

Field Meeting Report: Charnwood Forest, led by Anthony Evans 18th May 1985

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DOLAMORE, L. (1986). Field Meeting Report: Charnwood Forest, led by Anthony Evans 18th May 1985. *Proceedings of the Shropshire Geological Society*, 5, 11–17. The purpose of the field meeting was to visit key exposures within the Precambrian inlier of Charnwood Forest, at Bradgate Park, Woodhouse Eaves and Beacon Hill.

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The group assembled at the car park adjacent to Hallgate Farm and the Cropston reservoir, by Bradgate Park. The area to be visited lies within Bradgate Park and is open to the public park. However, **no hammers are allowed**. We arrived at 10.30 am after a two hour car drive from Shrewsbury. The weather was fine and warm and the bluebells were out in the woods.

The stratigraphical succession in the Charnwood Forest is shown in Tables 1 and 2. Broadly speaking the Precambrian rocks of Charnwood Forest form a plunging anticline, much faulted, and obscured by the over-lying mantle of Triassic rocks (Keuper Marl). As shown on the maps (Figures 1 and 2), the oldest rocks (Blackbrook Group) crop out in the centre of the anticline, while the younger rocks appear on the north-east, south-east and south-west, forming a horseshoe distribution around the Blackbrook Group.

The Brand Group consists of sedimentary rocks. The rocks of the lower two groups are wholly or partially composed of pyroclastic material. The rocks of all three groups are usually well bedded. Besides sedimentary and pyroclastic rocks, there are intrusions of dacite (a type of rhyolite, sometimes called "porphyroid"). These are often strongly sheared and cleaved. Later comparatively non-sheared intrusions of granophyric diorite (markfieldite, formerly referred to as syenite) are especially well developed in the south-western part of the Forest.

In addition to the large anticlinal fold affecting the Charnian rocks, there are a number of other secondary structures. These include small folds, a cleavage (very well developed in the finer grained rocks) and jointing. The cleavage does not show a close relationship to the major anticline, but usually crosses the fold axis obliquely. In the

south-east, however, it strikes parallel to the fold axis. The cleavage may therefore represent a later phase of deformation than that during which the fold was formed.

On entering Bradgate Park, the first outcrops encountered – marked 'A' on the second map (Figure 2) – are of banded pyroclastic rocks: tuffs and lapilli-tuffs, with some intermixed sedimentary material. Stratigraphically they are near the top of the Hallgate Member of the Bradgate Formation. These are in The Maplewell Group and are low grade metamorphosed tuffs or lithic greywackes. They are very fine grained, probable subaqueous sediments, well jointed some quartz veined but all intensively cleaved.

The exposure at 'B' is in two parts, the upper showing well defined folding but the lower was a mixture of a fine sediment and a conglomerate which showed the filling in by coarse material of a small channel, the pebbles of which showed having been rotated by the pressures with their long axes in the direction of cleavage.

The next exposure 'C' showed that the cleavage running through the greywacke changed direction slightly in places, this change is associated with change in the grain size. Also in this exposure other changes in cleavage direction are thought to be due to folding after metamorphism which has dragged the cleavage over in varying directions combined with the well marked differential cleavage.

A short walk brought us to an old quarry at site 'D', where the cleavage was less intensive and the jointing blocky. The feature illustrated here was plumose (feathery) markings on the joint faces, showing tension breaks. We then walked on past some buildings in the local stone, some converted to public conveniences, past the door enclosures to the ruins of Bradgate House.

The house was built *ca.* 1490-1505 by Thomas Grey, Marquis of Dorset and father of Lady Jane Grey, who was born here. Bradgate House was one of the first great country houses to be built of brick. It did not suffer in the Civil War, but was left to decay after 1739. The only part which has been completely preserved is the chapel in which occasional services are held.

To the south of the house, we crossed the stream to examine exposure 'E' of the Stable Pit Quartz Arenite. This is a medium-grained indurated quartzite which weathers to a dark purple colour. It is cut by many quartz veins and a dyke of very much altered markfieldite. Cross bedding can be seen in these exposures.

