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Field Meeting Report: Staple Edge in the Forest of Dean, led by Bill Draper 5th October 1986

Les Dolamore[1]

DOLAMORE, L. (1987). Field Meeting Report: Staple Edge in the Forest of Dean, led by Bill Draper 5th October 1986. *Proceedings of the Shropshire Geological Society*, **6**, 30–35. The purpose of the field meeting was to visit exposures typical of the Forest of Dean, from the Devonian Brownstones up through the Carboniferous Limestone and into the Coal Measures.

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INTRODUCTION

The day was cool, dry and misty when we assembled in the car park at the Heritage Centre in Soudley, preparing to follow the Geological Trail (illustrated in Figures 1 to 3).

The Forest of Dean is bounded by the rivers Wye in the west and Severn in the east, it includes the towns of Ruardean and Mitcheldean in the north and Lydney in the south.

GEOLOGICAL SETTING

The Forest of Dean follows the extent of a synclinal basin which has determined the succession and structure of the area. During the Devonian and through to the end of the Carboniferous, the basin was a continental shelf sea with St Georges Land to the north. Sediments from St Georges Land were being washed down by the south-flowing rivers into the basin 400 to 300 million years ago, whilst the beginnings of the Variscan (Hercynian) tectonic episode was causing periodic and frequent changes in the level of the shelf seas.

Devonian Brownstones are the oldest rocks exposed in the Trail area, although there are older Devonian and Silurian rocks in the north-east corner of the Forest. The Brownstones are micaceous, and sometimes calcareous, sandstones with cyclothems of mudstones, conglomerates and sandstones. The conglomerates contain mainly locally derived quarts-vein pebbles, with some jasper and igneous material, all set in a sandy siliceous cement matrix.

The Tintern Sandstone Group comprise sandstones and mudstones in cyclothems and are similar in origin to the Brownstones. The non-sequence illustrates a possible short period of recession of the sea with little or no erosion taking place. Conditions then became suitable for limestone deposition as the Carboniferous Period developed. The Lower Limestone Shale is usually fine-grained and dolomitised, and in some places may be oolitic and crinoidal.

The Lower Dolomite is a massive fine-grained dolomitic limestone with poorly preserved fossil brachiopods and crinoids. Crease Limestone in the south of the Forest is either oolitic or crinoidal, elsewhere it is altered to coarsely crystalline granular dolomite. The dolomitisation is thought to be of secondary origin, associated with the iron mineralisation.

Whitehead Limestone is a fine-grained dolomitic limestone with some shale bands. It contains fossil algal colonies, thought to have formed in very shallow marine conditions after a period of non-deposition.

The Drybrook Sandstone is mainly sandstone with some shales and conglomerates, the sandstone containing rounded wind-eroded grains and cyclothems, suggesting land deposition by meandering rivers.

All these Lower Carboniferous sediments indicate frequent variation in sea level and the proximity of a land area to the north.

The non-sequence, following up the succession, again indicates a period of up-lift of the land area, or a drop in sea level, with little erosion occurring.

The Coal Measures are present in both lower and upper groups. The Lower Group is

represented by the Edgehills Sandstone which is a coarse sandstone with conglomerates and one thin coal seam, but there is no Millstone Grit.

The Trenchard Group of Upper Coal Measures rests unconformably on both the Carboniferous Limestone and the Devonian. It consists of sandstones, shales and conglomerate, with one or two coal seams.

The Pennant Group, of massive sandstones and some shales, contains the most important coal in the area, the Coleford High Delf seam, at its base.

The Supra-Pennant Group consists of shales, mudstones and thin coals in its lower division, the Upper division having only sandstones and shales.

The main Variscan orogenic movements occurred after the Coal Measures deposition and, although there are no Triassic or Jurassic rocks in the Forest, they occur nearby and must have been deposited all over the Carboniferous sequence, but now stripped off by subsequent events.

IRON MINERALISATION

The mineralisation of the limestone in the Forest is Neptunean in origin, the deposition taking place from descending solutions, via joints and bedding planes, by metasomatic replacement of the calcite in the limestone. The iron minerals were able to penetrate due to the dolomitisation which increases the porosity of the limestone.

The source of the iron minerals is a problem yet to be solved.

The iron-bearing ores have a mineralogy comprising a mixture of oxides of iron such as goethite (FeO.OH), hydrohematite ($Fe_2O_3.2H_2O$), hematite (Fe_2O_3), and other hydrated oxides under the all-embracing title of 'limonite'.

The deposits occur mainly in the Crease Limestone as large orebodies or irregular masses up to 100 metres long by 10 metres in thickness, usually extending down dip, and connected by veins called 'leaders'. Orebodies near the surface were excavated in open pits, known locally as 'scowles'. Iron working goes back to the time of the Romans or even further, the smelting was by charcoal.

