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# THE JOURNAL *of* BRECKLAND STUDIES

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Volume 1: 2017

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VOLUME 1  
2017



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*Front cover:*  
Juvenile female Goshawk at about 40 days old.  
*Photo © Ashley Banwell*

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## THE JOURNAL OF BRECKLAND STUDIES

### *Editorial Panel*

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## **Editorial note on Definitions and Nomenclature**

The area that is the focus of this new journal goes under a suite of slightly different but clearly synonymous names. 'The Brecks', 'Breckland' and 'The Breckland' are all in use to describe the 400 square miles (1000 square kilometres) or so of inland East Anglia characterised by light soils of sand, chalk and flint, largely overlain by tracts of heathland and forestry. The coherence, distinctiveness and integrity of the area are recognised in its designation by Natural England as National Character Area 85: The Brecks.

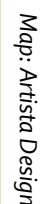
The word 'breck' is probably of Saxon origin and was used historically in the area to denote sections of heath that were broken by the plough, cultivated for a few seasons until their already sparse nutrients were exhausted by cropping, and then allowed to revert back to heath. It is generally agreed that the specific term 'Breckland' was invented by local historian and naturalist W.G. Clarke (1877–1925), who was using it as early as 1894 in articles he published about the area. The name has stuck as an arguably more lyrical label than the more prosaic 'The Brecks', and it continues to enjoy usage as both a generic noun and a specific one. It was even purloined by local government, with the creation in 1974 of Breckland District Council (which extends however over only the Norfolk side of the county line with Suffolk, and encompasses an area greater than that identified by the NCA 85).

The authors of the papers that follow have each chosen which term to use in their respective contributions.





A map of the Netherlands with a black outline highlighting a study area in the central-western region. The map shows major cities like Amsterdam, Rotterdam, and Utrecht, as well as the German border to the east. A scale bar in the bottom right corner indicates 0 to 100 km.



## Foreword

This is the first volume of the *Journal of Breckland Studies*, a publication which presents the latest research on this fascinating region in an accessible and engaging way. It might at first sight appear odd that a new journal should be entirely devoted to a relatively limited area of Norfolk and Suffolk. But this is a reflection of the distinctive character of Breckland's landscape and of the sheer importance of its heritage, both natural and cultural. The natural dimension spans not only the surviving areas of heathland but also the extensive conifer forests that were planted in the twentieth century and which are now a mature element in the landscape.

Collectively, these support a rich and distinctive flora and fauna that includes species found nowhere else in Britain. Local biodiversity is further enhanced by the presence of other habitats, including ribbons of wetland along the various rivers that flow through the region. In an increasingly crowded, urbanised and intensively cultivated country, Breckland represents one of the few places in southern Britain where there is still ample space for wildlife.

The region is also rich in archaeology. The earliest known flint mines in Britain are located here, while the light Breckland soils, though agriculturally poor, were relatively easy to farm and so were extensively settled in early times. Meanwhile, the absence of intensive cultivation across wide areas in later centuries has ensured the survival of abundant archaeological traces of this early activity, whether on unploughed heaths or within the conifer plantations that have largely replaced them over the past century.

The marginal soils, and terrain uncluttered by fields and farms, have also attracted a range of distinctive activities that have left their mark through the centuries. Managed rabbit warrens once covered vast tracts of land here, while in the twentieth century the landscape proved particularly attractive for timber production and military training. Large areas are still used for both purposes, but the traditional Breckland landscapes are surprisingly durable – the most extensive areas of typical local heath now survive within the Ministry of Defence's Stanford Training Area, for example.

In Breckland, perhaps more than in most landscapes, the 'natural' and the 'historical' heritage cannot be neatly separated. W.G. Clarke, who pioneered the study of the district at the start of the twentieth century and who was responsible for coining the name 'Breckland', moved easily between the two. Both aspects are now much better researched and understood as a consequence of the Breaking New Ground landscape partnership scheme, which was funded by the Heritage Lottery Fund and involved a wide range of partners, including in particular the Breckland Society – a body devoted to preserving and studying the region.

Most of the research described in this volume was carried out under the umbrella of, and with the active support of, the Breaking New Ground scheme. The same is true of this inaugural volume of the *Journal of Breckland Studies*, which we are





confident will prove to be the first of a long-running series that will both foster research into this beautiful and distinctive region and encourage its conservation into the future. I would like to thank my fellow editorial panel members for their involvement, and on their behalf, extend our gratitude to the contributors to this landmark publication.

***Professor Tom Williamson***

School of History, University of East Anglia

Chairman, Editorial Panel of the *Journal of Breckland Studies* for 2017

# 1

## A fieldwork study of former Desert Rat camps in the area of High Ash

*Julia and Tony Grover*

The aim of this study was to provide a record of what remains today of these historically important Second World War sites. All of the remaining bases of structures and other features are being fragmented by sapling growth and most are likely to be excavated by future reafforestation or building of infrastructure.

### The study area

The area of study consisted of Sugar Hill, Dixon's Covert and Quadrilateral Covert. High Ash and Shakers Wood, having already been researched and recorded in the Norfolk Historic Environment Record, were used mainly for reference. All the sites have public access.



Figure 1.  
Location of the camps.  
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2017 Ordnance Survey.

### Historical background

There are records of the Fife and Forfar Yeomanry training at High Ash Camp from May 1943, but the most significant use was from January to May 1944 when these camps were used for training the 7th Armoured Division (The Desert Rats) tank regiments that



would be deployed in the D-Day landings.<sup>1</sup> Much of the training was in the operation of the new Cromwell tanks, and there were large workshops for their maintenance as well as other infrastructure to support an estimated 14,000 troops. However, it is unlikely that they would have all been there at the same time as there are memories of men being sent for training in Scotland and Yorkshire for short periods.

In the study area this Armoured Division comprised the 1st Royal Tank Regiment stationed at Sugar Hill, the 5th Royal Tank Regiment at Betts's Covert and Shakers Wood, and the 4th County of London Yeomanry at High Ash. There were also troops in Quadrilateral Covert.

In the months immediately after the end of the war some of the huts housed refugees from Eastern Europe. Altogether in Norfolk we can estimate that around 3000 Polish troops arrived in this first phase. There are records of the Carpathian Regiment of Light Artillery at the Quadrilateral Camp and Dixon East camp, and 13th Supply Company (13 Dyw Komp Zaop) at Shakers Wood.

Before their arrival, inspectors of the many camps considered suitable for refugees in the UK found conditions very variable. Many were in a complete state of disrepair, their corrugated iron and asbestos roofs crumbling and with few facilities, including no hot water. However, improvements were made by the refugees, including the Poles, who worked hard to make the camps resemble small villages and towns. Each had its own school as soon as was practical, along with gardens and vegetable plots. The people of local villages such as Mundford and Ickburgh remember joining the refugees for films and dances in larger buildings on the camps. Some of the larger buildings have continued to be used for small businesses such as engineering and poultry rearing.

### Research methods

RAF aerial photography from 1946, together with maps and written records, was used to determine the study sites, which were then visited on the ground in March and April 2016. *Figure 1* shows the location of the camps.

Where the concrete bases of huts and larger buildings could be found they were measured and mapped, together with roadways and installations for the disposal of drainage and sewerage. Any artefacts were photographed and recorded.

#### (i) The Aerial Survey of 1946 and written records

In 1946 the RAF carried out a black-and-white aerial stereoscopic photographic survey of the area.<sup>2</sup> At this time it is probable that much of the fabric of the camps was still in place, indeed some areas were still inhabited by war refugees, especially the Poles. Therefore these photographs were used initially to locate the areas where the camps existed. They were easy to identify by their unique 'bobbly' pattern among the more regular pattern of tree plantations. *Figure 2* shows the area covered by *Figure 1*. The 'bobbly' patterns in the trees of the camps can be seen, and a few large buildings on the camps are clearly visible. Stereoscopic pairs of photographs were studied but very little extra detail could be ascertained, and certainly the smaller huts could not be identified individually. The areas of the camps were then named from written and map evidence.

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<sup>1</sup> The Desert Rats Association [www.desertrats.org.uk](http://www.desertrats.org.uk)

<sup>2</sup> Norfolk Historic Map Explorer <http://historic-maps.norfolk.gov.uk/mapexplorer>. Original photographs available at the offices of the NCC Historic Environment Service, Union House, Gressenhall NR20 4DR.



*Figure 2.*  
An aerial photograph  
of the study area  
taken by the RAF on  
30 March 1946.

### (ii) Fieldwork

Because of the large areas involved we decided to survey three areas in the field: Sugar Hill, Dixon's Covert and Quadrilateral Covert, all publicly accessible. However, before any survey work was started we visited the site of High Ash and Shakers Wood Camps, where some research has already been done and information boards are available, to get an idea of what we might find in our study areas. Following this initial visit we decided to look for the following:

- Concrete bases for huts*
- Concrete roadways*
- Drainage and sewerage systems*
- Artefacts*

The tools used were:

- a long metal rod to locate areas of concrete*
- a tape measure*
- a compass*
- sticks with flags to mark the centre of bases as they were located*



## Sugar Hill

This was the camp of the 1st Royal Tank Regiment. The site is largely on south-facing sloping ground. Our initial surveys were made in early April when bracken and bramble growth had barely started. Fieldwork identified three distinct areas of this camp:

- i) A large area to the west of the public road, containing most of the old buildings and including billets, washrooms and social areas (*Fig. 3*).
- ii) The main working area (*Fig. 4*). Large concrete bases in a 'V-shaped' area in the east of Sugar Hill, close to the public road.
- iii) A small area to the east of the public road where it met the concrete road from the High Ash area (*Fig. 4*).



Figure 3.

Figure 3 shows the main part of the camp. As we walked westwards away from the public road and along a concrete track we immediately found the ground to the north scattered with concrete bases, many outlined by a raised earth margin, among conifer trees. The bases were buried by a shallow covering of leaf litter, with some now broken apart by sapling growth. Many had slightly raised ground around the edge. Each was laid at a different angle (similar to those now visible at Shakers Wood). There were also many drains, open and covered.

We attempted to plot as many of the bases as we could on a sketched map but as time went on we reduced this exercise. With experience we found we could fairly confidently identify these bases from the shapes of the ground and the trees around them. We also found more, larger bases with steps and a boot-scraper in its original position. The bases were all roughly 5m wide and varied in length from 11 to 23m. Some of the more interesting are listed below.



## FORMER DESERT RAT CAMPS AT HIGH ASH

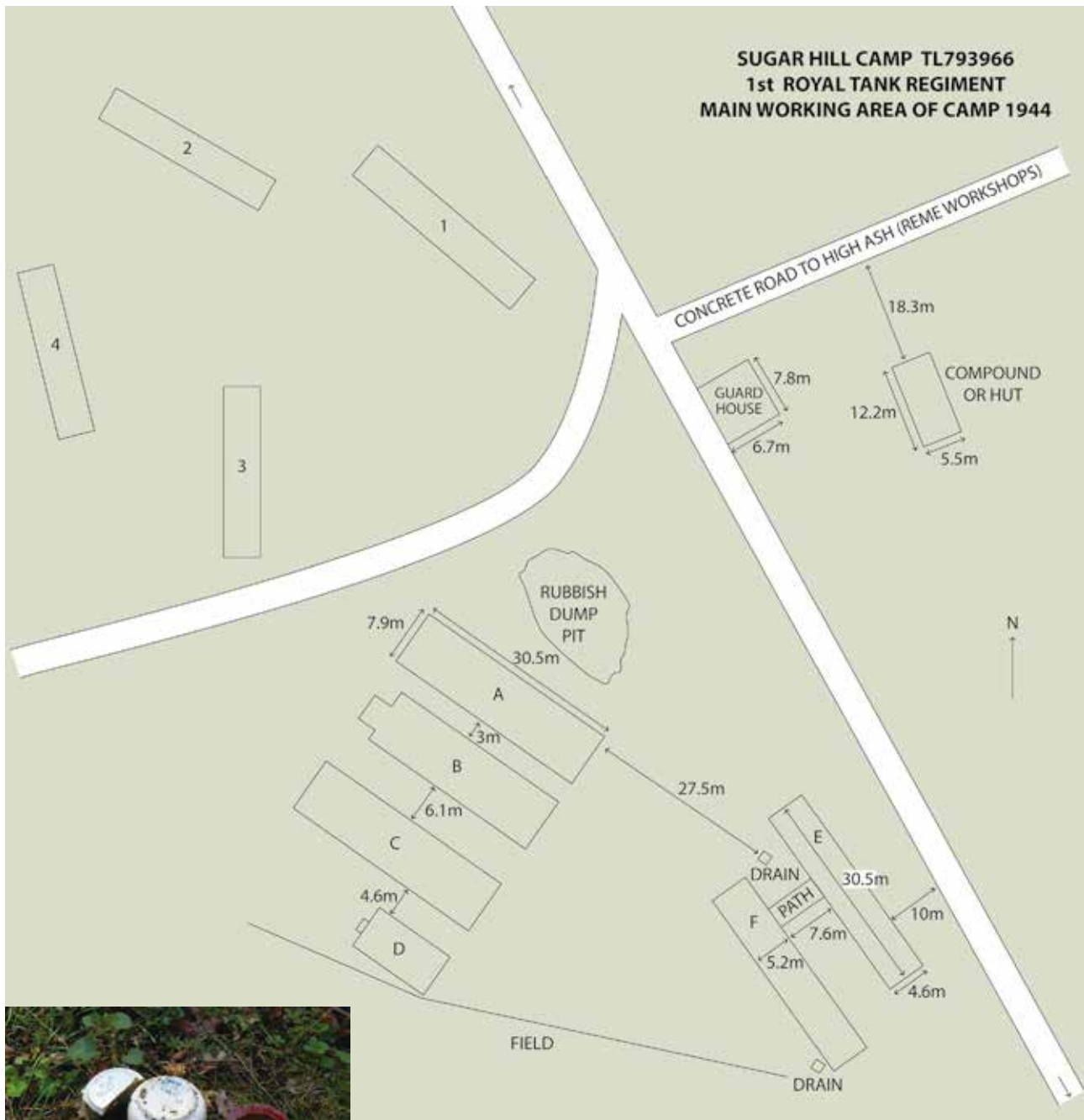


Figure 4.



(left) Figure 5.

Items of crockery, dated 1943–1945. This may suggest that Bases E and F (see above, Fig. 4), linked by a narrow path, were where the troops were fed and relaxed. There were many drain covers in this area, although to date we have found none entering the bases.

Figure 4 shows a plan of what would appear to be the main working area of the camp. Bases A, B, C & D were probably workshops, although we found no hard roads for access and the bases are raised above the present ground level. Base A is at 104m and B and C at 94m. Steps connect A and B as they lay at different levels due to the slope of the ground. These are thought to have been either the mess, NAAFI or engineering sheds. Base D was a small square shape. Near Base A is a pit with some broken remains of cups and plates with marks dated 1943, 44 & 45 and a glass inkwell (Fig. 5).





Base number 10 we thought was the toilet and shower block, owing to the brick bases of cubicles and larger drains and sumps (Fig. 6), parts of a comprehensive drainage system laid out across this whole area.

Figure 6.  
Bases of cubicles on a base at  
Sugar Hill.



Base 18 had steps up to a side entrance with a boot-scraper still fixed in the concrete (Fig. 7). As we worked westwards from the public road it became more difficult to locate bases. This may be due to bases having been removed, or buried under deeper litter/soil.

Figure 7.  
Boot-scraper by steps into a large  
base at Sugar Hill.



A few artefacts were found: cups and saucers marked G VI R 1942 to 1945, a teapot lid and an inkwell. We thought it likely that many of the better remains had already been taken away. We also identified a possible base of a stove (Fig. 8).

Figure 8.  
The remains of a stove on a base  
at Sugar Hill.



## FORMER DESERT RAT CAMPS AT HIGH ASH

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A significant discovery at this site, as well as all the others, was the remains of extensive sewerage and drainage systems. Some of the drains were still covered (Fig. 9) but many were open, and posed a danger to those walking around in the undergrowth. Base 18, with the remains of six cubicles, had an adjacent sump to underground drainage.



*Figure 9.*  
Recording a typical drain cover.

Away from the camp, standing in an arable field further to the west, were the remains of a small sewage treatment plant. There is no apparent outlet other than to soakaways. The landowner confirmed that all had been removed except for a brick and concrete enclosure of two pits with wheel valves, which was too massive to move (Fig. 10). What remains there today is just a part of a complete system similar to that which exists, almost intact, on the edge of Dixon's Covert.



*Figure 10.*  
The remains of a sewage treatment works to the south-west of Sugar Hill.

