Glacial Lakes, Established and Possible, in the North Cotswolds Area

The first two articles in this recent series focussed on the natural landforms and evolution of river valleys, whilst the third article reviewed lakes, pools, and other water-related, man-made, features of the landscape, and also observed that, today, no natural lakes exist in the North Cotswolds.

This paper, the last in this series, examines the possibility that some North Cotswold valleys may once have held small, relatively short-lived, natural lakes. In addition, during the Middle Pleistocene epoch, it may surprise readers to learn that one of the largest lakes ever seen in England lay just adjacent to the North Cotswolds.

Glacial Lake Harrison (so named to honour the geologist who, in 1898, first proposed the existence of an ancient lake in this area) covered a maximum area in excess of 500 km2, and extended from Bredon Hill in the SW to Leicester in the NE (Fig. 1), and is thought to have existed for ~10,000 years (Murton and Murton, 2012).

Glacial Lake Harrison was formed during the latter stages of the Wolstonian Ice Age (186–126 ka BP) which was the second of the three major Ice Ages which have occupied U.K. in the last half-million years (Table 1).

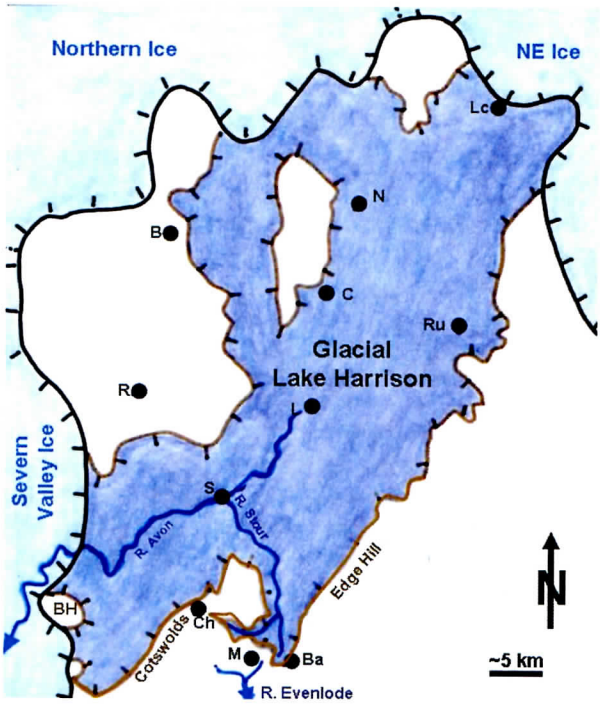

Fig. 1: Map showing the maximum extent of Glacial Lake Harrison.
Key: B = Birmingham; R = Redditch; Lc = Leicester; N = Nuneaton; C = Coventry; Ru = Rugby; L = Leamington Spa; S = Stratford on Avon; Ch = Chipping Campden; M = Moreton in Marsh; Ba = Barton on the Heath; BH = Bredon Hill. The 'toothed' brown line outlines high ground.
(After Murton and Murton (2012).

Table 1: Ice Ages of the UK Quaternary

MIS*	NAME	AGE (KaBP)	S. Limit of Ice relative to Cotswolds
4 - 2	Devonian (Multi-phase)	75-11.5	Well to N of Cotswolds (Yorkshire – N. Midlands)
8 – 6	Wolstonian (Multi-phase)	300-126	Cotswold – Edge Hill escarpment
12	Anglian	470-430	Cotswold – Edge Hill escarpment (?). Possibly further south by no evidence remains

*MIS = Marine Isotope Stages: used to subdivide the Quaternary period into warm periods (interglacial; odd numbers) and cold periods (glacial; even numbers), based on oxygen isotope analysis of deep-sea sediment cores and ice cores (from Antarctica and Greenland).

The Wolstonian ice sheets had advanced southwards and eastwards to nearly the Cotswold – Edge Hill escarpment, and in doing so smothered the pre-existing drainage systems. When the ice started to retreat northwards from the Cotswold – Edge Hill escarpment, the pre-glacial drainage to the north and northeast was still blocked by ice, so a large melt-water lake developed across the South Midlands, extending as far south as Moreton in Marsh (Fig. 2).