Underground mining for both iron and coal was not developed until the seventeenth century, when steam power for hauling and pumping became available. The tradition of 'Free Mining' goes back to mediaeval times when certain rights and freedoms were claimed from the Crown. To be a Free Miner requires certain rigid qualifications and they are very jealous of their privileges. The last large-scale mine closed in 1965, but there are a number of small adit mines still being operated intermittently, and recently there has been some open-cast working.

PUBLISHED GEOLOGICAL TRAIL

In 1981 the Nature Conservancy Council published a 24-page booklet, by Andrew Mathieson of Bristol City Museum, describing a teaching trail of twelve locations. Due to growth, weather, wear and tear, and so on, three of the locations have become inaccessible. We visited locations 1 to 9 but continued to walk the trail through the Forest to location 10, then returned on foot by road to the Heritage Centre in Soudley.

ITINERARY

LOCALITY 1: Railway cutting [SO 654 104]

Starting at the Heritage Centre we took the B4227 road into Soudley towards Ruspidge. After about half a mile, on the right, is the well-defined track of a disused railway. At about 30 metres from the road, a steep-sided cutting shows:

a. Brownstones with cross-bedding, mudstones with suncracks occurring together in cyclothems. About 20 metres thickness exposed.

b. Quartz Conglomerate – about 4 metres thickness, locally derived pebbles plus some from further away.

c. Tintern Sandstones with cyclothems, cross-bedding and ripple marks.

The non-sequence between a. and b. provides evidence for the changing sea level up and down the shore of the Old Red Sandstone Continent.

LOCALITY 2: Upper Soudley Sand Pit [SO 653 107]

Upper Soudley Sand Pit is a small quarry in Tintern Sandstone, the top 8 metres of the Devonian succession. Cross-bedding is evident,

solifluxion has overturned the top layers of bedding. The sand is very micaceous and well-coloured.

LOCALITY 3: Blue Rock Quarry [SO 653 108]

Blue Rock Quarry yielded limestone at the turn of the century; small kiln ruins are at the base.

Lower Limestone Shales (base of Carboniferous) are exposed at the top of the quarry with alternating fine-grained limestone and calcareous mudstone with brachiopods, crinoid ossicles and wormcast fossils. The curious cavities on the high wall appear to be due to small-scale blasting.

LOCALITY 4: Brinchcombe Tunnel, North Entrance [SO 653 109]

Lower Dolomite is exposed with the bedding and jointing well-developed but easily confused. Traces of cross-bedding on the vertical faces. Dolomitisation is the conversion of calcium carbonate to calcium magnesium carbonate by hypersaline marine conditions, such as may occur at the base of reefs. Up to 15 per cent of the calcium may be substituted.

LOCALITY 5: Perseverance Iron Mine [SO 652 113]

All that can now be seen of the mine is the concrete capping to one of the shafts. Iron ore from the Crease Limestone was extracted by deep mining to about 400 feet. Some 370,000 tons of ore was obtained. Closed 1899.

LOCALITY 6: Perseverance Road Cutting [SO 652 112]

The Perseverance Road Cutting exposure is at the left side, probably in the top of the Lower Dolomite, overlain by Crease Limestone, a coarse and granular dolomite containing hematite and limonite and about 10 metres thick. Then 14 metres of Whitehead Limestone, a shallow water deposit having brachiopods and crinoids also, but very difficult to see, fossil algal structures.

LOCALITY 7: Staple Edge Sandstone Quarries [SO 651 111]

The Staple Edge Sandstone Quarries are two disused quarries where building sand was extracted. The exposures are in massive Drybrook Sandstone with cyclothems of shales and conglomerates. Some fossils, including brachiopods and gastropods were seen. Evidence of fluvial deposition, channelling, washouts, ripple marks and wind-eroded sand grains were all present.

LOCALITY 8: Mr Warren's Gale (Free Mine) [SO 649 109]

This is an adit in the Coleford High Delf seam which outcropped here. The mine was not in operation. The adit follows the dip of the seam some way before being worked more easily along the strike.

LOCALITY 9: Chimney Scowles [SO 651 105]

Chimney Scowles is a disused ironworking, so called for the eighteenth century stone-built chimney, used for inducing ventilation in the deeper parts of the mine. We were able to enter the workings for a short distance to follow the 'leader' and get an idea of the ways in which the ore was emplaced. The country rock is the dolomitised Crease Limestone.

In 1981 the Nature Conservancy Council published a 24-page booklet, by Andrew Mathieson of Bristol City Museum, describing a teaching trail of twelve locations.

The maps and tables which follow are reproduced from the Trail Guide Book, a copy of which is held in the Society Library.