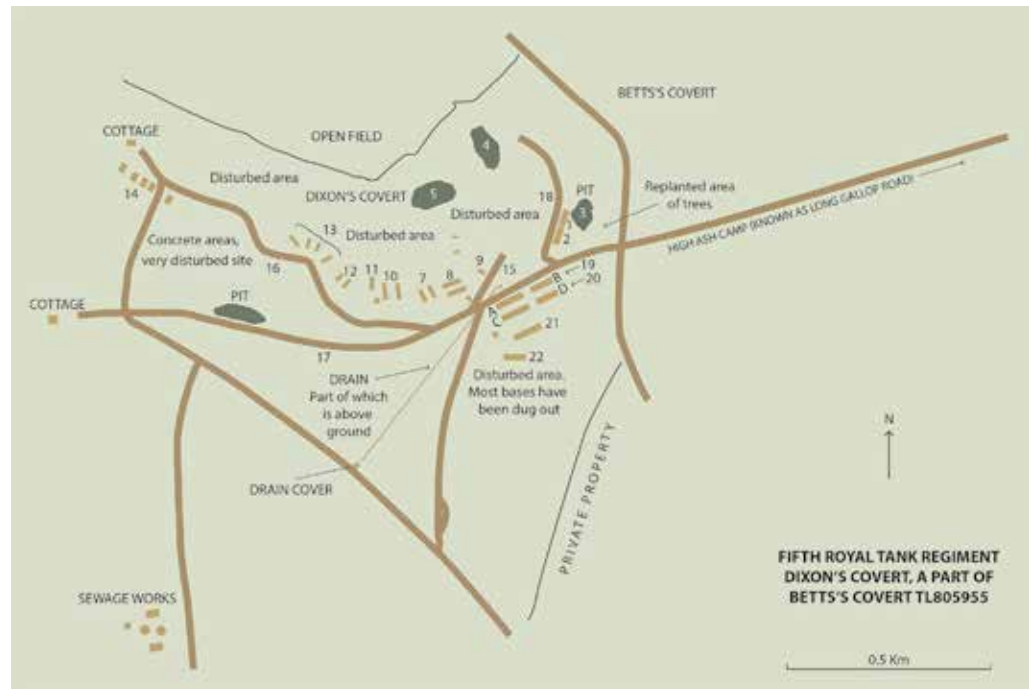
At the far west end of the Sugar Hill site we returned to the concrete track and identified a row of seven bases, each 5.5 × 12m, along the south side of this. Base group 54 (seven bases) and 55, each 12 × 5.5m, stood in line at the southern margin of the site. These are numbered 54 and 55 on Figure 3. We considered these to have been small workshops or stores.



### Dixon's Covert

Although records show that the camp was called Betts's and Dixon's Covert, only Dixon's Covert is publicly accessible. This was one of the two camps of the 5th Royal Tank Regiment. After the war Polish families were living in both coverts. Local people from Mundford and Ickburgh recall visiting the cinema in a large 'hut' when the Poles were living here. This is now part of a sizeable poultry establishment. The 1946 photography shows the characteristic 'bobbly' pattern of huts among the trees in Betts's Covert.

Figure 11.



We surveyed this area later in April 2016 and found that the growing vegetative ground cover was beginning to pose a problem to our work. *Figure 11* shows the complete and partially complete bases found.

The camp is also built on sloping ground getting lower towards the south-west. The 1st Edition OS map of around 1880 shows several gravel pits in this area.

The remains here are more difficult to interpret as many of the concrete bases appear to have been removed, leaving only a gravelly base, and the remaining bases were less easy to identify as they did not have the raised margin that we saw on many of those on Sugar Hill. There are many pits of various sizes that may or may not have been there before the camp was built.

Recorded on our plans are complete, or parts of, bases that we have found, although the leaf litter was very deep and possibly we missed some of them under deeper cover. The little squares on *Figure 11* mark square drain access, covered with a metal plate, or open where this is missing.

Base 15 marks a concrete road which finishes at a pit and does not appear to continue on the other side.

Bases 1 and 2, which stand close to the road, appear to join end-on at slightly different levels, making a very long building. We suggest that they may have been



## FORMER DESERT RAT CAMPS AT HIGH ASH

workshops. However, this area too appears to have been disturbed and the end of No.2 has been planted with trees. Here no concrete base was found. The 1946 aerial photography shows two long, narrow buildings standing in parallel at this site. There was a considerable amount of wire-reinforced glass found scattered around these bases.

The first bases by the access road to the south are four large concrete bases A, B, C and D and there were probably more beyond these, which we identified from the 'bobbly' pattern on the 1946 aerial photographs and patterns that we recognised in the present trees. Prodding with a spike suggested that there was gravel or broken concrete in these rectangles. Bordering this area is a concrete road, 3m wide, going south to meet a gravel road going NW to SE. To the north of this road the 1946 photography suggests many huts were scattered among the trees, but we found little evidence of these on the ground.

Beyond the southernmost margin of the site, now hidden among the trees, we found the large, disused sewage works (Fig. 12). This is largely intact except for the pump in the brick building. The outfall for this can be seen approximately 30m further on, into a branch of the River Wissey. This works is considerably larger than the one near Sugar Hill. We considered that it served High Ash and Shakers Wood Camps as well as these two coverts. This would certainly merit study by an engineer interested in the history of such treatment works.

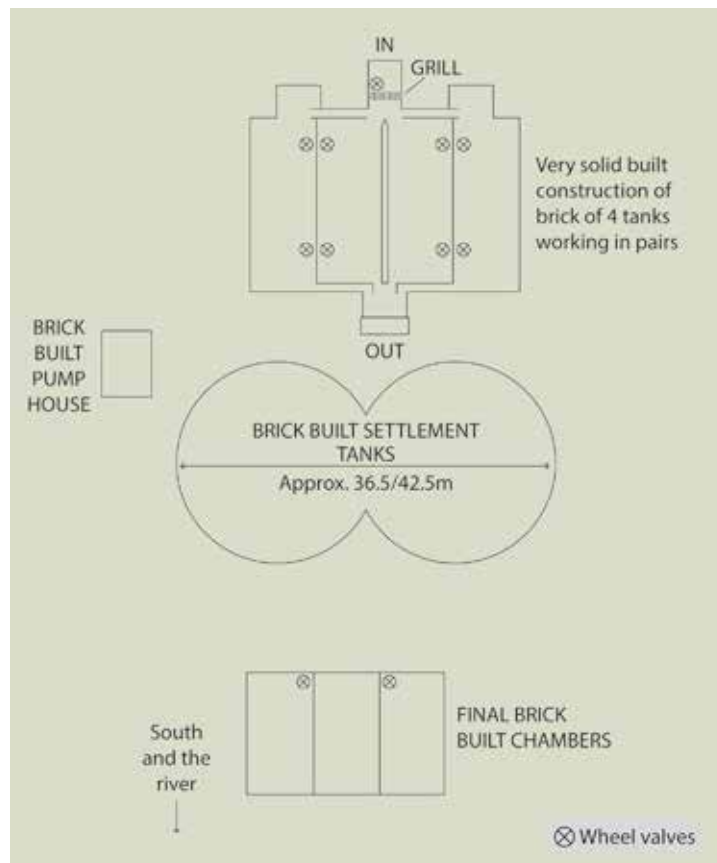


Figure 12.  
Plan of sewage works.

It would appear that the dirty water, controlled by wheel valves, would enter one of the open paired rectangular troughs through a rack of iron bars to remove large materials. It would then be directed into one of two circular filter beds, each over 20m in diameter. The low brick walls bounding them are still intact. From these the



water would pass into one of three final rectangular troughs controlled by wheel valves, and finally passing through an underground pipe to the river. The only significant piece of equipment missing was a pump from the small, empty pump house.

Figure 13.  
Part of the sewage treatment works to  
the south of Dixon's Covert.



### **Quadrilateral Covert**

There was not much time to survey this area properly. The 'bobbly' pattern of huts is visible on the 1946 photographs, but by the time we reached here the brambles and bracken were at waist height and we found the ground was very disturbed. One complete hut base was found, and remains of some drain covers. It was thought that the drainage from here went to the Sugar Hill sewage works. Research determined that there was a sizeable camp here with its own NAAFI and washing block, but there were not thought to have been any workshops.

### **High Ash**

The camp area here is on private land and is fenced off. The owner said that the bases are still intact but it is too overgrown to survey. The 1946 RAF photography confirmed the presence of bases here and research by others suggests there was a large camp with its own NAAFI, orderly room and washing block. In the garden of a private house, Falconers Lodge, is a large concrete base that the owner believes was a church. This can be identified on the RAF photography. He said that a round concrete slab in the centre of this base marks the place where something (unknown) is buried.

### **Shakers Wood**

We did not survey this area, as an annotated sketch of the remains of the camp exists in the Norfolk Record Office. It shows cookhouses and a medical centre, toilets and washrooms, a NAAFI and Orderly Room. We assumed that these facilities would have been similarly present at the other camps.

To conclude, we found that there are still significant remains of the Desert Rats camps in these areas. Much remains to be recorded at these sites before they are completely lost to nature and development, and largely forgotten. A more rigorous survey would reveal the layout of these camps and suggest their day-to-day operations at this significant time before the D-Day landings. There are still those alive with memories of this time and also the camps' later use as temporary homes for refugees when the buildings were less secret.

# 2

## Exploring the lives of Goshawks in the Brecks: identifying patterns in nest behaviour, habitat use and movements within and beyond the Brecks

*Dr Ian Henderson and Dr Greg Conway, The British Trust for Ornithology*



Figure 1.  
A juvenile female Goshawk at about  
40 days old.  
Photo © Ashley Banwell.

### Introduction

The Goshawk is a scarce breeding species in the UK, with around 280–430 pairs in total (Musgrove *et al.* 2013), and is protected under Schedule 1 of the Wildlife and Countryside Act 1982. The Breckland is a regional stronghold for this exciting but very elusive bird of prey, supporting perhaps about 25 territories. The species should be a relatively common breeding raptor in the UK and although the national population is slowly increasing,<sup>1</sup> there is much regional variation, probably due to low recruitment, where persecution may still play a role.

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<sup>1</sup> Balmer *et al.* 2013.





East Anglia is typical of a lowland region in the UK where the Goshawk population is far below carrying capacity, although in the Brecks the species is regarded as a headline representative of the bird fauna. As such, the Forestry Commission and dedicated volunteers take active steps to help protect nests and breeding habitats within Thetford Forest. Prior to this study, however, literally nothing was known of this population's movements, scale of interaction with the wider countryside, or its relative use of forest, farmland or heathland.

A key aim of the study was therefore to improve our understanding of the species' dispersal behaviour. Would young birds remain within the Breckland population or would they move away to recruit into the wider population of East Anglia? Also, little was known about the core diet of the birds breeding locally, so another aim was to quantify the composition of the chicks' diet, as a potential limiting factor on population expansion. Of course Goshawks are, famously, elusive and furtive and not amenable to normal visual observation. Now, modern methods of tracking have opened up opportunities for objective investigations into some of the mysteries of the bird's life and potentially also sources of its mortality.

## Methods

### *Tracking*

In 2016, two Goshawk chicks, a male and a female from different nests, were fitted, under licence, with GPS tags and provided our first dispersal data. The GPS tags were fitted as a backpack using smooth but strong material, Teflon ribbon, to construct the harness. Each harness is individually fitted to the chick at between 25 and 40 days old, when the skeletal structure has fully developed (*Fig. 1*). Care was also taken to allow for muscle development in the larger female in particular when fitting harnesses. The tags attempted two GPS locations per day (approximating to mid-day and evening) and the data were transmitted via the GSM mobile network after six fixes were received (normally every three days but with periods of dormancy in poor weather).

### *Chick diet*

In addition to the tagging, in 2015 we installed cameras on three Goshawk nests containing hatched chicks, under licence (representing the north, middle and south regions of the forest). This was to identify the staple diet of chicks and look for consistency or variations between nests. A small, camouflaged infrared motion-sensitive camera (maximum dimensions 4cm × 4cm) was fitted to a nearby branch by each nest. A record was also kept of the prey discovered at the base of the nest tree (always visited under licence) as well as within the nests, when being visited to ring the chicks.

## Results

### *Tracking*

#### **Dispersal and movements**

The patterns of behaviour and movement in juvenile birds were consistent with other studies.<sup>2</sup> At 30 days old the chicks remained within the nest, but from 35–40 days moved increasingly on to the nearby branches as their flight feathers developed. The birds became increasingly restless between 50 to 60 days old. The typical distances travelled were around 50m to 100m from the nest site, rarely to 200m away (*Figs. 2a & b*). Between 60 to 70 days old, the birds were typically

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<sup>2</sup> eg, Kenward, 2006.

ranging over distances of 100m to 200m, though still essentially remaining within the natal wood (Figs. 2c & d). At this age, the birds were capable of longer flights with occasional excursions being recorded, including one to a distance of 7km from the nest site, before returning the same day (perhaps following an adult). At 70 days old, in both individuals, the point of departure from the natal area was abrupt and now strongly directional, as they moved far from the natal area (Fig. 2e). Both birds travelled distances of 30–35km over a period of three days, and both individuals adopted a nomadic life style with constant daily movements between locations, typically of 5–6km. Rarely more than two days was spent in any one specific location. At about 80 days old, the female began to settle into a pattern, covering a large 30km<sup>2</sup> area of mixed farmland and woodland in north-west Norfolk, some 30km from her natal area. Unfortunately she was found dead in this area near a road, possibly as a road casualty. The tag was returned to the BTO working and intact. Interestingly, the male, having also initially moved 35km away, this time north-east via the Wissey river valley to Swanton, Norfolk, then acted differently. This bird looped back to Thetford Forest after 15–20 days via visits to Thompson/Merton and the fens near Feltwell. This bird's last recorded position in Thetford Forest was within 3km of its original nest site.

Figures 2a–2e. Projections of the pre-dispersal movements of two juvenile Goshawks from 50 days old (a) & (b), becoming increasingly restless up to 70 days old (c) & (d). Dispersal is abrupt and directional at around 70 days (e); yellow track is the female, blue track is the male).

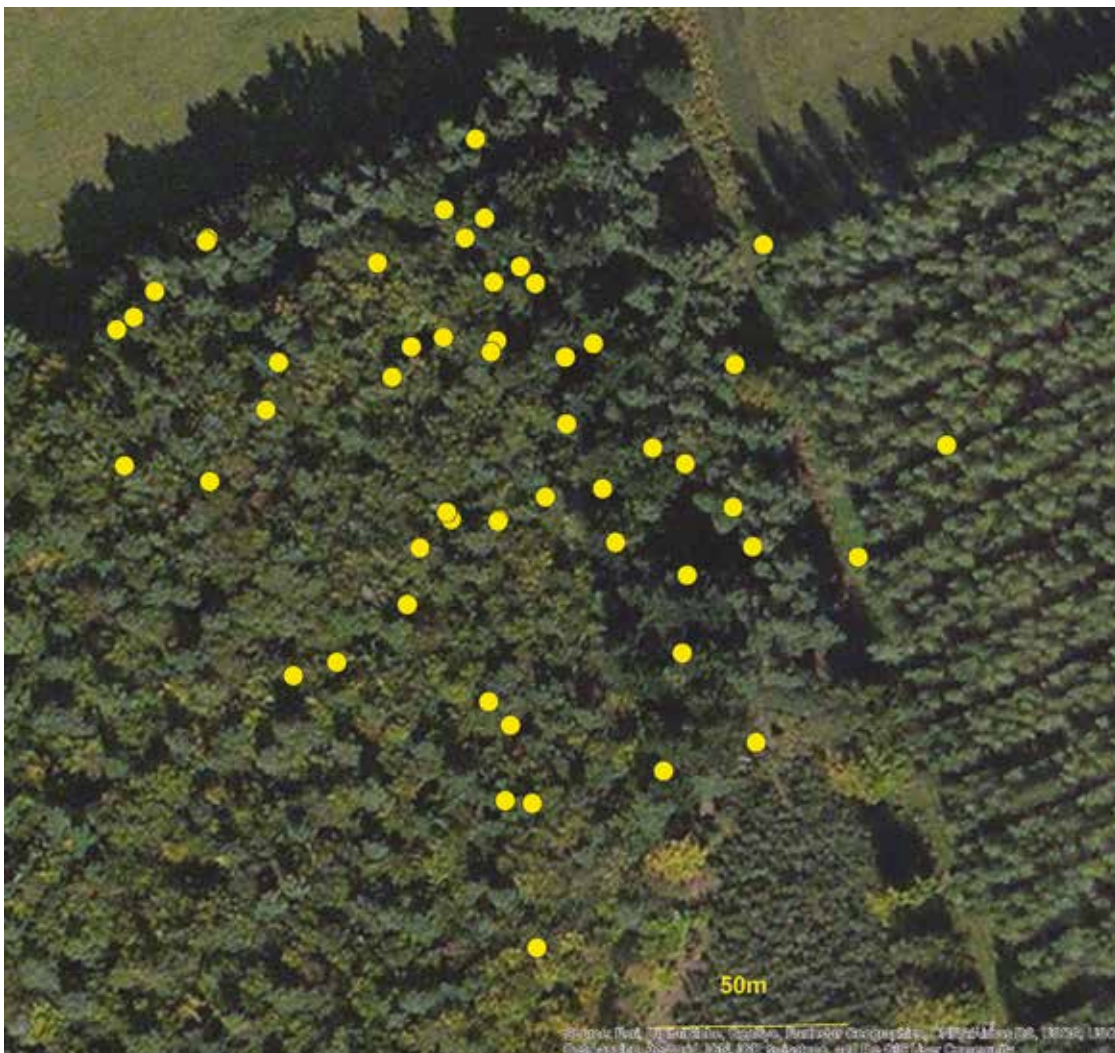


Figure 2a.





Figure 2b.