As the water rose, it eventually found a spill-over point at the lowest level of the escarpment, the Moreton Gap (Fig. 3), and the overflowing melt-water flooded southwards down the Evenlode valley (which had originally been carved by the palaeo-Thames prior to the earlier Anglian Ice Age (~450 ka BP, see Jeans, (2020), and Table 1).

Fig. 2: A view of what Lake Harrison might have looked like, just north of Moreton in Marsh, during the Wolstonian Ice Age (after Lee (2011)).

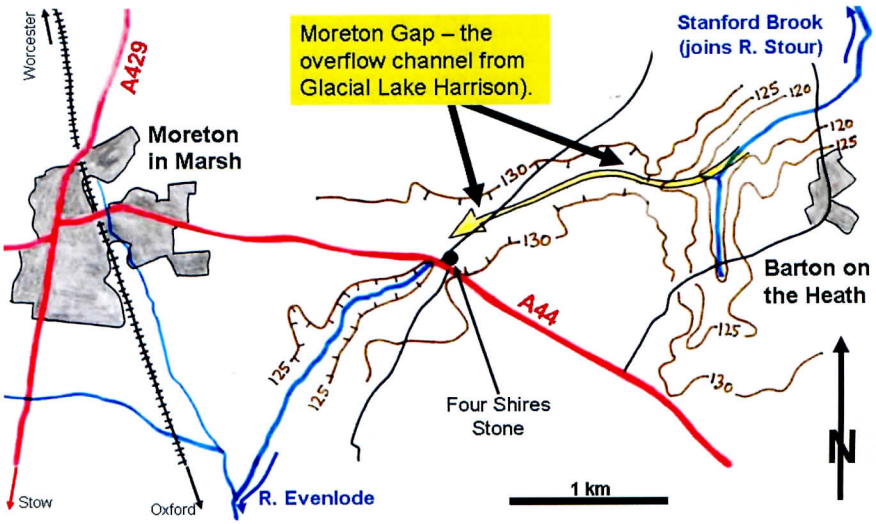

Fig. 3: Map of the Moreton Gap, showing the location of the overflow channel from Glacial Lake Harrison (see Fig. 1). The channel now marks the divide between the Stour drainage flowing North, and the Evenlode drainage flowing South.

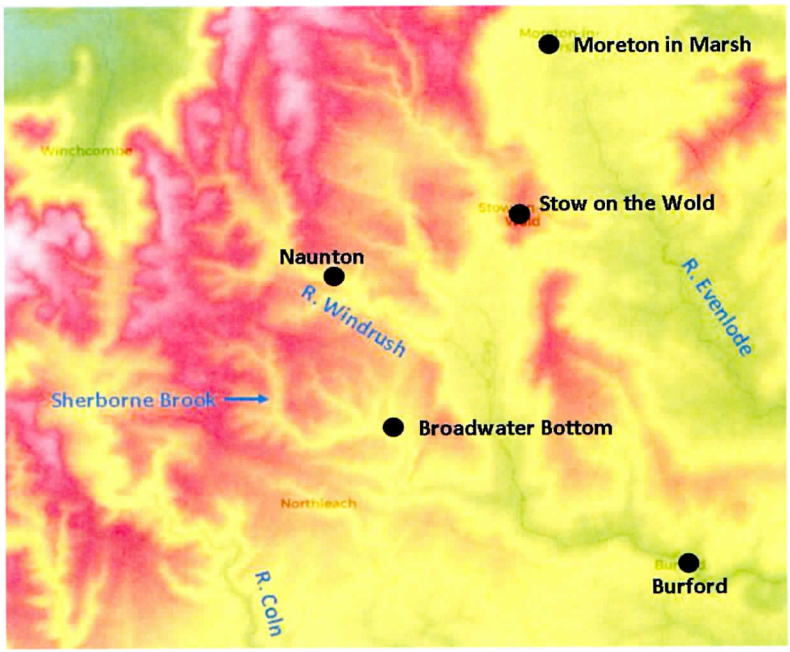

Fig. 4: Location map showing North Cotswold topography.
(Image source = en-gb.topographic-map.com)

Fig. 5: View west over Broadwater Bottom, showing the very flat valley floor in the distance (ploughed and cropped in the foreground). The Gom's Hole footpath runs left to right through the middle of the scene, between the flat valley floor and the cropped land.