Prior permission to visit the Trail is required from the Forestry Commission; details may be obtained at the National Conservancy Council Office at Attingham Park.

Disclaimer - The information contained in this account has been prepared from notes taken during the field meeting. Its sole aim is to provide a record of what was seen and provide an insight into the diversity of geology exposed within the Forest of Dean. It should not be used for any other purpose or construed as permission or an invitation to visit the sites or localities mentioned.

GEOLOGICAL SUCCESSION IN THE FOREST OF DEAN

	Thickness
CARBONIFEROUS	
Upper Coal Measures	
(Westphalian D)	
Supra - Pennant Group	max. 360m
Pennant Group	200 - 260m
Trenchard Group	18 - 120m
unconformity	
Lower Coal Measures	
(Westphalian A)	
Edgehills Sandstone	
non - sequence	
Carboniferous Limestone	
(Dinantian)	
Drybrook Sandstone (S_2)	max.230m
Whitehead Limestone(C_2S_1)	18 - 60m
Crease Limestone (C_1 - C_2)	10 - 30m
Lower Dolomite (Z - C_1)	70 - 130m
Lower Limestone Shale (K)	60 - 70m
DEVONIAN	
Upper Old Red Sandstone	
Tintern Sandstone Group	80 - 165m
Quartz Conglomerate	3 - 33m
non-sequence	
Lower Old Red Sandstone	
Brownstones	726 - 900m

Figure 1: The geological succession within the Forest of Dean.