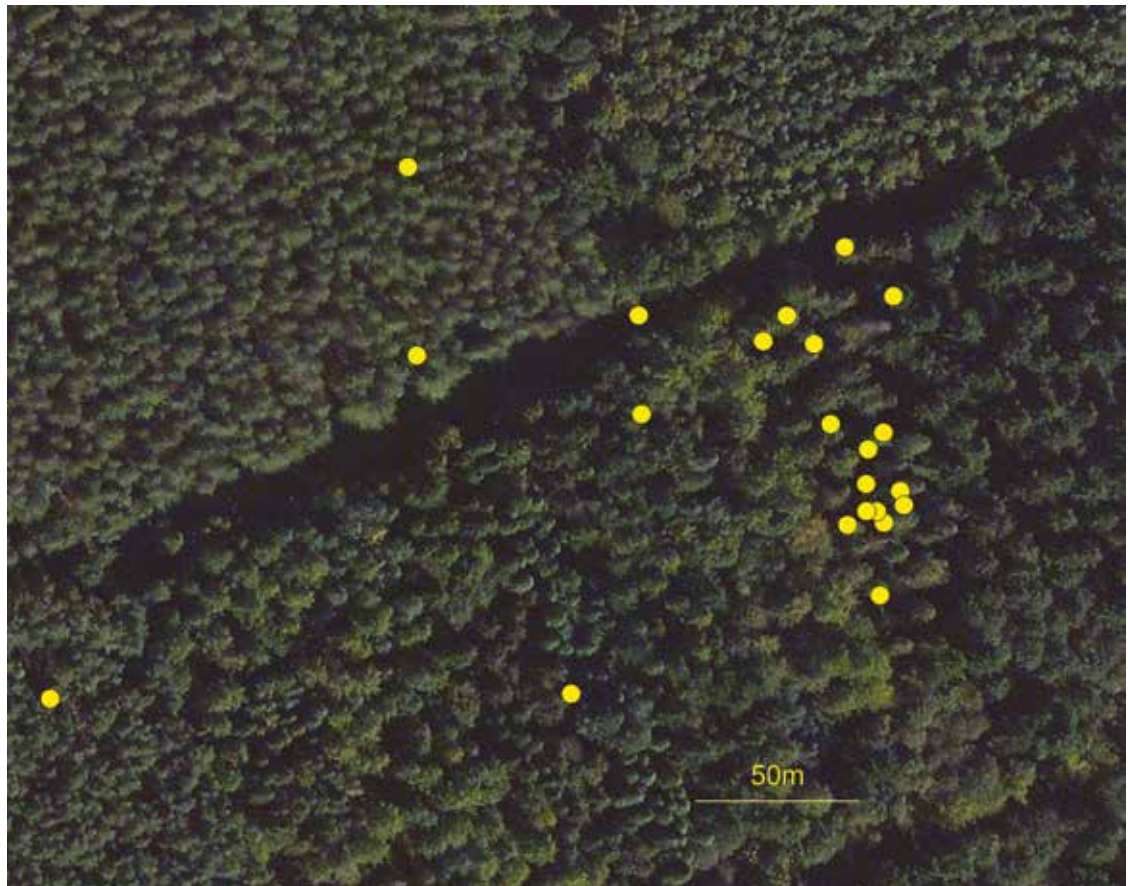
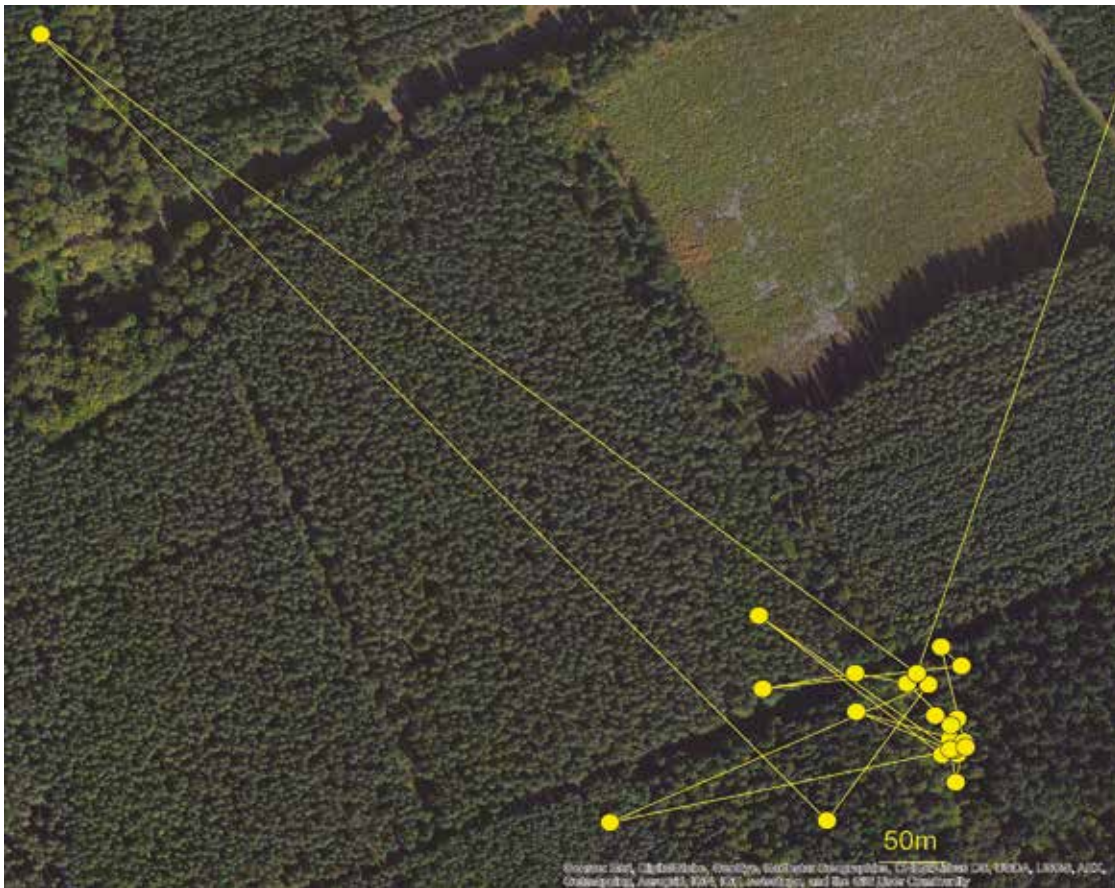


Figure 2c.











*Figure 3.*  
A typical pattern  
of movement and  
habitat use in a  
juvenile Goshawk.  
Close inspection will  
reveal the bird moving  
regularly across  
open farmland, from  
woodland edge to  
shelter belt and so on.  
Broadly speaking, the  
circles represent daily  
GPS fixes.

were located on open fields, as would be expected by chance due to their large proportional area of coverage. Most diurnal GPS locations are centred on small patches of woodland, the edges of woodland or on narrow shelter belts, but rarely the larger areas of woodland or forest (*Fig. 3*). It is possible that the use of dense forest could be underestimated if the tags are less likely to acquire GPS fixes there. But in our case there were very few missing data points in the sequence to suggest this was a common event. Also, the tags were working quite well in the forest to begin with, before birds dispersed. So all in all, the pattern suggests the birds were moving swiftly and regularly between edge habitats. The evening GPS points were similarly scattered, suggesting the birds were mainly roosting opportunistically rather than in selected or preferred woodlands or woodland structures. Generally, the pattern was of an itinerant lifestyle at this young age.



### **Nest attendance patterns**

At the nest, the behavioural patterns are all consistent with previous studies of Goshawks.<sup>3</sup> The female typically left the nest very early in the morning, sometimes before dawn, returning every hour or two with nest material and occasionally with food (provided by the male), but the longest period of parental absence was six hours. Nest repair and maintenance was undertaken continually by the female,

<sup>3</sup> e.g., Kenward 2006.

who brought fresh greenery throughout the entire nesting period. The smaller male undertook the majority of the hunting and delivered prey, but only the female fed the chicks (Fig. 4). The female did all the nest attendance, nest maintenance and protection (being aggressive towards the male too). Sometimes she covered young chicks at night or in wet or cold weather, but very often the chicks were exposed for long periods of time with the female absent either hunting or finding nest material.



Figure 4.  
Adult female Goshawk in attendance at nest with female chick.  
Photo © Forestry Commission.

### Chick diet

Prey was usually delivered to the nest 'processed' (plucked, headless), so precise identification was at times challenging, as was the identification of remains in the vicinity of the nest. Usually, the legs provided the best clue. The diet data are new for the Brecks, and overall the principal prey at this stage of the life cycle was Grey Squirrel *Sciurus carolinensis*, making up over half (average 64 per cent) of all items (Fig. 5). However, Wood Pigeons *Columba palumbus* and crow species (typically nestlings or recently fledged Carrion Crows *Corvus corone*, Rooks *C. frugilegus* or Jackdaws *C. monedula*), plus Jay *Garrulus glandarius* and Magpie *Pica pica* were also significant. Other animal species recorded less frequently, in or by nests, included Rabbit *Oryctolagus cuniculus*, Green Woodpecker *Picus viridis* and Red-legged Partridge *Alectoris rufa*. Figure 5 shows that there were differences in the proportions of species being delivered to nests, with Grey Squirrels being especially dominant at one site, but with more variety at the others, probably depending on availability. All three nests successfully fledged three young in 2015.

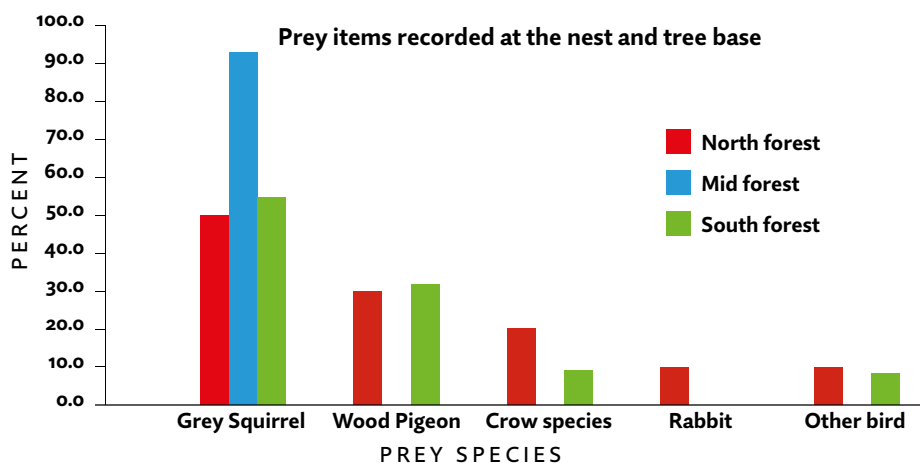


Figure 5.  
Breakdown of the percentage of prey items identified at three different Goshawk nest sites (mainly at the nest but including the nest tree base). 'Other bird' includes Green Woodpecker, Red-legged Partridge and 'unidentified bird'.





## Discussion

For all species, we need to understand fundamental aspects of their lives in order to manage habitats and landscapes appropriately, with informed decisions using evidence-based observations. The Lawton report<sup>4</sup> extolls the virtues of being bigger, better and more connected, but without knowing the scale over which organisms move, these qualities can remain quite notional. For Goshawks in the Brecks, the present project was at least able to help us develop an initial understanding of the scale and qualities of the countryside we may need to consider when thinking about conservation initiatives for this species. There is so much more to learn, but this project was a new venture and an essential foundation for future work.

From the two operating tags, we now appreciate the scale of movement that the Brecks' juvenile Goshawks can undertake. This was previously unknown but allows us to understand the potential of the birds to disperse and mix, and for the population to connect easily with areas far beyond the Brecks. Their movement suggests that the dispersed population of East Anglia may interact freely, and overall this flux of movement will benefit the longer-term viability of the Goshawk population across East Anglia. It is tantalising to suggest that the Brecks population may be an important source for colonisation across East Anglia, but confirmation would require further data, and of course the opposite could also be true.

We discovered that the young birds disperse suddenly (the trigger could be denied food or active displacement by the parents<sup>5</sup>); and that they are highly mobile and itinerant in lifestyle, which seemingly belies their furtive character. Our data indicate the important use of the shelter belts, forest edge and wood lots across open or mixed farmland. These birds were not confined to large forest habitats but ranged widely and with as much dependency on farmland as on forest, moving from woodland patch to woodland patch. Currently, we have data from two birds only and we do not know how typical those movements are. But if the birds are at least partly representative of this species locally, it raises issues of wider interest. First, from a conservation perspective, a more landscape-integrated perspective may be required in thinking about the needs of the species beyond the forest. Second, the farmland interaction raises concerns about potential conflicts with gamebird management.

It would have been desirable within this project to have seen the birds survive into the following spring, so that we could witness patterns of settlement into new territories, either within the Brecks or beyond. The male and the female were different in this regard. The male may have had to return to the Brecks because he was struggling to find food outside the forest, or perhaps there were conflicts with other Goshawks? Would the male have established a new territory within the Brecks? Would the female have settled in north Norfolk? These are aspects of the species' behaviour that we would like to pursue with future work.

Interestingly, the staple prey of the forest Goshawks for feeding young at least was Grey Squirrels, Wood Pigeons and crow species. Red-legged Partridge was recorded once but not Pheasant *Phasianus colchicus*, probably due to Pheasants being too large to be carried to nest sites. One source suggests that for Goshawks breeding within Stanford Training Area (STANTA), Wood Pigeons dominate the prey count, followed by crow species and with Grey Squirrels in third place,<sup>6</sup> again

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<sup>4</sup> Lawton, 2010.

<sup>5</sup> Kenward, 2006.

<sup>6</sup> Feakes and Pleasance, 2016.

probably reflecting differences in prey availability. Nevertheless, these are common prey species and the diet for chicks at least is unlikely to be limiting the population trajectory of Goshawks locally. Interestingly, all of the common prey species are subject to 'control' to some extent by land managers, yet the potential net benefit provided by some birds of prey is a subject rarely aired or promoted!

### Acknowledgements

The Goshawk population in the Brecks is closely monitored, as has been the case for decades. This requires strong and devoted volunteer input, with dedicated and knowledgeable individuals who attribute hours of free time to nest finding and nest monitoring – in particular, we thank Bernard Pleasance in this regard, as well as Simon Evans for organising the nest site logistics. The Forestry Commission England also maintains a strong interest in the species, encouraging understanding of its use of the forest estate. We would also like to thank Neil Thomas for tree climbing services, often in his own free time. Photos are by Peter Dolton, Paul Stancliffe, Ian Henderson and Ashley Banwell. The funding for the BTO Goshawk tagging project was provided by the Breaking New Ground Landscape Partnership Scheme in the Brecks, supported by the Heritage Lottery Fund.

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## The early Palaeolithic archaeology of the Breckland: current understanding and directions for future research

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### Introduction

The Breckland is one of the most important areas in Britain for understanding the changing nature of human occupation of north-west Europe through deep time. An unparalleled geological sequence spanning a million years provides the stratigraphic framework in which the region's Lower and Middle Palaeolithic record can be examined and understood. The archaeological record itself is exceptional, including some of the earliest Acheulean handaxe sites in northern Europe,<sup>1</sup> the earliest evidence for controlled fire-use in Europe<sup>2,3,4,5</sup> and several primary context sites that provide important evidence of the behavioural and environmental context of ancient human occupation of the region.

The study of the Breckland Palaeolithic record is as old as the discipline itself, beginning during the formative years of Palaeolithic research and continuing to play a role in many of the debates that have occupied British Palaeolithic archaeologists over the last 150 years. The Breckland Palaeolithic Project, a three-year research programme that began in May 2016 and is funded by the Leverhulme Trust, continues this tradition. The project aims to employ the area's geological and archaeological records to examine how human populations and their culture and technology adapted to a developing landscape within a single region through deep time.

This paper will review current understanding of the Palaeolithic record of the Breckland and establish key questions for future research. A short summary of the history of research in the area highlights its prominent position in British Palaeolithic studies. The archaeology is considered in three chronological groups: sites associated with the former Bytham River, representing human occupation between 600,000 and 500,000 years ago; Hoxnian interglacial sites (c.400,000 years ago); and Lower and Middle Palaeolithic sites associated with modern rivers (400,000 to 200,000 years ago) (*Fig. 1*). The paper concludes by proposing a number of key directions for future research.

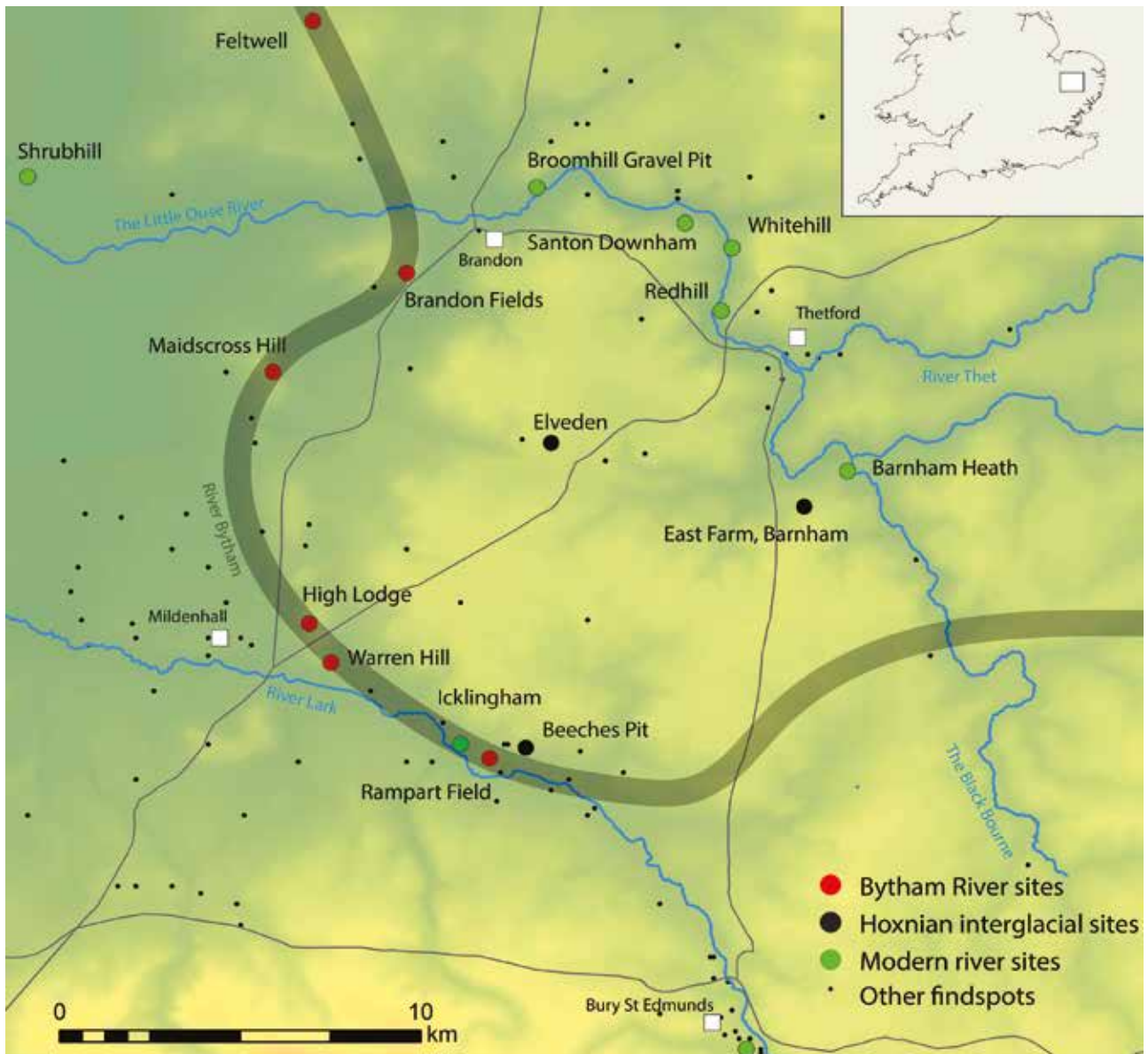
<sup>1</sup> Moncel *et al.*, 2015, p.321