Slickensides in two directions showed that the quartzite formed a small syncline. The outcrop is possibly part of an exhumed Triassic landscape. Close by the side of the ruined house we looked at exposure 'F' which is part of a laccolithic intrusion of markfieldite or a granophyric diorite of andesite and hornblende with usually 10% quartz and alkaline feldspar, all subjected to hydrothermal alteration. This "markfieldite" is identical to the intrusion at Nuneaton, thus indicative of a Precambrian age. Recent anomalies in the Rb-Sr dating have cast doubts on the accuracy of the figures given.

We then had a long trek uphill to the War Memorial area where the view is splendid in clear weather, but the day was rather misty so bad luck for us! We ate our lunch here as it gradually clouded over.

After lunch we looked at exposure 'G' in the Bradgate Formation, dipping steeply southwards. The large exposure of the single bedding plane contains examples of the fossil *Charnia discus*. The frond-like structure found in 1952 is not present here but the associated discs were present, not too difficult to see and of varying sizes.

The next exposure 'H' by the side of the folly "Old John", still in the Maplewell Group, illustrates slumping in the sediment – quite small in extent but the slightly coarser sediment, semi-lithified, had broken into a breccia in a matrix of finer sediment lying in the beds above and below which had maintained coherence in the disturbance.

Further exposures at 'I' showed up as very coarse lumps of breccia in the dacite tuffs and the whole was structureless. The lumps were often

long contorted irregular pieces, typical of slumping.

The last exposure 'J' we looked at in Bradgate Park was a small group of large rocks in the Tuffaceous Pelites Member showing a structure described as "pull apart" and "sedimentary boudinage", thought to occur as the pyroclastic sediment was subjected to down-slope tension whilst still unlithified.

Woodhouse Eaves is a village shown on the last map (Figure 3) and here we looked at two sites. The first was a small quarry beneath the church, probably slates were extracted from here. These were interbedded with sub-greywackes – there were no special features seen within this Swithland Formation of the Brand Group.

We then walked out of the village, up Windmill Hill, where the outcrop is an ignimbrite in the Beacon Hill Formation. This rock appears to be a devitrified pumice-tuff in which flattened chloritized pumice fragments can be seen. It was presumably deposited by a glowing avalanche (*nuée ardente*) such as engulfed St. Pierre, in Martinique, during the 1902 eruption of Mount Pelée. No stratification is visible in the exposure.

The last site visited was the Type Locality for the Beacon Hill Formation. This is the second highest hill (818 feet) in Charnwood Forest. From it we can see other parts of the Forest including the highest point – Bardon Hill (912 feet) – Ives Head (660 feet), the town of Loughborough, the Castle Donnington Power Station, etc. On clear days Boston "Stump" is visible from here.

At Beacon Hill we saw the main formation of the Maplewell Group. The rocks are laminated green or buff siliceous tuffs which weather white or cream. They showed the well-cleaved nature of the rocks, the "refraction" of the cleavage as it traverses bands of differing grain size, the lines on bedding surfaces due to the intersection of cleavage and bedding. These lines are approximately parallel to the fold-axis and are therefore called b-lineations.

Most of the folding in Charnwood Forest is concentric in type, (synonyms: flexural or buckle folding). This is the type of fold produced by buckling a pack of cards. Towards the end of the phase of concentric folding the cleavage was developed and minor cleavage folding then occurred. This folding took place by shearing along the cleavage planes. It has produced the

numerous pockers to be seen in many of the exposures.

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 Precambrian geology exposed within Charnwood Forest. It should not be used for any other purpose or construed as permission or an invitation to visit the sites or localities mentioned.

Table 1. Stratigraphical succession within Charnwood Forest.

Post-Glacial	Alluvium
Glacial	Boulder Clay
	Sands and Gravels
Trias	Keuper Marls, Sandstones and Breccia
Carboniferous	Basic dykes in Mountsorrel Granodiorite
	Limestone at Grace Dieu
Silurian	Mountsorrel and Granodiorite and associated hypabyssal and plutonic rocks
	Microgranite dyke at Lubscloud
	Rb-Sr date = 433 ±17 m.y.
Ordovician	Tremadocian sediments known just east of the Thringstone Fault in the Merry Lees Colliery and in boreholes in Leicester.
	Possibly hornfelsed Cambrian in aureole of Mountsorrel Grandiorite
Late Precambrian	Granophytic diorites of Bradgate, Groby, Markfield
	Rb-Sr date = 552 ±58 m.y.
Late Precambrian to (?) Cambrian	The Charnian Supergroup (formerly the Charnian System)

Table 2.

