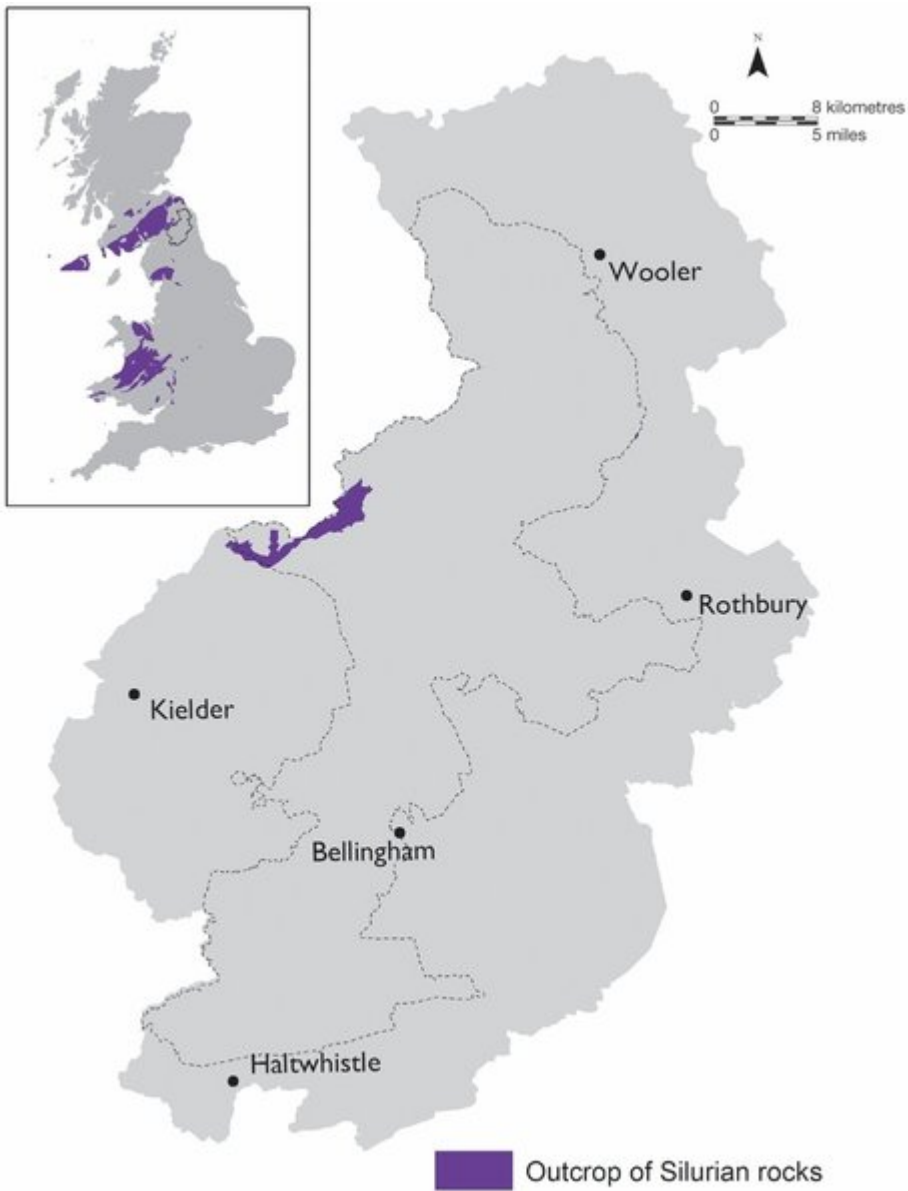
Although covering a relatively small surface area, the few outcrops of Silurian rocks visible within the district are the only evidence of basement rocks within this part of northern England. They therefore contribute significantly to our understanding of the geological history of the area and the geological history of Great Britain.

The sediments of the Coquet Head Inlier contain the diagnostic characteristics which are taken to indicate deposition by turbidity currents. Although few in number, the palaeocurrent (direction of ancient water flow) data are important in consideration of British Wenlock palaeogeography.

## **Figures**

(Figure 19) The distribution of Silurian rocks in the district.

(Figure 20) Steeply dipping shales of the Riccarton Group in Lumsdon Burn.



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*(Figure 20) Steeply dipping shales of the Riccarton Group in Lumsdon Burn.*