Eventually, as the Severn / Welsh Ice melted back towards the west, Lake Harrison was drained away to the SW, into the Severn valley, by the ancestral River Avon.

The evidence for Lake Harrison is well-founded, having been substantiated by many geologists (Shotton (1983) in particular) who studied the numerous gravel and clay pits, road cuttings, pipe trenches and drill holes across the area, and discovered the consistent presence of a reddish lacustrine clay layer overlying the glacial debris ('Till') deposited as the Wolstonian Ice Sheet firstly moved south and then retreated northwards. Unfortunately, their temporary nature means that I know of no existing exposures revealing the Wolstonian till or the Lake Harrison clay layer.

Despite the current absence of natural lakes in the North Cotswolds, there is some tentative evidence that small lakes, possibly dammed as a result of land slippage, cambering, and valley bulging (see Jeans, 2021), may have existed more recently than Lake Harrison, during the early Holocene period (~11.5-8 Ka BP), following the last Ice Age (Table 1). The evidence for this comes from local occurrence of wide and remarkably flat floors of certain valleys, which then narrow dramatically downstream, before passing out into wider valleys again. This pattern is seen in a few of the valleys in the North Cotswolds, notably the Sherborne Brook at Broadwater Bottom; and the River Windrush below Naunton (see Fig. 4 for location map, and Figs. 5-6 and 7-9, respectively, for examples).

In the case of Broadwater Bottom, the initial clue was the very flat valley floor which extends from the Gom's Hole footpath west to beyond the Fosse Way (see Fig. 5). East of the footpath, the valley has been disrupted by ploughing. Further east, and downstream, study revealed that the valley side in Furzehill Wood is very steep, and that there is an anomalous raised area in the valley bottom just below the Wood. If this steep slope suffered landslipping in post-Glacial times, and if the raised area represents the accumulated landslipped debris, then we have a mechanism for damming the valley and creating a lake (Fig. 6).

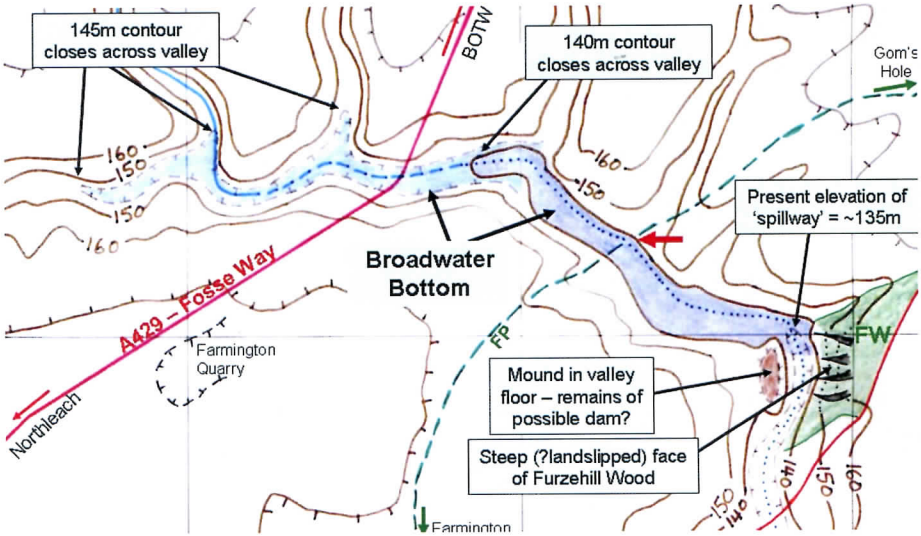

Fig. 6: Sketch map of Broadwater Bottom, showing the location of the possible dam and possible extent of the lake upstream of the dam (at 140m OD in dark blue, and 145m OD in light blue). FW = Furzehill Wood; FP = Foot Path; contours in metres; grid lines 1km apart; large red arrow = view shown in Fig 5.

Fig. 7: View across Harford water meadows towards 'Windrush Narrows', looking East (downstream). River Windrush in foreground.