Stratigraphy of the Charnian Supergroup
(from the work of Dr. J. B. Moseley, 1979)

THE CHARNIAN SUPERGROUP

GROUP	FORMATION	MEMBERS
BRAND	Swithland Formation 260m	None
GROUP	Brand Hills Formation 56m	Stable Pit Quartz Arenite Member Hanging Rocks Conglomerate Member
MAPLEWELL	Bradgate Formation 649m	Hallgate Member
		Sliding Stone Slump Breccia Member
GROUP	Beacon Hill Formation 1119-1347m	Tuffaceous Pelites Member Sandhills Lodge Member Beacon Fine-grained Tuffs Member Benscliffe Member
BLACKBROOK	Blackbrook Reservoir Formation	Upper Tuffaceous Pelites Member Coarse-grained Tuffs Member Lower Tuffaceous Pelites Member
GROUP	Ives Head Formation	South Quarry Slump Breccia Member Lubcloud Greywackes Member Morley Lane Tuffs Member

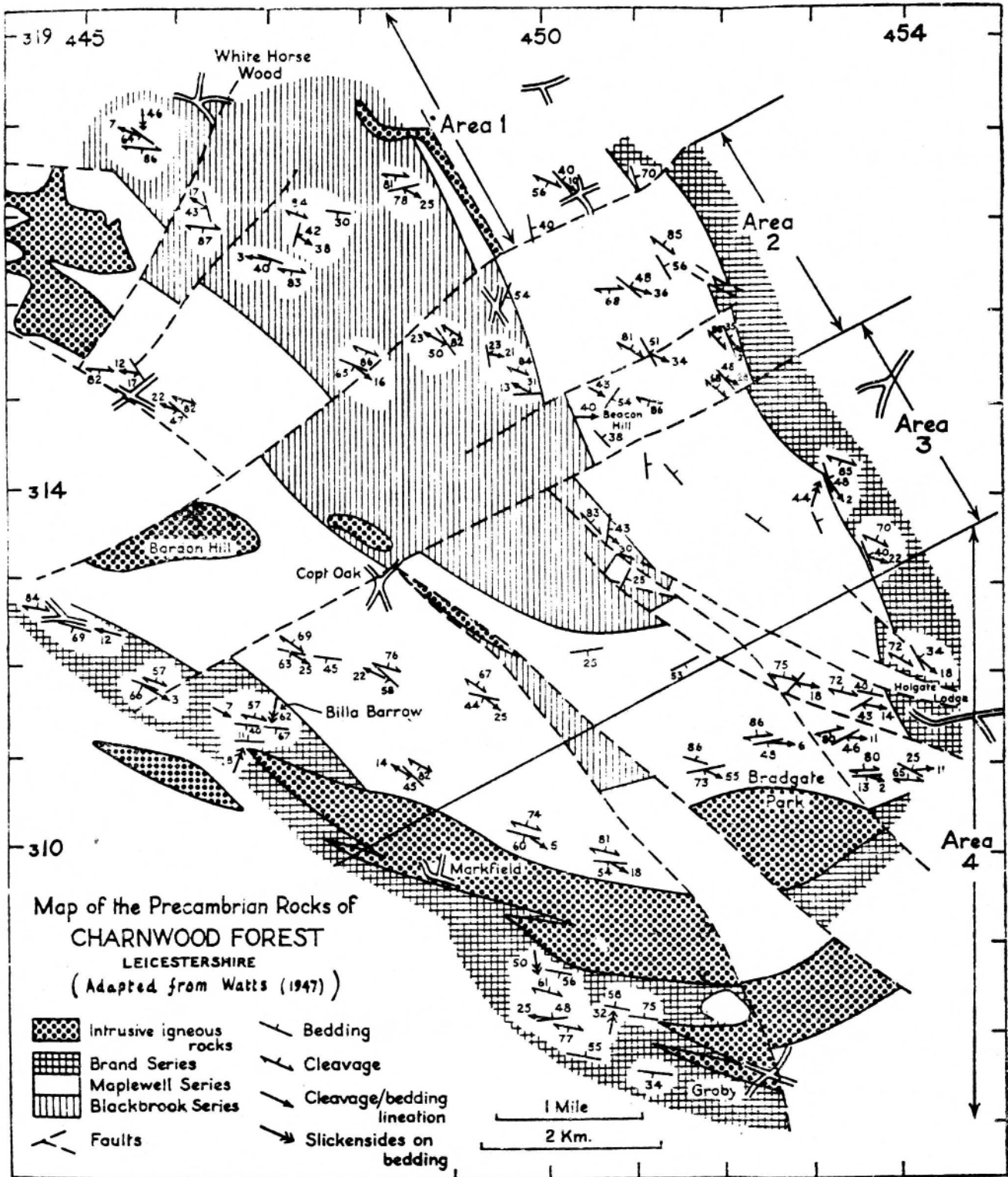


Figure 1: Geological map of Charnwood Forest.

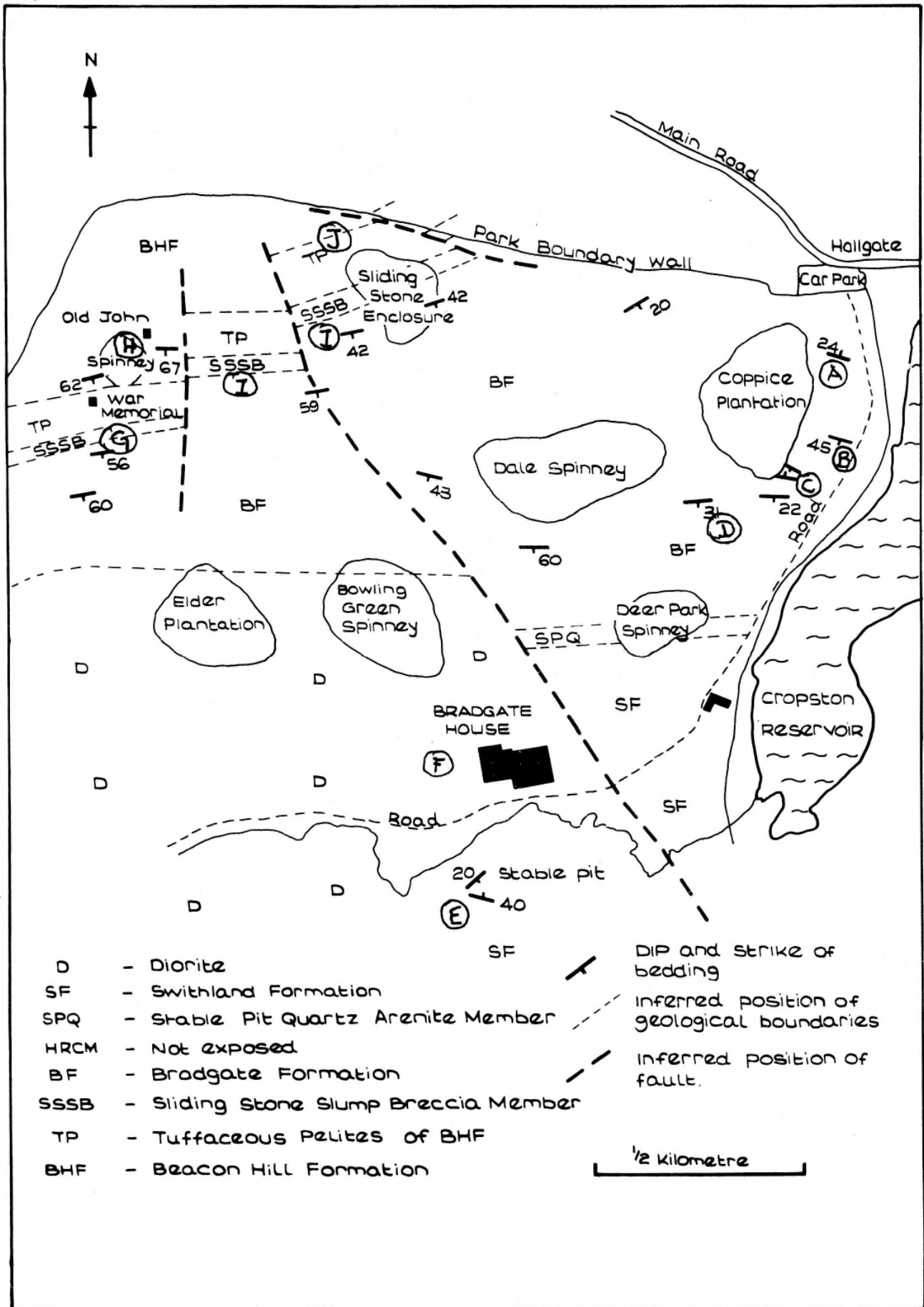


Figure 2: Geological map of Bradgate Park within Charnwood Forest.