<sup>2</sup> Gowlett *et al.*, 2005

<sup>3</sup> Preece *et al.*, 2006

<sup>4</sup> Preece *et al.*, 2007

<sup>5</sup> Roebroeks & Villa, 2011



### A brief history of Palaeolithic research in the Breckland

The earliest recorded observation of Palaeolithic artefacts from the Breckland was by John Evans in 1860, when he identified two Palaeolithic implements among the collections of Joseph Warren, an antiquarian based in Ixworth, Suffolk.<sup>6</sup> One of the artefacts was an Acheulean handaxe (Fig. 2) that had been recovered by workmen digging gravel at Rampart Field, near Icklingham, prompting Evans and the geologist Joseph Prestwich to visit Icklingham later that year. Writing of this visit in 1872, Evans notes that whilst no further discoveries were made during their visit, the instructions he and Prestwich gave to the workmen soon began to bear fruit and numerous implements were subsequently discovered. The visit by Evans to Warren in 1860 marks the beginning of Palaeolithic research in the Breckland, coming just one year after he and Prestwich had undertaken their momentous visit to Abbeville and St Acheul in the Somme Valley, France, which is generally considered to mark the birth of Palaeolithic archaeology as an academic discipline.<sup>7</sup> During this visit they witnessed the discovery of a handaxe from within

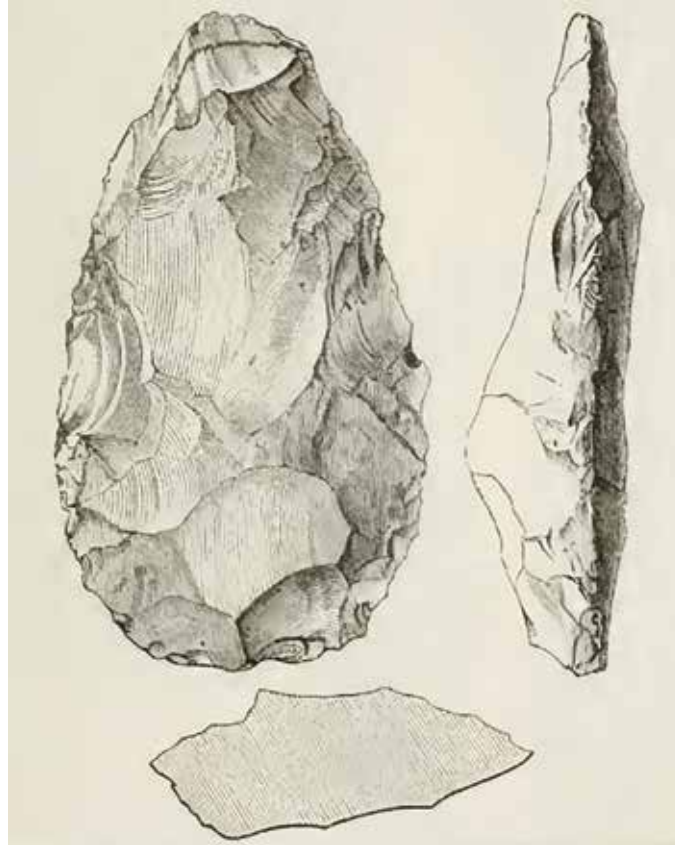
Figure 1.  
Early Palaeolithic sites  
of the Breckland. Site  
locations taken from  
*The English Rivers  
Palaeolithic Survey*  
(Wessex Archaeology,  
1996)

<sup>6</sup> Evans, 1872, p.486

<sup>7</sup> Gamble & Kruszynski, 2009



Figure 2.  
The handaxe from Rampart Field,  
Icklingham, identified in the  
collection of Joseph Warren by John  
Evans in 1860. (Evans, 1872, p.489).



an undisturbed gravel deposit laid down within an ancient course of the River Somme. With this key piece of evidence, Prestwich and Evans returned to London and set about demonstrating the antiquity of humans.<sup>8,9</sup>

Evans's paper of 1861 acted as a call to arms, encouraging the scientific community to search for stone artefacts in similar deposits in Britain. This marked the beginning of the heyday of collecting Palaeolithic material as antiquarians responded to the call and started regularly visiting gravel pits, clay pits or any other situation that provided access to exposures of Pleistocene sediments in search of stone tools. In the Breckland they were met with almost immediate success. Many of the early discoveries were made by Henry Prigg<sup>10</sup> (later Trigg), a Bury St Edmunds-based antiquarian, and John Wickham Flower<sup>11,12</sup> of Croydon. Within just a few years, Palaeolithic material was identified in and around Bury St Edmunds (including Grindle Pit and Sicklesmere), Icklingham (Rampart Field) and Mildenhall (Warren Hill and High Lodge). A second group of sites was identified in the valley of the Little Ouse at Redhill and Whitehill, both near Thetford, Santon Downham and Broomhill Pit, near Brandon. Further material was identified at Brandon Fields, Maids Cross Hill near Lakenheath and Shrubhill near Feltwell. Remarkably, this first decade of searching discovered many of the sites and assemblages that continue to be the subject of academic study and debate today.

However, it was not just the discovery of Palaeolithic material that made the Breckland an important area during the formative years of Palaeolithic studies. On

8 Evans, 1861  
9 Prestwich, 1860  
10 Prigg, 1869  
11 Flower, 1867  
12 Flower, 1869

returning from France in 1859, Evans was challenged with convincing a sceptical scientific community that the handaxes, flakes and cores he had witnessed being recovered from the Somme gravels were indeed human-made. Further, he wanted to understand and to be able to demonstrate how they could have been manufactured without the use of modern tools. One of the ways he achieved this was to draw on the expertise of modern flint-knappers. Writing in 1872, Evans states:

‘We may ... call in aid the experience of some of our own countrymen, who still work upon similar materials, although for the purpose of producing different objects from those which were in use in ancient times ... The principal places in England where the gunflint manufacture is now carried on are Icklingham in Suffolk, and Brandon, on the borders of Norfolk and Suffolk, at both which places I have witnessed the process.’<sup>13</sup>

Evans goes on to describe in detail the techniques employed by the local flint-knappers to produce gun flints. He then notes:

‘... it would appear that the production of flakes of flint, without having a pointed metallic hammer for the purpose, was a matter of great difficulty. I have, however, made some experiments upon the subject, and have also employed a Suffolk flint-knapper to do so, and I find that blows from a rounded pebble, judiciously administered, are capable of producing well-formed flakes, such as in shape cannot be distinguished from those made with a metallic hammer.’<sup>14</sup>

During the late nineteenth and early twentieth centuries, great quantities of Palaeolithic material were recovered from pits across the Breckland as the region continued to attract the attention of early Palaeolithic archaeologists and geologists. Notable among them was Worthington George Smith, a London-based archaeologist who recovered a significant assemblage of Palaeolithic artefacts from Warren Hill between 1878 and 1884, and the geologist Sydney Barber Josiah Skertchley. The latter, while working as an officer of the Geological Survey, provided the first detailed description of the geology of the Breckland.<sup>15</sup> During this period, several new sites were discovered, such as Beeches Pit, near West Stow, Botany Bay Brickyard, near Brandon,<sup>16</sup> East Farm, Barnham<sup>17</sup> and Elveden Brickyard.<sup>18</sup> Collecting continued on a smaller scale into the second half of the twentieth century, with significant contributions made by Basil Brown of Ipswich Museum, who amassed a large collection of material from Barnham Heath, and by R.J. MacRae at Feltwell.<sup>19</sup>

Systematic excavation and analysis of the Breckland Palaeolithic record began in the 1920s,<sup>20</sup> most notably by T.T. Paterson of the University of Cambridge, who investigated numerous sites across the region,<sup>21</sup> and later by John Wymer.<sup>22</sup> The British Museum has also been a major driver of research in the region, leading

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<sup>13</sup> Evans, 1872, p.13

<sup>14</sup> Evans, 1872, p.19

<sup>15</sup> Whitaker *et al.*, 1891

<sup>16</sup> Evans, 1897

<sup>17</sup> Clarke, 1913

<sup>18</sup> Smith, 1931

<sup>19</sup> MacRae, 1999

<sup>20</sup> Marr, 1921

<sup>21</sup> Paterson, 1939

<sup>22</sup> Wymer, 1985





large-scale research excavations at High Lodge from 1962 to 1968 and in 1988,<sup>23</sup> at East Farm, Barnham from 1989 to 1994<sup>24</sup> and at Elveden from 1995 to 1999.<sup>25</sup> In recent years, major excavations have also been conducted by the University of Liverpool at Beeches Pit<sup>26</sup> and by the Norfolk Archaeological Unit at Lynford Quarry,<sup>27</sup> while new excavations are ongoing at East Farm, Barnham, as part of the Natural History Museum-led Pathways to Ancient Britain project.<sup>28</sup> Over the past 30 years there have also been numerous small-scale interventions at sites across the region, such as at Santon Downham,<sup>29</sup> Warren Hill,<sup>30</sup> Maidscross Hill<sup>31</sup> and Redhill<sup>32</sup> to name just a few. It is the combined results of all this work that provide us with the view of the regional Palaeolithic record presented below, and that highlight the questions that the Breckland Palaeolithic Project is addressing.

### The Breckland Palaeolithic record

Over a period of 136 years, from Evans's visit to Warren in 1860 to completion of *The English Rivers Palaeolithic Survey*, Wymer's extensive survey of the British Palaeolithic record, approximately 150 findspots have been identified; the exact figure depends on where the boundaries of the Breckland are drawn. From these there are at least 7500 Palaeolithic artefacts, of which at least 5000 are Acheulean handaxes.<sup>33</sup> The true number of artefacts collected may well have been many more, with an unknown quantity lost to private collections. These figures do not include the many thousands of artefacts recovered during the systematic excavations that took place at Beeches Pit, Barnham, Elveden and Lynford during the late twentieth and early twenty-first centuries. The number of sites and artefacts marks the Breckland as a rich source of Palaeolithic material and a major component of the broader East Anglian Palaeolithic record, which, with the Thames Valley and the Hampshire basin, make up the three major concentrations of Palaeolithic material in Britain. However, it is not the quantity of material that has drawn successive generations of archaeologists to the area, but the quality of the records at a number of key sites and the wealth of information about early human occupation in Britain that can be gleaned from them.

The three time spans that the Breckland Palaeolithic Project has identified can be related to the broad geological divisions of the modern-day landscape. The extinct Bytham River flowed eastwards from the West Midlands, through East Anglia and into the North Sea (*Fig. 1*) and deposited quartz and quartzite-rich gravels, which now survive only as remnants on the sides and tops of the low-lying hills. These gravels are arranged in a series of river terraces, which were formed as the river cut successively lower courses, resulting in preservation of former floodplain sediments, which increase in age with altitude. This river was destroyed by the Anglian Glaciation 450,000 years ago. The retreat of Anglian ice sheets left a till-covered landscape with small lake basins and an emergent drainage network. As climate warmed into the Hoxnian interglacial, these basins were infilled with fine-grained sediments that often preserve fauna and flora. New rivers, such as the Lark and Little Ouse, were established and now flowed into the newly formed Fen

<sup>23</sup> Ashton *et al.*, 1992

<sup>24</sup> Ashton *et al.*, 1998

<sup>25</sup> Ashton *et al.*, 2005

<sup>26</sup> Gowlett *et al.*, 2005

<sup>27</sup> Boismier *et al.*, 2012

<sup>28</sup> Ashton *et al.*, 2016

<sup>29</sup> White, 1997

<sup>30</sup> Bridgland *et al.*, 1995

<sup>31</sup> Ashton & Lewis, 2005

<sup>32</sup> Gibbard *et al.*, 2008

<sup>33</sup> Wessex Archaeology, 1996

Basin. Through time these rivers also cut lower courses, leaving a series of terraces formed of gravels that can now be identified above the floodplains on the valley edges. The geological framework of the Breckland therefore forms the structure within which early human evidence can be understood.

### The Bytham River sites

The oldest archaeology in the area is associated with deposits laid down by the east-flowing Bytham River. The gravels contain a distinctive suite of lithologies from the English Midlands, including quartzite, quartz and Carboniferous chert, that are quite different from the flint-rich gravels of the modern Breckland rivers that flow in the opposite direction to the west. The Bytham gravels have survived in patches, remnants of a series of terraces that chart the evolution and migration of the river through successive glacial-interglacial cycles. Reconstruction of these terraces is problematic and different explanations for the deposition of these sediments have been proposed.<sup>34,35,36,37</sup> The Bytham River and its constituent terraces are used here as the lithostratigraphical framework in which the archaeological evidence can be considered.

In the Breckland, archaeology has been recovered from sediments of the lowest two terraces. The first terrace represents the final iteration of the river prior to its destruction during the Anglian Glaciation and is likely to date to approximately 500,000 years ago. Breckland sites assigned to the first terrace are Warren Hill, the lower of the two gravel deposits found at Maids Cross Hill, and the former Frimstone's Pit at Feltwell.<sup>38</sup> A further set of Bytham River deposits that are thought to be of similar age are found at High Lodge. Here, a sequence of pre-Anglian interglacial floodplain deposits overlies Anglian till. This anomalous position is interpreted as resulting from the entrainment of blocks of pre-Anglian floodplain deposits by Anglian ice and redeposition of them on top of the younger till deposit.<sup>39</sup> A further archaeological assemblage is found in overlying gravels.

Sediments from the younger of these two terraces have been examined through ongoing field investigations at Warren Hill and Maids Cross Hill. At Warren Hill, the sequence consists of c.10m of silts, sands and gravels,<sup>40</sup> and at Maids Cross Hill, which is approximately 8km upstream of Warren Hill, a similar sequence has been identified at a similar elevation (*Fig. 3a*). Sediments from both sequences have recently been dated through the application of electron spin resonance (ESR) dating on quartz,<sup>41</sup> providing age estimates of about 550,000 years ago, which lends some support to a pre-Anglian age for these sediments.

In the Breckland, sediments of the second Bytham terrace are found at Maids Cross Hill, Brandon Fields and Rampart Field. The gravels on the summit of Maids Cross Hill consist of sandy quartz- and quartzite-rich gravel resting directly on Chalk bedrock at an altitude of 21m OD.<sup>42</sup> This closely matches the description of the sediments at Brandon Fields recorded by Flower.<sup>43</sup> The age of the second terrace is presently unknown but is probably a glacial-interglacial cycle earlier than the first terrace.

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<sup>34</sup> Lee *et al.*, 2004

<sup>35</sup> Lewis, 2012

<sup>36</sup> Westaway, 2009

<sup>37</sup> Gibbard *et al.*, 2009

<sup>38</sup> MacRae, 1999

<sup>39</sup> Ashton *et al.*, 1992

<sup>40</sup> Bridgland *et al.*, 1995, p.59

<sup>41</sup> Voinchet *et al.*, 2015

<sup>42</sup> Ashton & Lewis, 2005

<sup>43</sup> Flower, 1869, p.450



Figure 3. (a) Section excavated through sediments of the first Bytham terrace at Maidscross Hill. Photo: Simon Lewis  
(b) Examples of the three main components of the Bytham archaeological record. Top: three rolled crude bifaces from Warren Hill, Maidscross Hill and Brandon Fields. Middle: three fresh ovates from Warren Hill. Bottom: Two fresh scrapers from High Lodge and a rolled and patinated scraper from Maidscross Hill.  
Photo: Rob Davis courtesy of the British Museum

The handaxe assemblages from Brandon Fields, Maidscross Hill and Rampart Field could represent human occupation of the area approximately 600,000 years ago. These sites provide the earliest evidence for Acheulean handaxe technology in Britain, and are among the earliest in north-west Europe.<sup>44</sup>

Sediments relating to older terraces are found elsewhere in the Breckland and extend the geological record back further in time. Archaeological evidence is lacking, other than a possible struck flake from Hengrave,<sup>45</sup> which might suggest an earlier human presence in the area.

<sup>44</sup> Moncel *et al.*, 2015

<sup>45</sup> Rose & Wymer, 1994



Three distinct typological components can be identified within the Breckland Bytham River assemblages (*Fig. 3b*). The first group consists of crude, thick handaxes that appear to have been manufactured by removing relatively large, bold flakes, probably with a hard stone hammer. These are common among the second terrace assemblages from Maids Cross Hill and Brandon Fields, but are also a significant component of the Warren Hill material where they are typically rolled. A second group consists of relatively refined ovate and cordiform handaxes, which display evidence of flaking using a soft hammer, such as antler or bone. These are found in fresh condition in the gravels at High Lodge and form the greater part of the Warren Hill assemblage where they are typically fresher than the cruder forms. The third group consists of a series of elaborate scrapers with unusually invasive retouch. These are most numerous at High Lodge, where they were excavated from the floodplain sediments and are found in fresh condition. However, small numbers of similar but rolled scrapers have also been found at Warren Hill, Brandon Fields and Maids Cross Hill.