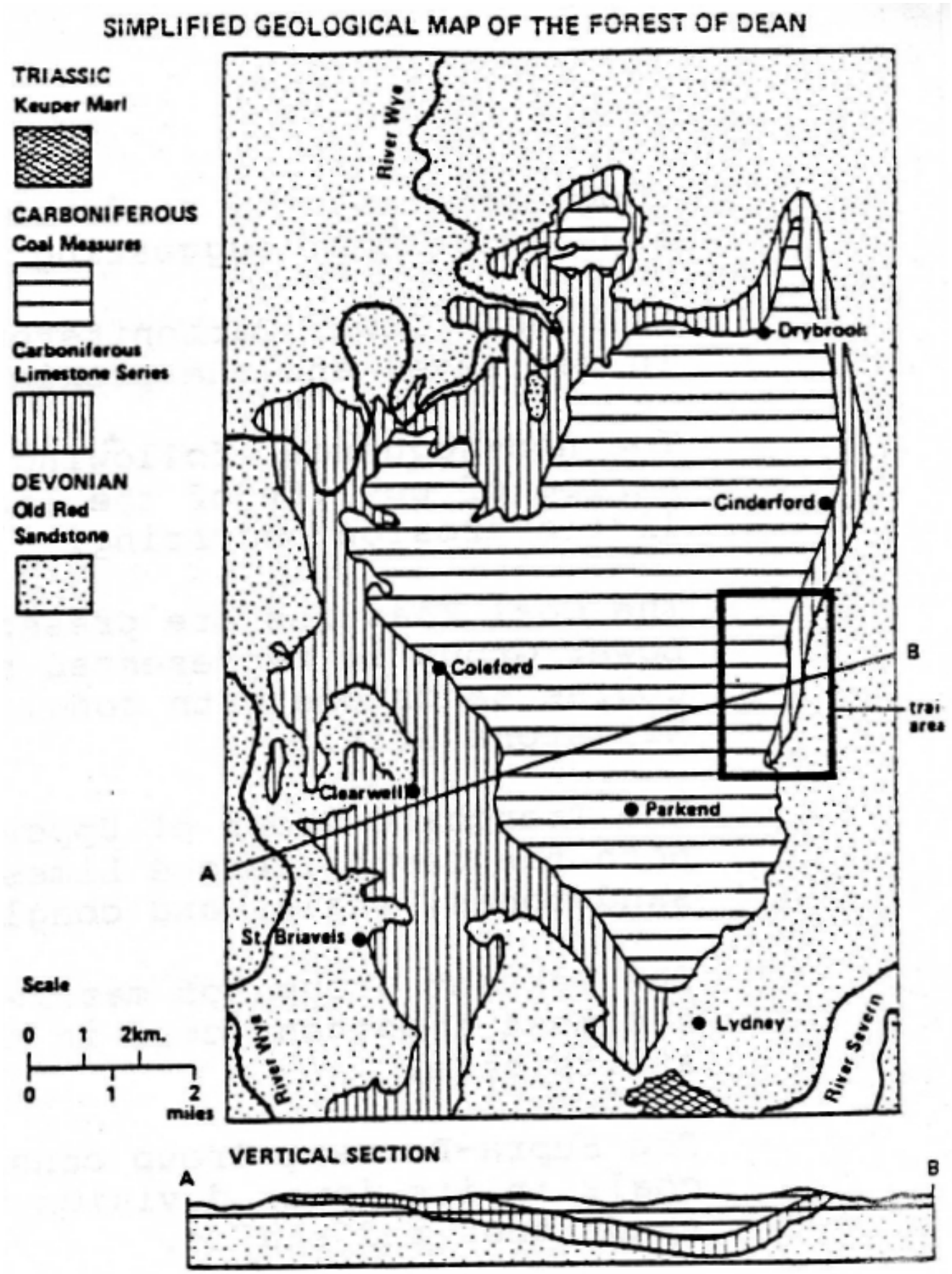

Figure 2: Simplified geological map of the Forest of Dean.

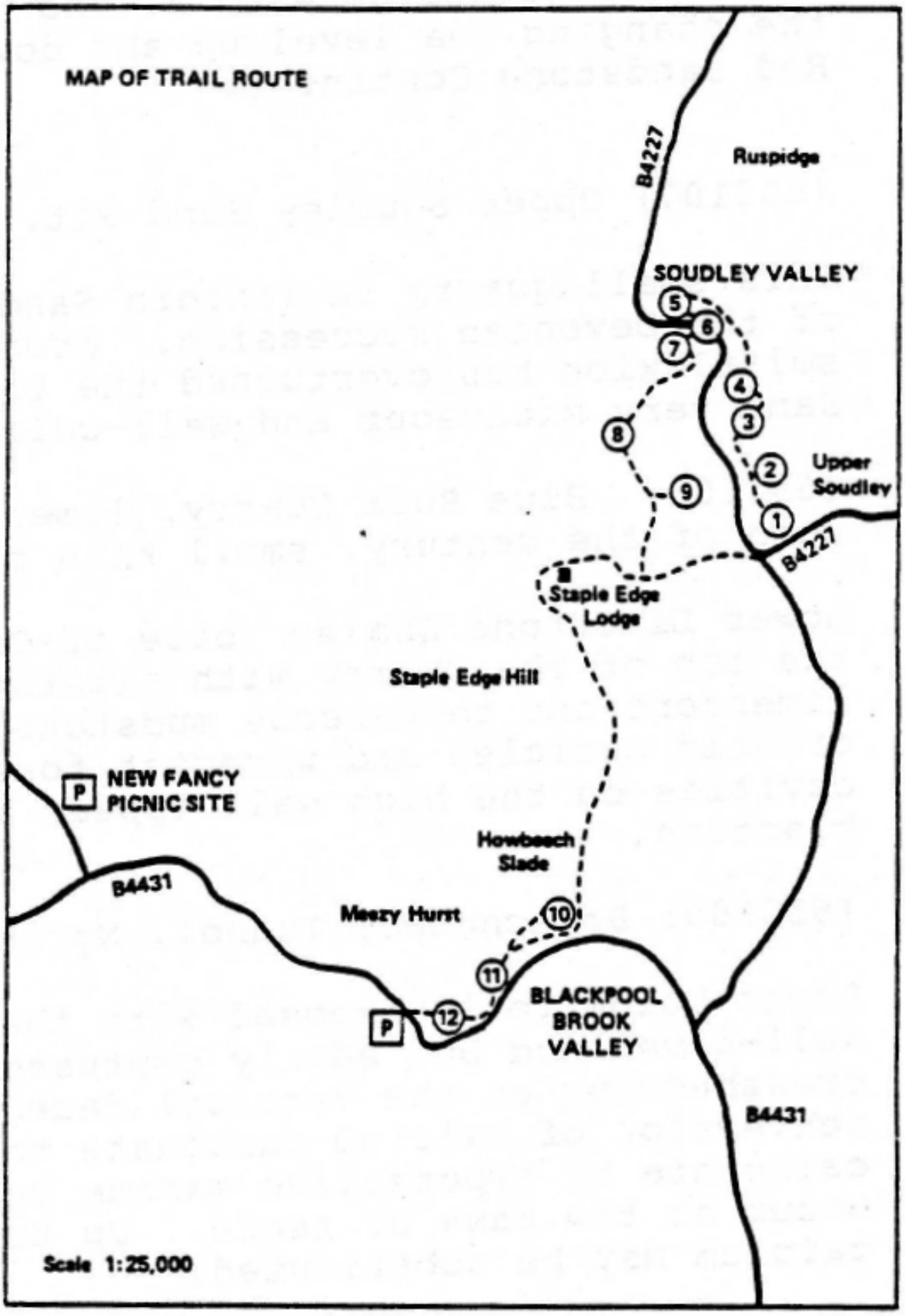

Figure 3: Map showing the location and route of the Geological Trail.

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