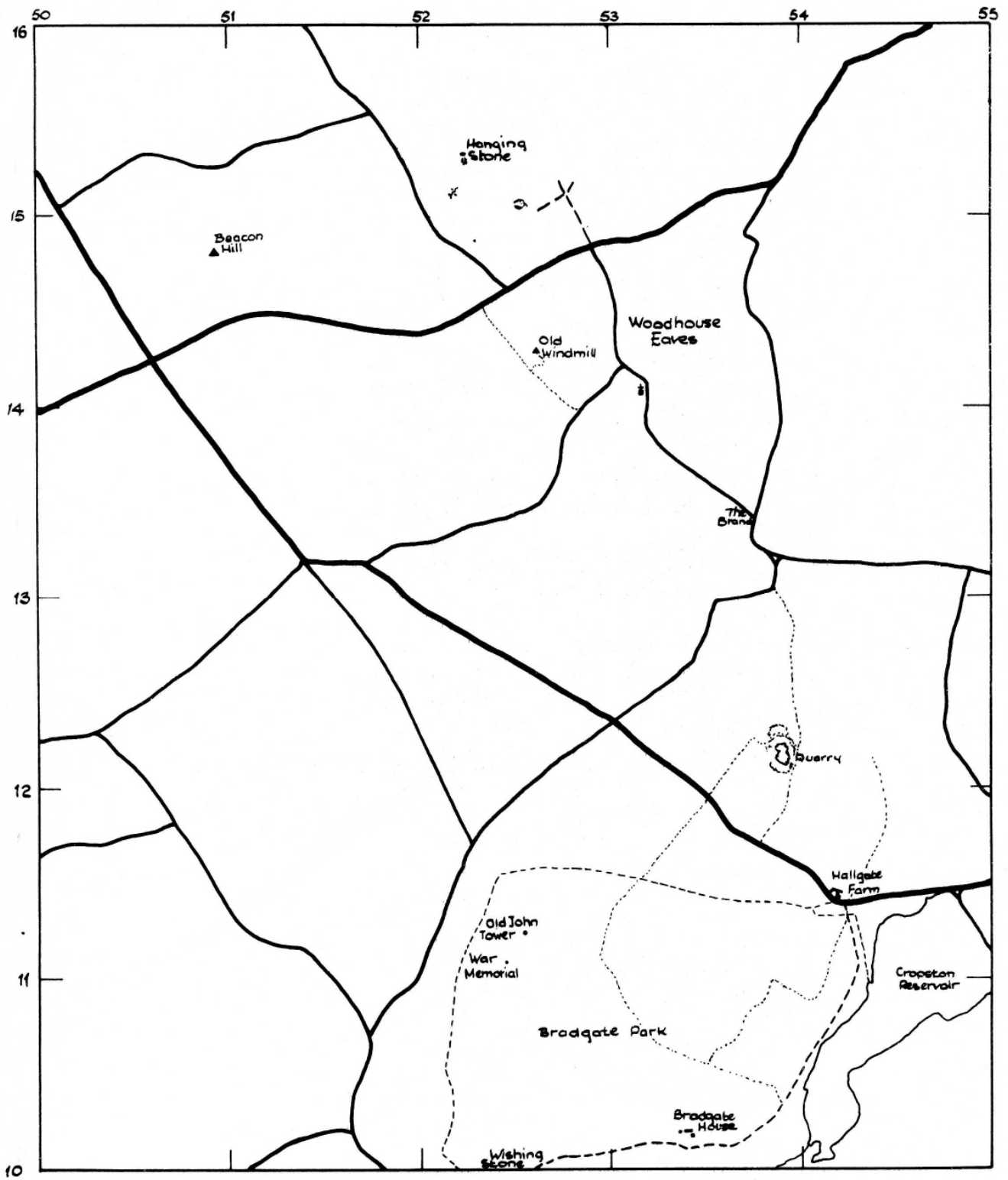


Figure 3: Location map for Charnwood Forest.