The different typological groups might represent the introduction of distinct tool-making traditions by different groups of humans, potentially originating from different source areas on mainland Europe.<sup>46</sup> A key aim of the current project is to investigate the relationship between the different artefact groups. It is notable that the Breckland assemblages are quite different from the simple core and flake working found at the earlier East Anglian sites of Pakefield and Happisburgh Site 3, which respectively date to 700,000 and over 800,000 years ago.<sup>47,48</sup>

### Hoxnian Interglacial sites

The Hoxnian interglacial is the warm stage that immediately follows the Anglian Glaciation. It lasted for approximately 30,000 years, from around 420,000 to 390,000 years ago, and, in general terms, is characterised by a climate comparable to the present.<sup>49</sup> The transition from the Anglian to the Hoxnian is also marked by significant changes to the palaeogeography of Britain, most notably the breaching of the Weald-Artois anticline and the formation of the Strait of Dover.<sup>50</sup> This event begins the cycle of Britain's periodic island status during periods of high sea-level versus its status as a peninsula of mainland Europe during periods of low sea-level. However, during the Hoxnian there is some evidence of a landbridge across the southern part of the North Sea Basin.<sup>51,52</sup> The archaeological record of the Hoxnian consists of two stone tool assemblage types, one that lacks handaxes and is termed 'Clactonian' after the type-site at Clacton, Essex, and assemblages with handaxes and therefore assigned to the Acheulean. The relationship between these two assemblages has long been a subject of debate.<sup>53,54,55,56</sup> The Breckland provides key information for understanding this relationship, as well as rare evidence for another component of the technological repertoire of human groups at this time, namely controlled fire-use.

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<sup>46</sup> Moncel *et al.*, 2015, p.321

<sup>47</sup> Parfitt *et al.*, 2010

<sup>48</sup> Parfitt *et al.*, 2005

<sup>49</sup> Candy *et al.*, 2014

<sup>50</sup> Gibbard, 1995

<sup>51</sup> Meijer & Preece, 1995

<sup>52</sup> Hijma *et al.*, 2012

<sup>53</sup> Wymer, 1968

<sup>54</sup> Wenban-Smith, 1998

<sup>55</sup> Ashton *et al.*, 1998

<sup>56</sup> McNabb, 2007



In East Anglia, the retreat of Anglian ice sheets left a till-covered landscape with numerous lake basins and an emergent drainage network. Sediments infilling the lake basins preserve floral and faunal evidence that allows environmental reconstruction and provides a framework for inter-site correlation and comparison, while stone tools and cut-marked bones found within and at the fringes of the water-bodies provide evidence of human presence and behaviour. In the Breckland, Hoxnian archaeological assemblages have been excavated at East Farm Barnham, Elveden and Beeches Pit.



Figure 4.  
Ongoing excavations  
at East Farm,  
Barnham.  
Photo:  
Jordan Mansfield

The former brickpit at East Farm, Barnham, has been the subject of four phases of excavation: Paterson's investigations from 1933 to 1936,<sup>57</sup> Wymer's excavation in 1979,<sup>58</sup> British Museum-led excavations from 1989 to 1994<sup>59</sup> and most recently our own ongoing work that started in 2013<sup>60</sup> (Fig. 4). Together, they have revealed the presence of a steep-sided subglacial meltwater channel, initially infilled with glacial sands and gravels and till. A basin formed on the surface of the till and infilled with fine-grained, interglacial sediments. In the centre of the basin, these sediments are calcareous and preserve organic remains, such as pollen, molluscs and vertebrates, which suggest a slow-moving to still body of water that gradually

57 Paterson, 1942

58 Wymer, 1985

59 Ashton *et al.*, 1998

60 Ashton *et al.*, 2016

dried out, surrounded by grass and deciduous vegetation with warmer summers than present.<sup>61</sup> These deposits can be attributed to pollen zone II of the Hoxnian interglacial (Holl).<sup>62,63,64,65,66</sup>

The majority of the archaeology is found along the southern margin of the basin in association with a lag gravel, which would have provided the raw material for stone tool manufacture. The condition of the artefacts and the presence of some refitting knapping sequences indicate that much of the material is in primary context. Two technologically and chronologically distinct assemblages have been identified<sup>67</sup> (Fig. 5). The earliest material comprises cores, hard hammer flakes and flake tools, and has traditionally been assigned to the Clactonian.<sup>68</sup> A later phase of human occupation, separated stratigraphically from the earlier material, is characterised by the presence of artefacts relating to the manufacture of Acheulean handaxes.

At the old Brickyard Pit at Elveden and at Beeches Pit, a former clay pit in West Stow parish, only Acheulean assemblages have been recognised. The situation at Elveden is remarkably similar to Barnham.<sup>69</sup> An interglacial sequence occupies a basin formed on the surface of a glacial till. A lag gravel is present at the margins of the basin, providing the major source of raw material for stone tool manufacture. The archaeology, which was excavated from five areas of the site, is typically found either in association with the lag gravel or on a stable land surface that formed as the basin gradually dried out. Handaxes or flakes characteristic of their manufacture were present in all of the archaeological assemblages at Elveden, which can therefore all be attributed to the Acheulean.

The situation at Beeches Pit is quite different from Barnham and Elveden, primarily because the archaeology is not associated with a fluvial setting. The Pleistocene deposits occupy a deep hollow cut into the Chalk bedrock that is likely to be a subglacial channel infilled with brecciated chalk and glacial sediments. On the north-west side of the pit the glacial sequence is overlain by a series of fossiliferous, temperate deposits rich in molluscan and vertebrate remains, located immediately to the south of a Chalk bluff that would have provided a source of good quality flint raw material. Together, the sedimentary and organic evidence indicates the presence of small pools of water, at times fed by fresh water springs, in a temperate deciduous forest.<sup>70,71,72</sup>

Archaeological excavations conducted by the University of Liverpool<sup>73</sup> recovered a large Acheulean stone tool assemblage comprising cores, flakes, flake tools, handaxes and handaxe roughouts. They also identified clear areas of burning, marked by burnt flint with calcined bone and shell, which lay in shallow basins, lined by burnt sediment. They occurred as a series of distinct features, some of which intersect to create a relationship between the burning events. These have

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61 Parfitt, 1998  
 62 Lewis, 1998  
 63 Preece & Penkman, 2005  
 64 Parfitt, 1998  
 65 Voinchet *et al.*, 2015  
 66 Hunt, 1998  
 67 Ashton *et al.*, 2016  
 68 Wymer, 1985, p.121  
 69 Ashton *et al.*, 2005  
 70 Preece *et al.*, 2007  
 71 Voinchet *et al.*, 2015  
 72 Penkman *et al.*, 2011  
 73 Gowlett *et al.*, 2005



Figure 5.  
Examples of artefacts excavated at East Farm, Barnham. a) soft hammer flakes from area IV (4).  
b) hard hammer flakes from Area VI. Photo: Rob Davis courtesy of the British Museum

been interpreted as a repeated series of hearths that over a short period of time migrated c.2m to the northwest. The refitting of three burnt flakes onto an unburnt refitting group shows the likely contemporaneity of artefact manufacture with the fire and therefore provides strong support for the interpretation of hearths. This constitutes the oldest evidence for human use of fire in Europe.



The human activity at Beeches Pit can be interpreted in the landscape context of the site. The Chalk bluff to the immediate north of the site provided an abundance of flint raw material. The protection that the Chalk afforded on the edge of the Lark Valley in combination with the freshwater springs and pools would have been an ideal habitat for humans. Most other *in situ* Hoxnian sites, such as Barnham and Elveden, are found in fluvial contexts, which is in part a reflection of the rich animal and plant resources in these situations, but also because of access to stone raw material for tool manufacture.<sup>74</sup> They could therefore be simply interpreted as manufacturing areas. Beeches Pit is unique in Britain for providing evidence of habitation from the evidence of the hearths, reflecting more permanent settlement.

The rich organic records at Barnham and Beeches Pit enable their archaeological records to be correlated with other key Hoxnian sites in Britain with a high degree of resolution. Taken together, the British Hoxnian sites indicate the presence of two different groups of humans that occupied Britain during the interglacial, an earlier group with a stone tool technology that lacked handaxes, and a later group with this technology and controlled fire-use. Comparison of the British and European records suggests that the two groups may have originated in different parts of Europe, with the first group arriving from central Europe, followed some time later by a group from western Europe.<sup>75</sup>

### **Sites associated with the rivers Lark and Little Ouse**

The final set of Breckland sites are those associated with sediments deposited by the rivers Lark and Little Ouse. Both the geology and archaeology are poorly understood and will therefore be a major focus of the current project. As described above, the modern drainage network was established following the retreat of Anglian ice sheets, so the associated fluvial sediments are likely to span the period from the late Anglian/early Hoxnian to the present day. As with the Bytham deposits, these sediments were deposited as a series of terraces that chart the progressive migration and downcutting of the rivers. Where the terrace sediments contain archaeology, the terrace framework can provide a means of assessing patterns of change through time.

There are, however, a number of complicating factors. First, in many places the terraces are not well defined, at least when surface contours are considered. This may be a result of the sandy character of the Breckland fluvial deposits and therefore their susceptibility to erosional processes that degrade the terrace-forms.<sup>76</sup> A consequence of this is that the distribution of different terrace bodies is not well understood. A second issue is uncertainty over the provenance of some of the archaeological assemblages. Much of this material was collected from gravel pits during the late nineteenth and early twentieth centuries, and while some collectors maintained detailed records of their collections, others did not. Consequently, there are large quantities of material that are only labelled with fairly general locations, such as a village or even a parish, which cannot be assigned to a specific terrace. A further limitation is the absence of chronological control beyond simple terrace counting. Finally, sites associated with the modern rivers have attracted less attention from the scientific community than the Bytham and Hoxnian sites, with few recent published studies, although work by Richard West<sup>77</sup> at Redhill<sup>78</sup> and

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<sup>74</sup> Ashton *et al.*, 2006

<sup>75</sup> Ashton *et al.*, 2016, p.842

<sup>76</sup> Gibbard *et al.*, 2008

<sup>77</sup> West, 2009

<sup>78</sup> Gibbard *et al.*, 2008



Santon Downham<sup>79</sup> are exceptions. All of these factors combine to mean that this part of the Breckland record is poorly understood.

So what is known? The Palaeolithic record from the terraces of the Little Ouse and Lark is dominated by Acheulean handaxes, which is likely to reflect the preferences of collectors and the conspicuousness of handaxes in a gravel context rather than to be a true reflection of the archaeological content of the deposits. In the valley of the Little Ouse, large collections of handaxes have been found at Barnham Heath, Redhill, Santon Downham and Broomhill Gravel Pit.<sup>80</sup> In contrast, the valley of the Lark has produced numerous sites but none with such large assemblages. The handaxes are likely to represent human presence in the Breckland during the Hoxnian interglacial and the subsequent interglacial around 320,000 years ago. It has been suggested that there is variation in handaxe typology between some of the sites across the area: for example, pointed and sub-cordate forms are dominant at Redhill and Broomhill Gravel Pit, twisted ovates are present at Santon Downham,<sup>81</sup> and many fewer pointed handaxes are known in the Lark valley in general.<sup>82</sup> It is possible that these observations identify in the Breckland an expression of broader patterning of handaxe variation through time that has been recognised elsewhere in Britain and argued to reflect different traditions of handaxe manufacture introduced to, or developed in, Britain at different times during the Lower Palaeolithic.<sup>83</sup>

There is also some evidence of early Middle Palaeolithic occupation of the Breckland. This period is marked in Britain by the development of a specific core technology called Levallois that produces flakes of a pre-determined size and shape. The Levallois technique first appears in Britain at the site of Purfleet in the Thames Valley around 300,000 years ago and becomes the dominant component of British Palaeolithic assemblages approximately 240,000 years ago. In the Breckland, there are just 26 Levallois artefacts recorded from 18 separate sites.<sup>84</sup> The largest collection comprises eight from Barnham Heath. As noted above, Barnham Heath has also produced a large number of handaxes and the relationship between the two artefact types is currently unclear. It is also unclear when Levallois material first appears in the Breckland and whether the sparse Levallois record reflects low population density during the Middle Palaeolithic or some other factor affecting artefact recovery.

### Directions for future research

The Breckland has long held a prominent position in British Palaeolithic studies and continues to provide fresh insights into the nature of ancient human occupation of north-west Europe. The area is home to key sites for understanding the timing and nature of the earliest Acheulean occupation of Britain and the relationships between human groups, technology and culture during the Lower Palaeolithic. However, there are a number of key questions that remain to be answered by this rich record. With regard to the Bytham River sites, the development of a better chronology for terrace formation and the demonstration of the presence or absence of archaeology from the higher terraces would help to refine understanding of the first appearance of humans in inland areas of Britain. Further, a detailed examination of the relationships between the three main typological components

<sup>79</sup> White, 1997

<sup>80</sup> Wessex Archaeology, 1996

<sup>81</sup> Evans, 1872, p.504

<sup>82</sup> Prigg, 1869

<sup>83</sup> Bridgland & White, 2014

<sup>84</sup> Wessex Archaeology, 1996

of the pre-Anglian archaeological record is required to understand better their significance for the evolution of cultural traits. With regard to the Hoxnian sites, it remains unclear whether an earlier, non-handaxe assemblage might be present at Beeches Pit underlying the Acheulean material, as is the case at Barnham. It is also unclear at present whether the use of fire was a trait of groups with handaxes alone or was also a technology employed by the groups that lacked handaxe technology. A considerable amount of work needs to be done if the Palaeolithic records of the rivers Lark and Little Ouse are to be brought into broader models of human occupation during the Lower and Middle Palaeolithic. In particular, a better understanding is required of the distribution and age of river terraces and the provenance of the archaeological material. Only once this has been established can questions regarding chronological patterning in handaxe typology and the appearance and character of early Middle Palaeolithic occupation be answered.

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# 4

## Using Google Earth™ to investigate Twentieth-Century Breckland Military Sites

*Alan Clarke*

### Introduction

Google Earth (GE) is a freely available Geographic Information System (GIS) application which merges hundreds of thousands of aerial and satellite images to simulate a giant digital globe of the Earth. In some countries, such as the UK, the quality of the imagery available is very high and detailed. This paper describes how, as part of the 2016 Breckland Society project Military History of the Brecks 1900–1949 (part of the Breaking New Ground Landscape Partnership Scheme), we used GE and superimposed images, particularly historical maps and Lidar images, to locate First and Second World War infrastructure much more easily than could be done by fieldwork alone. It focuses on the investigation of three sites:

- The 1944 Desert Rats' base in the High Ash camp area
- The 1916 Elveden tank training area
- The former bombing range at Berner's Heath (which was also part of the tank training area)

We hope to show how other 'citizen archaeologists and historians' can use these same techniques in their local areas, especially as a filter to determine good sites for detailed fieldwork (as some undoubtedly are already doing).

### Background

I have been an enthusiastic user of Google Earth (GE) since its release in 2005. Though not living locally, I have been interested in the Brecks since the early 1970s, but the availability of GE sparked a much deeper interest. With its high-resolution aerial images, it has allowed me to explore the Brecks in much more detail, particularly areas which are shown as undifferentiated forest on OS maps.

Some features of GE facilitate the task of finding, mapping and recording landscape features:

- Google regularly adds new images, but it keeps all the old ones. You can select a date and see the aerial view taken closest to that date
- Google is also adding historical images, specifically those taken by the RAF in 1945–46. Coverage of the Brecks is partial, but improving. Military infrastructure (especially airfields) is often very prominent
- You can accurately overlay your own images, such as old maps, and change their opacity so that you can see them superimposed and thereby locate old features
- Some old features cannot be seen directly, but are hinted at by variation in



the vegetation cover, e.g. bare earth vs. heather vs. grass. Seasonal changes can also reveal features. This is a long-established archaeological technique

- You can get precise coordinates for any location; the GPS facilities on most smartphones will then help you navigate to within a few metres of that point

### **Brief history of the High Ash camp area**

High Ash lies west of the A1065, 2km north of Ickburgh. It is the site of the Desert Rats memorial, and the annual Desert Rats Association reunion and parade. Most of the area is either owned or leased by the Forestry Commission. (See also *A Fieldwork Study of former Desert Rat camps in the area of High Ash*, pp. 9–18).

High Ash has been forested since the late 1920s. In the early 1940s, the War Office started the construction of a large camp, to serve as a base for mechanised units to live and train in the art of tank warfare, particularly in the months leading up to D-Day. The tank training was carried out in the area north-east of High Ash inside what is now STANTA (Stanford Training Area, previously known as the Stanford Battle Area). Between 1940 and 1942, civilian contractors constructed hundreds of individual buildings on the site, mostly the smallest standard size of Nissen hut (16ft, 4.9m wide). There were also a number of other, larger, single-storey buildings, both Nissen-style, brick-walled and temporary, such as NAAFIs, cookhouses and vehicle maintenance facilities.

Most accommodation huts were built underneath the cover of the trees, presumably to remain hidden from aerial reconnaissance. The medium-sized communal buildings such as the NAAFI and cookhouses were on the edges of rides and roadways. The very largest structures, such as those used for vehicle maintenance, were in the open but presumably well camouflaged.

Shakers Wood was first planted about 1928, so the original trees would have been about 12–15 years old when the huts were built. It was subsequently felled and replanted in 1960. Soldiers lived 18 to a hut, with draughty doors, no insulation and only a small stove for heating. It was a miserable place during the winter of 1943–44, as Leslie Paul records in his book *Heron Lake*:

‘October 27th, 1943. Torrents of rain yesterday. Today one slides about in the light waterlogged soil as though slushing through chocolate blancmange. Our Nissen hut is built on a concrete base. But this is not very thick and rests on soil which is little better than a marsh at this time of year. Ominous bulges have appeared in the floor... The hut is wet enough anyway. Battledress trousers I thought I was pressing under the straw mattress are stiff with damp and covered with green mould. I hurriedly turned out my kit bag. My black boots are white with mould and everything at the bottom is green and stinking with damp rot.’