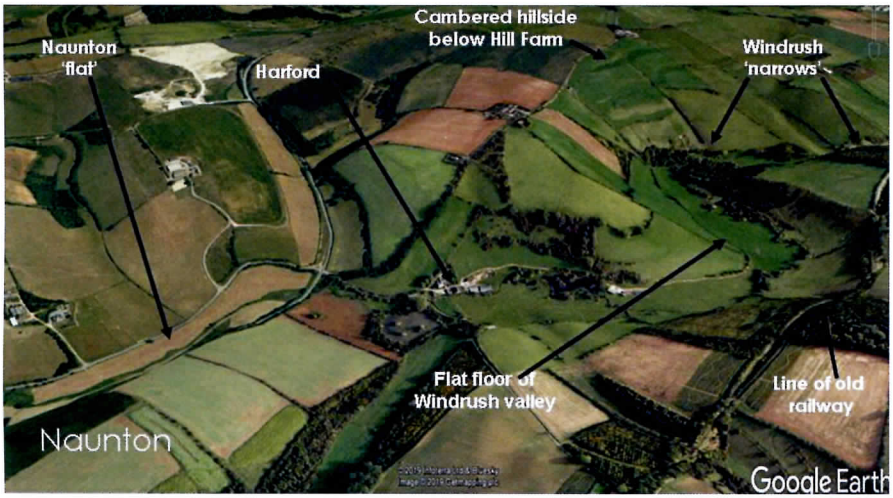

Fig. 8: Aerial view SE down the Windrush valley towards Hill Farm and 'Windrush Narrows'

In the second example, the valley of the Windrush below Naunton changes from being broad, open, and flat-floored (Figs. 7, 8) to being constricted through the steep-sided 'Windrush Narrows' below Hill Farm (Fig. 9).

The hillsides which flank the Windrush narrows are impressively cambered, and this process can cause significant bulging (see Jeans, 2021) or upwarping of shales in the bottom of the intervening valley, which the Geological Survey shows to be occupied by Liassic shales. This valley bulging,

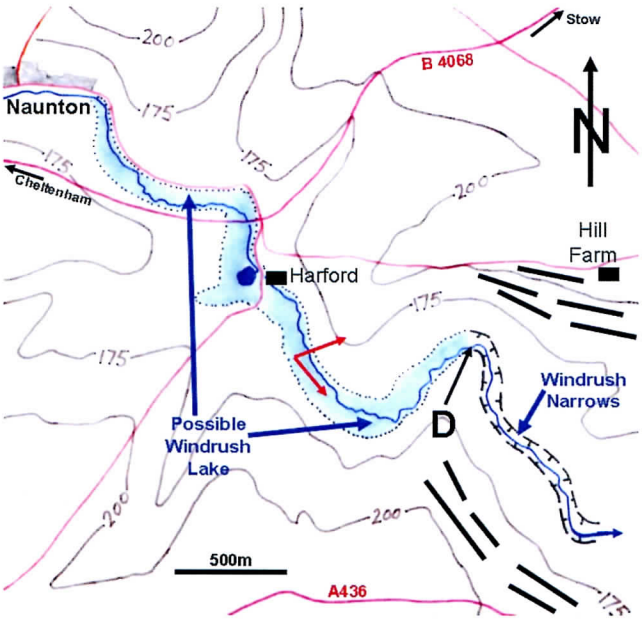

Fig. 9: Sketch map of the Windrush valley between Naunton and Aston Farm. Contours in metres. The heavy black lines below Hill Farm and north of the A436 show schematically the location of the cambered hillsides. D = location of possible dam. Red arrows indicate the view in Fig. 7.

together with possible land slippage, could have caused the Windrush to have become dammed, creating a broad, shallow lake upstream of the Narrows, over what are now the Harford and Naunton water meadows.

It is interesting to note that the Windrush changes from a tightly-meandering stream to a straight / gently winding stream just below the point at which it becomes south-flowing in the Narrows. This area is private ground, and there is insufficient contour data to determine what this means, but it does suggest that the possible dam was located at the head of the Narrows (D in Fig. 9).

Readers should note that this idea of post-glacial riverine lakes in the North Cotswolds is just that – an idea. Further research, detailed mapping, and analysis of the valley floor sediments for evidence of lacustrine fauna and flora, would be required to confirm or refute this idea.

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