### **Use of Lidar In the High Ash area**

Lidar is very similar to downward-pointing radar, but uses laser light rather than radio waves. An aircraft flies a straight, level course over an area, scanning the ground with a laser, and recording all of the echoes. After much computer processing, one output can be a very precise three-dimensional (3D) terrain model of the underlying ground, stripping away the vegetation cover. Even tiny changes in ground level can be seen and exaggerated. Wikipedia provides a comprehensive description of how Lidar works.



We were very fortunate in that the Forestry Commission provided us with high resolution Lidar images of the whole of Thetford Forest, including High Ash. An extraordinary level of detail can be seen; even the ‘fossilised’ tracks left by Forestry Commission vehicles decades earlier are visible on Lidar, despite being completely invisible at ground level.

The first site we investigated was Shakers Wood; the bases of about ten Nissen huts at the northern end of the wood had already been cleared, and we could therefore compare how these appeared on Lidar with other suspected locations in the wood. The Lidar images were loaded into GE as overlays, and positioned, rotated and scaled until multiple reference points on each overlay coincided with clearly visible ground features.

As mentioned earlier, it is changes in elevation that really show up on Lidar. A flat concrete slab level with flat surrounding ground is hard to make out. But when the contractors levelled the ground for each concrete base in Shakers Wood in the early 1940s, they simply piled up earth into linear spoil heaps about 30–50cm high, surrounding the concrete; in wartime there was every incentive to get the job done as quickly as possible. In Lidar terms 30cm is a large height difference, so these rectangles of spoil leap out of the images.

With just a few hours’ work we found strong Lidar evidence of at least 66 Nissen hut concrete bases in Shakers Wood (*Fig. 2*), and hints of a few more. Almost all were a standard 16ft × 36ft (4.9m × 11m). These huts were known to house 18 men each, a total of almost 1200 soldiers.

To confirm our findings, we visited a number of both the obvious and the less obvious locations that we had identified. All were found to be genuine; there were no false positives. This made us confident about using the same techniques elsewhere on the site.

By knowing where the hidden bases were, we soon developed an eye for finding them in the wood. Our investigations were done mostly during April, and we soon realised that in spring most of the bases were covered with fresh, bright green nettles. The presence and extent of the underlying concrete was proved by using a metal probe.

We also investigated the Lidar for the Quadrilateral Covert (*Fig. 5*), Dixon’s Covert, Spring Covert and Sugar Hill areas of the site. Hut bases in these areas proved slightly more difficult to detect. We can speculate that this is due either to the ground being disturbed post-war, and the concrete being grubbed up, or to the fact that the contractors who built in these areas were not so consistent about simply piling up the spoil next to the concrete bases. Nevertheless, including Shakers Wood, we located a total of almost 200 definite or likely Nissen hut bases—enough to house over 3500 men.

As a final step, we superimposed aerial images of current-day Nissen huts at Bodney Camp onto the confirmed locations in Shakers Wood, to give a clearer impression of the layout of the huts (*Figs. 3 & 4*).<sup>1</sup>

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<sup>1</sup> All of the non-copyright data we added to Google Earth will eventually be available to download via the Breckland Society website, [www.brecsoc.org.uk](http://www.brecsoc.org.uk).



Figure 1.  
Shakers Wood viewed in  
Google Earth.  
© Google



Figure 2.  
Lidar image of Shakers Wood,  
opaquely overlaid in Google  
Earth. Dozens of hut bases are  
clearly visible.  
© Crown Copyright. Forest  
Research. Based upon FC England  
and Fugro Geospatial Data.



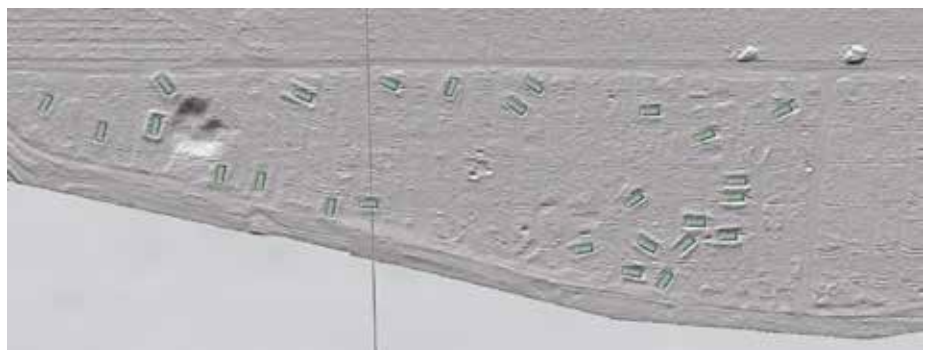
Figure 3.  
Scale images of a real  
16ft x 36ft (4.9m x 11m) Nissen  
hut superimposed.  
© Crown Copyright. Forest  
Research. Based upon FC England  
and Fugro Geospatial Data.



Figure 4.  
Lidar layer switched off, showing  
hut images superimposed on the  
wood.  
© Forestry Commission and  
Google.



Figure 5.  
More huts in Quadrilateral  
Covert. Lidar images of hut  
bases were much less distinct  
in this area, and there may have  
been many more huts than we  
identified.  
© Crown Copyright. Forest  
Research. Based upon FC England  
and Fugro Geospatial Data.



### The 1916 Elveden Tank Training Area

In 1916, the War Department needed somewhere large and discreet to test their new secret weapon, the tank, and to train the crews and develop tactics. They acquired a large area of the Elveden Estate from Lord Iveagh and, under the direction of Lt Col E.D. Swinton, built an accurate replica of a section of the Western Front trench system in what is now The King's Forest and centred on North Stow Farm. Over a million sandbags were used in this gargantuan effort (Pugh, 2014). One hundred years later, we could find no documented visible remains of this massive infrastructure, so we set out to see what we could find using the techniques described earlier.

At the Tank Museum in Dorset, Roger Pugh had photographed the original 1916 map of the trench system for his book. But it had not been laid perfectly flat, and had been photographed obliquely, so that image was not suitable as an overlay. Luckily, we subsequently obtained a much less distorted photograph of the map.

This time we superimposed two 'layers' on the GE backdrop—the Lidar images and the photograph of the 1916 map. We first aligned the Lidar with the GE aerial images, as they in theory should be easy to align very closely. As the image of the 1916 map was still slightly distorted, we used a large number of reference points to align and scale it to produce a 'best fit' relative to the other two backdrops (*Fig. 9*).<sup>2</sup>

Next we hid the aerial images, leaving the map semi-transparently superimposed on the Lidar, and looked for locations where there was a clear indication on Lidar of a ground feature (excluding roads, rides, etc) closely matching a man-made feature on the map (*Fig. 10*).



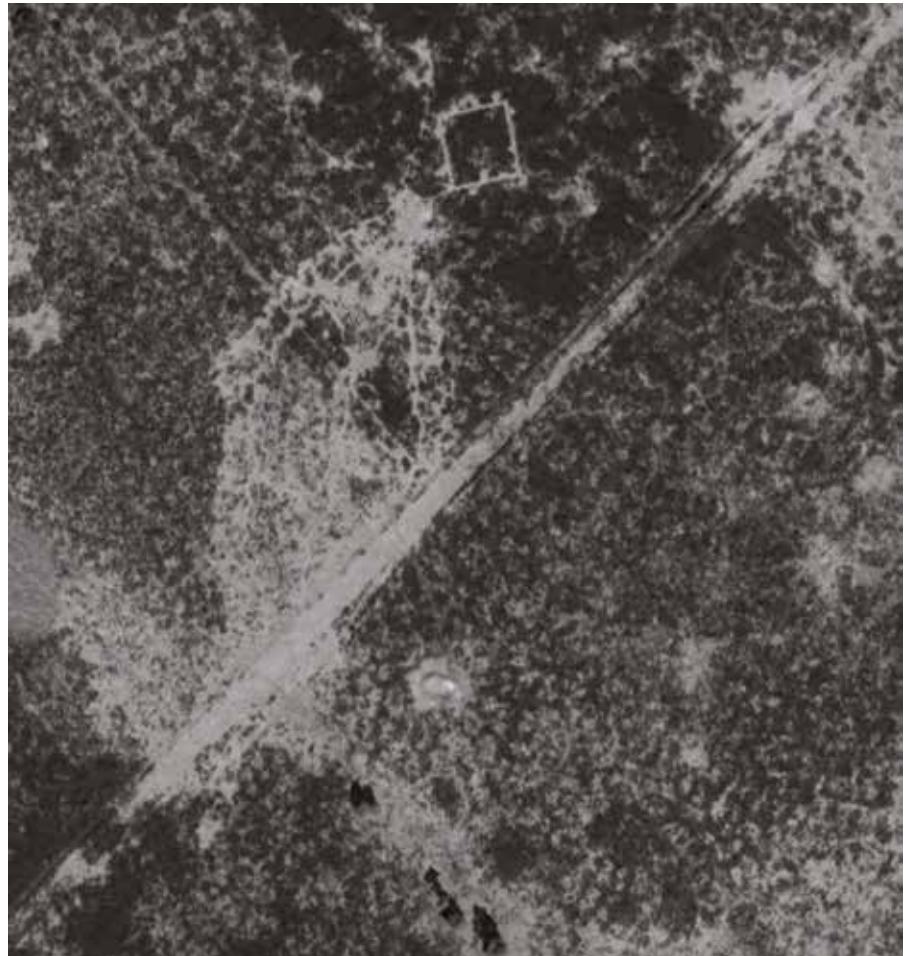
*Figure 6.*  
1916 map of the trench system in the SW corner of Berner's Heath, opaquely superimposed on the Google Earth 2005 image.  
© Google.

<sup>2</sup> Professional GIS systems, e.g. ESRI's ArcInfo, provide sophisticated tools for fitting images to maps.





*Figure 7 (right).*  
Google Earth 2005 image of the same area of Berner's Heath as *Figure 6*. Traces of the old trench system can clearly be seen in the vegetation patterns, below and to the west of the 1940s square target, which is c. 30m x 30m. The roughly elliptical trench system is c. 190m x 85m (image rendered in monochrome to emphasise contrast). © Google.



*Figure 8 (below).*  
Berner's Heath in 2008, showing the Second World War bombing targets. Image rendered in monochrome for enhanced contrast. © Google.





Despite the large area of the site, we found only one—but that leapt out. A fragment of a communication trench, about 80m long, with a very characteristic sine wave shape, crossed the B1106 a few hundred metres north of the entrance to North Stow Farm (*Fig. 11*). When we located it on the ground, it was only just visible as a slight depression, no more than 15–25cm deep. Intriguingly, at some stage a ‘grip’ had been cut in the roadside bank on each side and the trench was co-opted into the road drainage system. This must have been first done when the trench remnant was a much more obvious feature.

We hope it may be possible to professionally excavate a cross-section of this trench, simply to confirm its identity from its profile.<sup>3</sup>

### **Berner’s Heath bombing range**

Berner’s Heath (due south of the Elveden War Memorial) was used as a bombing range from before the Second World War until 1943. Inert bombs, typically filled with concrete, were dropped from up to 20,000ft (6000+ metres). It was also used as a low-altitude dumping ground where aircraft returning to base, perhaps damaged, could jettison their unused bomb load shortly before landing.

‘There were very specific instructions concerning what to do with any bombs that were not dropped on the target, with jettisoning only being done when absolutely necessary, and with the bombs made safe first.’<sup>4</sup>

It was reactivated after the war, and when the War Office lease expired in 1956 it was returned to the Elveden estate. Almost 75 years later, it remains pitted with very obvious large craters.

As it is not Forestry Commission land, no Lidar was available,<sup>5</sup> so we had to use just the 1916 map superimposed on GE images. The 1945–46 images clearly showed multiple bombing targets (a circle with crosshairs and a square, both about 100ft across, and a 500ft-long ship) and traces of them can still be seen in contemporary GE images.<sup>6</sup> Those from 2003–06 are perhaps the clearest (*Fig. 8*).

The targets were made by filling a shallow trench with crushed chalk. After the range was abandoned, acid-loving heather found it hard to recolonise the alkaline chalk. Instead, short grasses flourished, ‘branding’ the target shapes onto the landscape. They can all still be easily located on foot.

However, our interest also lay in the fact that part of Berner’s Heath formed the western edge of the 1916 tank training area. When we superimposed the 1916 map, tantalising hints of the extreme south-west corner of the 1916 trench system were clearly visible in the vegetation (clearer in some years than in others, see *Figs. 6 & 7*). We subsequently found a 1957 RAF aerial photograph<sup>7</sup> on which all three ‘tadpole-like’ trench systems on the extreme west of the tank area are very clearly visible, as is a very distinct ‘sawtooth’ trench fragment.

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<sup>3</sup> It is highly unlikely that any artefacts would be found in such an excavation.

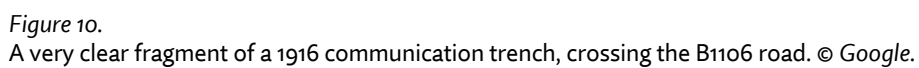
<sup>4</sup> Bond, 2014.

<sup>5</sup> We are currently investigating the availability and usefulness of Open Data Initiative Lidar data.

<sup>6</sup> Snarehill airfield was a Q-site (decoy airfield) but this use was discontinued in 1942. In 1943 the Berner’s Heath bombing range was abandoned and recreated at Snarehill. The same targets—square, crosshairs and ship—can be seen at Snarehill on the 1945–46 GE images. A railway line target, for practising the technique of diagonal stick-bombing, was also created. However, no targets can be seen on contemporary images as the land is now used for arable farming.

<sup>7</sup> Historic England image RAF\_58\_2688\_f21\_93 dated 25/1/1957.

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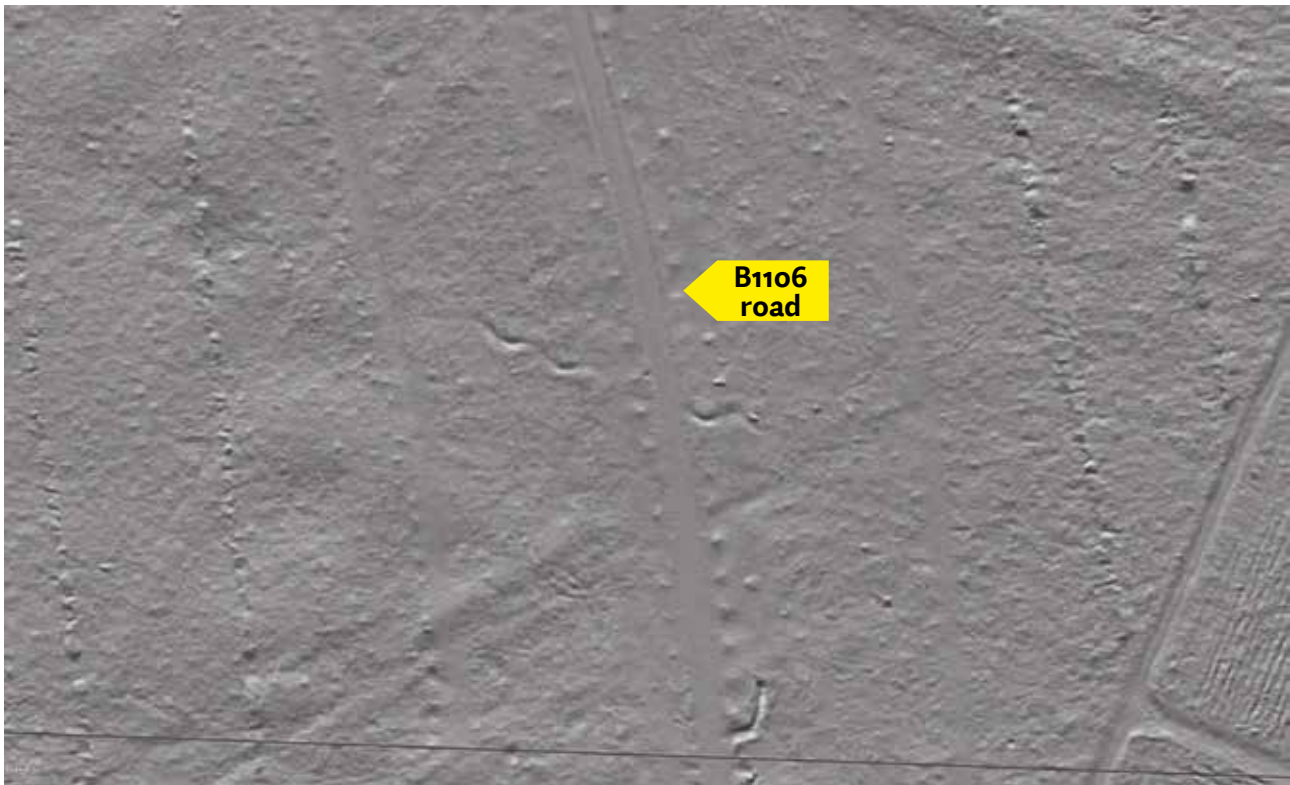


Figure 11.

The Lidar and 1916 trench maps semi-transparently superimposed on the current day Google Earth image. There is an almost exact match between the map and the Lidar. © Crown Copyright. Forest Research. Based upon FC England and Fugro Geospatial Data.

We hope to get permission from the landowners to overfly this area with a camera drone on several occasions in different seasons, to see whether we can get better aerial images of the trench system vegetation patterns than are available on GE. It would also be very interesting to have a small section of this feature excavated to reveal the trench profiles and means of construction.

### Postscript

The volunteers who carried out this work became very enthused with the rich military history that surrounds us in the Brecks, and a Brecks Military History Group within the Breckland Society will continue researching the area in the coming years, in particular the rich Cold War history of the area. The UK Government's Open Data Initiative, which is making many terabytes of geographical data, including Lidar, freely available to the public should enhance our efforts, and those of like-minded enthusiasts throughout the UK.

We should like to thank Pat Reynolds, Julia and Tony Grover, Peter Goulding, Anna Scott and Paul Allen for their contributions to this work.

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## The Diary of Frank Norgate (1842–1919)

Barbara Pritchard

*When shooting our young Rooks we bagged one of a bluish grey colour, without any black, (I stuffed it) at Sparham Rectory. The very first entry, 10 May 1858.*

The inscription inside the cover of Frank Norgate's diary, which runs from 1858 to 1902 and comprises more than a thousand pages, is most apt: "What is hit is history. What is missed is mystery." In literal terms the diary represents countless killings. As an aphorism it reflects the lifestyle of someone who, despite his chronic asthma, wasted no opportunity to meticulously observe, record and share with others his wide-ranging observations and findings of the natural world and man's creative use of its resources. Norgate penned his first entry in the hefty tome that became Volume 1 when he was 15 years old. The final entry, just before his 60th birthday, left much of Volume 2 blank and presented no obvious reason for the cessation. Entries, however, span his 45 years as an active field naturalist, 25 based in Sparham just north of the Brecks, five at their very heart in Downham (in Suffolk, then distinguished from Santon, just across the Little Ouse in Norfolk), and 15 in Bury St Edmunds from which he explored the southern Brecks. "The vast warrens of the 'Breck', the woods and water-meadows of the valley of the Little Ouse, and the neighbouring Fenland between them made an ideal training ground for a naturalist."<sup>1</sup>

Norgate's obituary in *British Birds* Vol. XIII June 1919, judged him "one of Norfolk's most painstaking and accomplished field naturalists", asserting "it is a pity that Norgate's notes and observations have not been placed in permanent book form by him, his extreme modesty making him content to impart his knowledge to others." This remains the case and still waits to be done, this paper hopefully going some way to gaining recognition for Frank Norgate and the value of his observations, especially regarding Breckland's ecology and archaeology. They make fascinating reading on many levels and his often tiny ink drawings throughout are both informative and charming. Moreover, the diary is an important historical resource as yet largely untapped and freely accessible at Norfolk Record Office.

I first came across the diary in 2014 while transcribing selected pages for The Breckland Society's *Flint in the Brecks* project, within the Heritage Landscape Partnership's Breaking New Ground scheme for The Brecks. With its many flint references, the diary was discovered at Norfolk Record Office (MC 175/12–13, 638X2) by retired archivist and Breckland Society member Kelvin Smith.

Revisiting its pages, I wanted to know more about Norgate himself, finding that as the eldest son of Canon Thomas Starling Norgate, Frank lived at Sparham Rectory until 1882 when he married Helen Marian Golding Bird ('H' in the diary)

<sup>1</sup> Wollaston, A.F.R (1921) regarding Alfred Newton (1829–1907) growing up at Elveden Hall, Suffolk. *Life of Alfred Newton: late Professor of Comparative Anatomy, Cambridge University 1866–1907*, p.4.



Abies	Robin Hawk (See Crossbill)	Sandpiper, Common 95, 96, 101, 123, 163, 201, 209, 607, 609, 610, 670.
Aln	Rocket (See)	Sandpiper, Green 73, 92, 125, 136, 137, 201, 284, 287, 288, 325, 331, 411, 412, 413, 415, 421, 423, 627.
At	Roe deer 85, 97, 98, 115, 689.	Sanicula 348, 403, 459.
Bat	Rodd 311.	Sanfoin 340, 611.
B	Rotten apples 332, 333, 349, 390.	Santonine 434.
Bul	Rook 1, 2, 3, 9, 22, 27, 81, 88, 94, 95, 111, 118, 128, 129, 130, 138, 139, 147, 148, 154, 159, 160, 180, 221, 222, 258, 289, 290, 291, 294, 298, 320, 324, 327, 330, 333, 367, 385, 386, 388, 389, 391, 396, 401, 404, 442, 443, 444, 445, 446, 448, 454, 456, 463, 464, 510, 511, 512, 587, 576, 526, 537, 545, 603.	Sap 325, 325.
Can	Rook (black face) 372, 394.	Saponaria 350.
Cho	Rook (black) 165.	Saperda 447, 448, 472, 503.
Cy	Rosary 285.	Saprolegnia 519, 521.
D	Rosa 102.	Satellitia 290, 295, 315, 317, 331, 332, 367, 368, 369, 387, 388, 389, 390, 392, 426, 429, 463, 487, 488, 488, 490, 504, 507.
Da	Rosemary 496, 576, 524, 589.	Sauca 278, 313, 314, 315, 424, 499.
Da	Rosa 346, 348, 388, 389, 486, 488, 464, 465, 494.	Savin 594.
La	Rose beetle 305.	Saw 193, 660, 703.
Dec	Rose (John) 4.	Sawn (Big) 48, 49, 50.
De	Ross 304, 363, 418.	Sawfly 276, 385, 400, 401, 404, 405, 416, 456, 459, 464, 465, 466, 474, 610.
J	Road 191.	Saxifraga 333, 388, 392, 449, 452, 502, 508, 511, 565.
J	Rushford 545.	Scandix 494, 511, 565.
J	Rubricata 428, 622, 673, 674, 675, 676, 677.	Scilla 57, 365.
J	Rubricollis 356, 360, 361, 362, 364, 406, 460, 461, 462, 463, 465, 468, 483, 504.	Scilla 511.
J	Rubricosa 110, 111, 294, 322, 333, 389, 390, 392.	Scleranthus 544, 548, 549.
J	Rubi 310, 419, 420.	Scleroderma 268.
J	Rubi 134, 135, 276, 301, 315, 365, 362, 365, 369, 406, 407, 408, 409, 410, 411, 413, 423, 426, 451, 465, 466, 468, 469, 473.	Schizostylis 497, 225, 295.
J	Rubus 347, 348, 427, 464.	Scoulton 28, 32, 81, 111, 118, 141, 148, 150.
J	Rudbeckia 625.	Scrapper 624, 628, 632, 633, 634, 635, 637, 638, 636, 641, 642, 643, 644.
J	Rumex 347.	Scoter 25, 39, 67, 627.
J	Rumicis 305, 306, 350, 351, 353, 416, 417, 418.	Scutellaria 350, 356.
J	Rumaway 165.	Scutosa 581.
J	Ruff 81, 89, 163, 450, 427, 587.	Scutovertex sculptus 691.
J	Rufina 316, 362, 366, 423, 424, 425, 426.	Sea beans, Black 216.
J	Rupicapra 381, 386, 387, 442, 496.	Seal 53, 102.
J	Ruscus 355, 694.	" Gray 50, 505.
J	Rushes 355, 359.	" Fur 542.
J	Russata 362, 587.	Sea much 200.
J	Russula 211, 271, 272, 276, 302, 315, 411, 413, 427, 471, 490, 617, 618.	Sea weed 200.
J	Saddlebags 311.	Sea serpent 282.
J	Sagaritis incisa 529.	Sea sickness 443.
J	Sampshire 52.	Second sight 570.
J	Sagina 545.	Sedgeford 83.
J	Sanderling 399, 405.	Sedum 477.
J	Sandhopper 53.	Seebohm 281, 535.
J	Sandgall 34.	Segatum 310, 313, 350, 351, 474, 476, 477, 481, 488.
J	Sagittaria 414, 537, 622.	Selene 151, 172, 302, 345, 407, 411, 617, 618.
J	Salt 204.	Semibrunnea 316.
J	Salix 271, 354, 469, 470, 471, 473, 581.	Senecio 309, 319, 328, 348, 349, 383, 411, 437, 494, 495, 497, 536, 622, 623.
J	Salix 110, 289, 294, 300, 302, 303, 387, 389, 390, 391, 392, 419, 420, 434, 502, 504, 581, 599.	Senex 353, 354, 410.
J	Salamander 34.	Serratula 355, 417.
J	Salmo 402.	Senecle 173, 274, 355, 357, 359, 418, 586, 622, 623, 674.
J	Salicornia 483.	
J	Salhouse 173, 395.	
J	Samolus 617.	
J	Sandy 315.	
J	Sandhills 250, 353.	
J	Sandpiper, Purple 6, 24, 72.	
J	Sandpiper, Bartram's 142.	
J	Sandpiper, Curlew 73, 370.	

Does over figures signify the number of entries of the word on that page.

Figure 1.  
A sample of the diary index.



in Kensington. They set up home together at Downham, where daughter Helen Roxalana was born in January 1884. For a while, reading of H. Roxalana “covered in fine hair” and later “focussing on a flower head”, I visualised an obscure lepidoptera specimen rather than a baby daughter! The following year, his wife Helen died of peritonitis. In 1887 Frank moved with ‘Little Helen’ to Bury St Edmunds. By 1911 he was remarried and living in Penge, south-east London, with wife Edith Rose, and daughter Helen, by then 27 years old. He died in 1919.

Ornithology, botany and lepidoptera were Norgate’s main interests. His full obituary (see page 66) best summarises his contribution to these specialist areas. His wide-ranging interests, however, also encompassed archaeology, scientific innovation, artefacts, manufacture and craftsmanship, playfully including verbal and mathematical conundrums. With descriptions of trips to London, time spent in the West Country, Scotland and elsewhere, the diary provides insight into life during the Victorian era. It also reflects a key period in the development of modern biology, with private collectors of natural history specimens playing a major role. Darwin’s theories were gaining credence and nearby Cambridge University was becoming established as a centre of major importance with the appointment in 1866 of its first Professor of Zoology and Comparative Anatomy. This was Professor Alfred Newton, one of the first zoologists to support and promote the views of Darwin. Also an ornithologist, Newton had strong connections with the Brecks, having spent his formative years at Elveden Hall, Suffolk. Norgate records interactions with Professor Newton, as well as other notable naturalists in the area, including ornithologist John Henry Gurney, Junior.

That Norgate was so well informed, well connected and using Latin names for species, made me curious about his education. His father (a classicist) and brother were both Cambridge graduates, having attended the Norwich School. Frank’s course is more obscure, which, given his field of study and chronic health problems, was probably not unusual. In the 1851 census he was a ‘Scholar at home’. His parents receive scant mention in his diary and seemed not to share his interests. School holidays were often spent at Beeston Regis shooting with T.W. and J.E. Cremer (probably son and grandson of the Reverend C. Cremer, Cromer Hall, until 1867).

Norgate attended the Norwich School from 1859 to December 1862, records reflecting his own interests rather than lessons attended. From 29 October to 5 November 1862 he was, for example, preparing stuffed birds for exhibition at the Corn Hall and judged second-best to ‘Sayer the birdstuffer’, one of the two judges!

**10 November 1862**

L. Dashwood & I went up the river to Drayton, hard work carrying our boat round Hellesden Mill. Saw Herons, Plovers, Kingfishers, Snipe, Moorhens & 3 Cygnets flying. We aimed at the cygnets as they came past us, within 2 or 3 yards & with difficulty restrained our trigger fingers. We afterwards bitterly regretted that we did not fire as we saw 3 similar Cygnets hanging up in the market afterwards, & we had just as much right to shoot any flying swan as any other bird, but we were not quite sure about this ‘right’ at the time.

By January 1864, aged 21, Norgate was in lodgings at Wyke Regis near Weymouth tutoring junior pupils at the Reverend J. Wilmot Neat’s School. While initially keeping a ‘weather eye’ on Norfolk, he quickly began exploring these rich new

habitats with their fossils and marine life. Field trips with boys are described, but rather as an observing field naturalist than as an actively responsible adult. They make amusing reading. One involves the guard at Portland ferrygate, some straw, an old woman in a cart and two very naughty boys. The other ends with all running for their lives (including a 'Lord R.H.'), having sat too long on rocks surrounded by giant waves. A lucky escape! Unsurprisingly, Norgate did not return to the school after the Easter holidays. After two weeks home-tutoring the Hon. George Bennet (son of Earl Tankeville) following scarlet fever, he ventured west, exploring Penzance, Tresco and more, and descending 540 feet into West Stray Park Coppermine. Subsequent censuses when he was aged 28 and 38 state that he was a 'Student of Natural History'. Helen Roxalana's baptism registration lists him, aged 41, as 'Gentleman'. Aged 49 he describes himself in the census as 'Living on my own means'.

Norgate's diary has many references to two of the chief historical activities in the Brecks: flint-mining and rabbit warrening. As well as recording his countless flint finds, Norgate described "hundreds of old flint pits with big Pines growing in & among them" at High Lodge (13 March 1884) and at Brandon Poor's Land (14 March 1884) he went to the bottom of a pit, providing a rare, contemporary account of pit construction and flint production in the area. The Breckland Society's *Flint in the Brecks* report (2016) includes this, along with Norgate's account of a visit to the Brandon Gun Flint Manufactory (7 March 1884, see Fig. 2). His margin note alongside a knapper's description of flints for horse pistols, carbines and muskets, reads: "The demand for gunflints is said to be increasing again now. They are all supposed to go to Africa." The life of the industry was perhaps extended by the European scramble for African colonies.

The flint transcriptions completed, I returned to the diary to pursue references to rabbits and warrens, prompted by my earlier involvement in The Breckland Society's Warrens of Breckland project of 2008–10. Finding the detailed description on diary page 562 of a warrener at work (Fig. 3) was thrilling.

Also exciting was discovering this reference to Thetford Warren Lodge:

**19 December 1885**

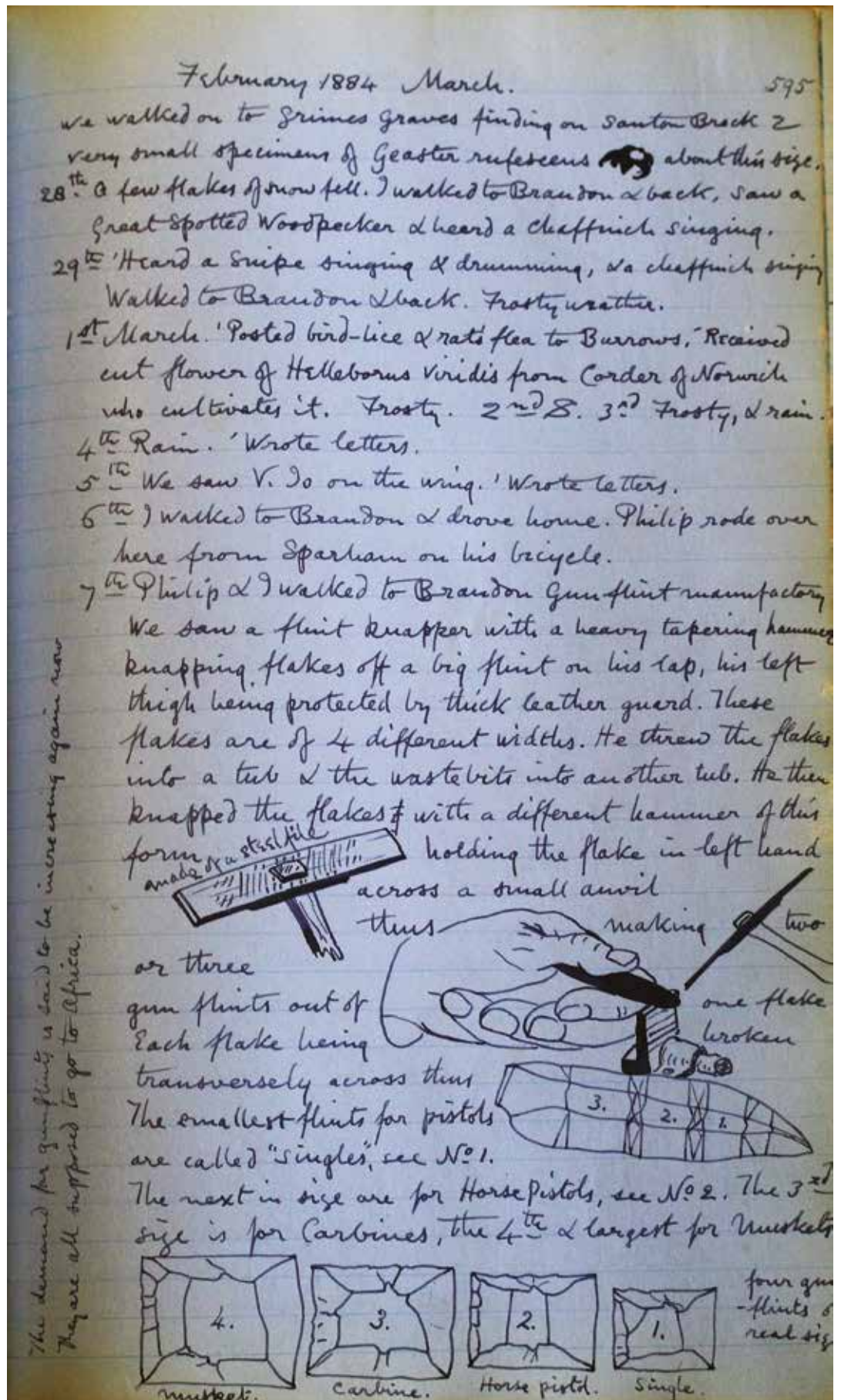
Walked to The Canons (Priory) Thetford & had lunch with Mrs MacKenzie . . . She lent me Hunt's History of Thetford, & . . . walked with me to Thetford Warren Lodge (or Fort) which we looked over. It seems to have formerly been a strong place as if for defence, the windows are narrow slits in very thick walls. [A margin note adds: Winding stone staircase very large rooms & 4 to 6 large bedsteads in one room. Warreners congregate here for preparing big bags of rabbits for market or other purposes.]

During the initial conservation of Mildenhall Warren Lodge during 2000–2002, spearheaded by Anne Mason with the Friends of Thetford Forest, odd pieces of ironwork had come to light in the surrounding area, and, once these were sorted, some bars were found to fit together. To the surprise of the volunteers involved, they produced a bedstead (Fig. 4). Norgate's December 1885 observations from Thetford give support to the bedstead's link with the lodge.





Figure 2.  
Page 595,  
describing a  
walk to Brandon  
'Gunflint  
manufactory',  
with details of a  
flint-knapper at  
work.





on its fragments of nibbled fircones & rabbits' dung.

2<sup>nd</sup> - Our 2 Temple moths laid 60 eggs. We saw warreners killing rabbits by placing nets, on sticks about a yard high, round a plantation which was then beaten through with men & lurchers, a few rabbits were thus driven into the nets & killed by men & dogs, other rabbits which took refuge in their burrows inside the plantation were then dug out, corded ferrets acting as guides. The warrener having put a ferret into a rabbit hole, lies down with one ear flat on the ground over the spot where he thinks the ferret is. He usually puts his ear on the exact spot & digs down at once, but sometimes he has to shift his position & listen on several spots. Sometimes he sticks his long handled spade upright in the ground & applies one ear to the handle; soon satisfied as to the whereabouts of the ferret & rabbits, which he hears scuffling underground, he snatches up the spade (a 7 foot handle with an iron hook at one end & a trowel-like spade at the other) & digs rapidly down to the rabbit & ferret making only a small boring just large enough to pull out the prey from. He then plunges one arm into the hole & pulls out the ferret & rabbit. He sometimes pulls out 5 or more rabbits in quick succession from one hole & throws them behind him dead & hurtled, i.e. neck broken & one hind leg stuck through a slit in the other hind leg, which slit he makes (with the front teeth of the lower jaw of the rabbit) between the bone & tendon achilles. The rabbit's neck is first dislocated by a quick jerk. This killing & hurthing is done in an instant in the act of pulling the rabbit out of the hole. The whole proceeding, from turning in the ferret to the heaping up of the 5 or 8 rabbits from one hole, is done so quickly as to look like a feat of legerdemain. I could rarely see the act of killing or hurthing, as it was done so rapidly that the rabbits seemed already prepared before

Figure 3.  
Page 562, an account of a warrener at work and with an illustration of the long spade used to dig rabbits out from below ground.



*Figure 4.*  
The bedstead found  
at Mildenhall  
Warren Lodge.  
*Photo:*  
A. J. Spidy



The entry for 12 March 1884 describes Rought's Rabbit Factory at Brandon. "Burton showed us the factory & told us they employ 300 hands, many of them girls." Norgate described the process, noting "The felt is used for making felt hats & the shreds of skin for size or some sort of glue." Norgate was drawn to the "beetles and certain species of micro-lepidoptera [which] make sad havoc with the skins in store" and "Tinea iruella, a rare insect, [which is] said to occur in fields in Brandon where the refuse and waste bits of skin & fur are thrown as manure."

In five pages, the diary's first four years to January 1862 retrospectively record Norgate's egg collection, a time when fresh eggs of birds such as Oystercatcher, Redshank and Coot could be purchased on Norwich Market (diary page 3). A margin note expands on "Jackdaw and Blue Rooks" eggs taken at Norwich Cathedral, 23 or 26 April 1861: "up by the 4 spires I was helped by stone masons who lashed two of their longest ladders together, but they were not long enough. To reach the hole & nest, I rashly left the top of the ladders to climb up an iron waterpipe, a staple hook of which gave way & the pipe swung a foot or more from its position. I fortunately was just able to gain the ladder & repent at leisure. The birds' eye view of men & horses made them look like beetles & tortoises."

There followed much honing of shooting skills and killing of birds and small mammals, with Kingfishers, Swifts and pipistrelles among Norgate's victims, and having "killed at one shot 3 long-tailed tits while roosting en masse" (pages 34, 35), he must have been a pretty good shot. The rarer the creature the more he craved it, though on 18 June 1863 wrote: "I shot a pair of Nightjars & saw many more of them on Beeston Regis Heath. (I seem to have slain too many of these innocent insect eaters, but I have not one in really good order for stuffing)."

Norgate latterly did less killing and more breeding (lepidoptera), watching and writing, exchanging sightings with learned friends and enthusiasts. This shift was possibly influenced by Alfred Newton. Particularly interested in extinct bird species, Newton differentiated human causes of extinction from natural processes such as evolution. A prominent member of the Society for the Protection of Birds from 1889 (now the RSPB), he campaigned strongly against feathers used in fashion, and it is his work which underpins current legislation for a closed breeding season protecting stock from depletion.

December, 1870. January 1871. 125.

30<sup>th</sup> Hackford (Therm. 18° at night in Sparham) I shot 2 pheasants, 1 partridge & 4 rabbits. A little snow fell.

31<sup>st</sup> Sparham. Therm. 17° at night. A little snow fell. I shot 1 Red-legged partridge. A long Eared bat was brought to me.

1871 January 1<sup>st</sup> Therm. 21° to 17°.

2<sup>nd</sup> Sparham. Therm. 21° at night. 21° to 24° in the day. I shot 7 partridges & 1 pigeon in 8 shots only.

3<sup>rd</sup> Sparham. Therm. 21° to 30°. I shot a pigeon.

4<sup>th</sup> Hackford. " 28° to about 30°. I shot 1 partridge, 1 Red-legged ditto 3 Hares, & 1 pigeon. & missed or lost 2 or 3 shots.

5<sup>th</sup> Sparham. Therm. 19° at night, 29° at 11 a.m. rain & hail & sleet at the time, 19° to 34° all day. Gabriel Pigott sent me 7 more Shore Larks which I received on the 13<sup>th</sup> inst. very fat. I hid in a small plantation & fired 20 cartridges at Ringdoves in about half an hour & bagged 18 Ringdoves.

6<sup>th</sup> Therm. 26° to 37°. Thaw. Hackford - I shot 3 partridges, 3 Red-legged partridges, 1 rabbit & 4 pigeons, & missed or lost 1 bird & 1 pigeon.

7<sup>th</sup> Sparham. Therm. 32°. I shot 5 rabbits & 1 pigeon & missed or lost only 2 rabbits. C. Stoughton was with me.

8<sup>th</sup> Therm. 29° at night. 9<sup>th</sup> Therm. 27° to 26°. Skating.

9<sup>th</sup> Hackford. I shot 1 Ringdove (fired 1 cartridge only)

10<sup>th</sup> Therm. 24°. 11<sup>th</sup> Th. 27° to 34°. 12<sup>th</sup> 29°. 13<sup>th</sup> 22°. 14<sup>th</sup> 32°.

15<sup>th</sup> " 36° to 33°. 16<sup>th</sup> 35° to 42°. 17<sup>th</sup> 35°. Skating at Sparham.

17<sup>th</sup> Sparham. (Thaw) E. Nelson & I shot 5 rabbits each.

18<sup>th</sup> " H. Hicks & I shot saw about 20 Wildbucks, 1 Green Sand-piper, Seagulls, & the first line Kingfisher I have seen since Xmas day. I shot 1 Water-rail & 1 Siskin.

20<sup>th</sup> Rime frost. Therm. 28°. P. Norgate Skated.

21<sup>st</sup> " " 25° " " & I " & saw Gold<sup>en</sup>eyes?

22<sup>nd</sup> Therm. 32°. 23<sup>rd</sup> 31°. 24<sup>th</sup> 32°. 3 Hoopoes seen at Sparham.

25<sup>th</sup> " 29° to 26°. Snowing. 4 Hoopoes seen in Sparham.

26<sup>th</sup> " 19°. I killed 3 partridges in 2 shots.

Figure 5a.

Figures 5a-d.

Norgate's obituary described him as "an extraordinarily acute and accurate observer", as illustrated here and overleaf by the beautifully observed drawings (Figs. 5a-d, depicting partridges, Shore Larks and Water Rail respectively) which accompanied his diary.





Figure 5b.

Figure 5c.

Figure 5d.



The following two entries, 26 years apart, which concur with 'irruptive' sightings of Pallas's Sandgrouse<sup>2</sup> in Western Europe, possibly reflect this shift in attitude, or perhaps the progress of photography which must also have done much to reduce the slaughter. Either way, they demonstrate how 'connected' Norgate was to contemporary events.

**26 June 1863**

Friday. We (9 guns) went to Blakeney T.W. & J.E. Cremer, W. & B. Upcher<sup>3</sup> went on the landward side of the Cley channel, & the rest of us went on the seaward side. A flock of about 30 Pallas's Sandgrouse flew past T.W.C. (within 10 or 20 yards of him) whilst he was struggling through some deep mud he missed them with his 1st barrel & killed 3 (female's) with his 2nd barrel, they fell in the black mud. J.E.C. killed 1 which flew over him. We had never seen this species before but identified them at once. 2 were given to Upcher. All were sent to Sayer of Norwich to be stuffed.

**28 January 1889**

Boughen sent me 2 photographs which he took of the Didlington Sandgrouse last summer [1888], too minute for me to keep.

Wherever he went, Norgate established himself as a collector, out and about, finding, trading or being given bird eggs, flints, plants, old bones, anything of interest. Wherever he went he explored new habitats, but also found local people of all walks of life, to share his interests, extend his knowledge and skills and help expand his collections. His diary is full of such encounters:

**21 August 1884**

Spent this day at W. Poley's where I met Major Feilden who initiated me in the art of searching for neolithic flint implements on the surface of the stony brecks.

**1 August 1889**

Cycled to Lackford & Icklingham where I called on the Rector Wilkinson who gave me 2 large rectangular stone coffins about 7 feet x 3 feet x 3 feet, both dug up in Icklingham (by Messrs Guilt & Henry Prigg) one is said to have contained a leaden coffin. Each coffin of one stone, each lid one stone slab.

**23 August 1889**

Cycled to Ickworth deer park to inspect the Marquis of Bristol's deer which are dying & killing each other. Out of the usual stock of about 500 Fallow deer ... 260 have died since last June.

[Inserts confirm Norgate's suspicion of rabies, and add that deer were 'attacking tree trunks' and 'the agent tried hard to dissuade me from going among the deer alone'.]

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<sup>2</sup> Native to Central Eurasia, "Irregular irruptions have taken place in western Europe, notably in 1863, 1888 and 1908 as well as in northern China ... etc." *BirdLife International* (2017) Species factsheet: *Syrhaptes paradoxus* by Ashpole, Butchart and Ekstrom.

<sup>3</sup> Possibly Henry Morris Upcher (1839–1921), a naturalist and ornithologist born at Sheringham Hall and who took an interest in the protection of wild birds. When Pallas's Sandgrouse were found visiting England in 1888 he worked to prevent them from being shot by sportsmen. Upcher's Warbler *Hippolais languida* was named after him. [Wikipedia]



**19 September 1889**

I dined with the Chas Kilners at 6.45 meeting J.G. Adami,<sup>4</sup> (practical demonstrator of Pathology) of Christ's College Cambridge, who has just returned from Pasteur's treatment after cutting his finger in examining Ickworth deer dead of rabies. On his way to Pasteur he felt horrible symptoms of rabies & also on his way home after treatment but they soon ceased & he seems quite well & strong.

**21 September 1889**

Adami called & carried off the remains of my collection of Entozoa [microscopic parasitic worms].

**7 July 1893**

Rail to Brandon [from Bury]. At Barnham the station master gave me a clutch of 2 Nightjar eggs taken for me by White the Woodman.

With diary entries ended, an inserted letter written from Keswick Hall by J.H. Gurney reads:

**28 October 1911**

Dear Norgate, On October 9th a very fine Nutcracker was shot in your father's parish of Sparham. I thought you would be interested in hearing of this, it is a female bird and belongs to the thin-billed race.

Norgate was less than forthcoming about his personal business and how his wife Helen entered his life remains unclear. In September 1882 Norgate started house-hunting, inspecting The Elms at Earsham, Mr Wrenford's house at Hillborough and Shipdham Hall with "rooms too many to be worth counting". In early October he and 'H.M.G.Bd' bought a portmanteau and jewellery.

**5 October 1882**

I married Helen Marian Golding Bird. We went to Cambridge.

Spending the 6th at the Zoological Museum and the 7th at the Botanical Gardens, they took the train to Thetford, the Temperance Hotel their base for the next three months while house-hunting.

**19 October 1882**

We drove by Croxton to Downham and saw a dry house with 4 sitting rooms, 2 kitchens, 5 bed rooms, 1 dressing room, 1 store room, 1 washing room, 3 attics & loft, W.C., and brewing loft, & large cellars, many cupboards & shelves, walled in garden. We afterwards hired this together with 2 stables, gighouse, knife cleaning house, & out of door W.C. for £30 a year free of rates taxes & repairs or painting & with water turned on upstairs & downstairs from the Downham Hall reservoir.

This was Bridge House, and page 554 describes their move, between 8 January

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<sup>4</sup> John George Adami, acclaimed British pathologist, had been invited by Dr C Scott Kilner, Medical Officer of Health for Bury St Edmunds, to investigate suspected anthrax among deer in Ickworth Park, which Adami identified as rabies. Having cut his finger on 8 August during post-mortem examination of an affected deer, he underwent the Pasteur treatment in Paris, his account of which appears in the BMJ October 1889.

1883: “We saw goods packed into Whiteleys<sup>5</sup> van”, and 16 January: “We abide at Downham.” Whilst a logistical challenge for them both, for Helen, who was from London, this must have been quite a shock. She gets minimal mention in the diary, only prompted by practicalities around getting married, setting up home, childbirth, and further house-hunting, as far-ranging as Reepham and Ely. This was ongoing at the time of her premature death after just two-and-a-half years, most of it spent under a leaking roof. Helen’s grandfather, father and brothers were eminent surgeons in London, pioneers in their fields. The following entry, when the couple were newly married, is the only hint I have seen that Helen possibly shared either their anatomical or Frank’s naturalist leanings.

### 28 October 1882

I cut a female anchor faced wasp through to kill it. Four & five minutes after this H took up the head (with thorax & wings attached), the jaws were still moving & on putting a hair between the jaws it was neatly severed by them twice.

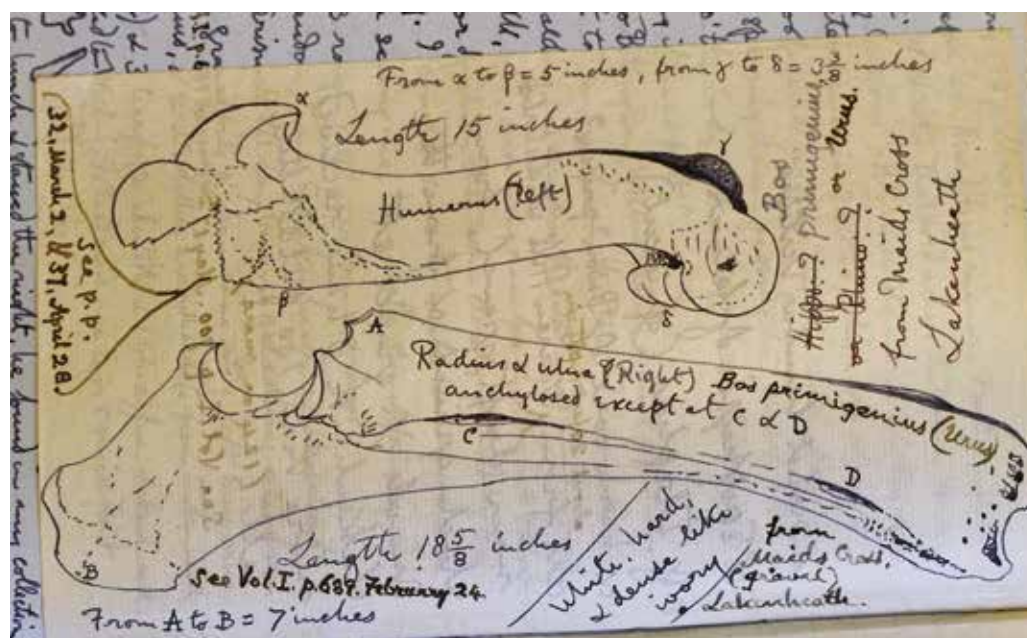


Figure 6. Norgate's records of the bones of *Bos primigenius*, a now extinct wild Aurochs, which were among 22 specimens he donated to the Cambridge University Museum of Zoology.

It is impossible to condense Norgate’s observations without detracting from their impact and value, but through this paper I hope to have whetted appetites. Whilst testimony to a life of rigorous observation, the diary is evidence too of vast collections of natural history specimens, flints and artefacts, not to mention two stone coffins, raising the question of where they all went. At a micro level: 23 August 1884, “Posted one ova of *sticticalis*<sup>6</sup> to Lord Walsingham...” (A keen lepidopterist, Lord Walsingham donated his collection of 260,000 specimens and library of 2,600 books to the Natural History Museum.) More tangibly,

### 28 April 1887:

Took my nest of *Picus minor* & (Paleolithic) bones to Cambridge. Gave the nest to Professor Newton, took the bones to Zoological Museum. The Professor & curator Mr Clarke & another man helped me to identify them

<sup>5</sup> As London’s first department store, Whiteleys of Bayswater, near Helen’s home, was ‘an immense symposium of the arts and industries of the nation and of the world.’

<sup>6</sup> *Loxostege sticticalis* Diamond-spot Pearl, a species of micro-moth. “Although suspected as a resident in the Breckland district of East Anglia, now primarily known as a migrant species. In recent years, the frequency and number of arrivals has increased, and records have occurred northwards to Shetland, typically arriving in late summer or early autumn.” ([ukmoths.org.uk](http://ukmoths.org.uk))



as—Right ulna & radius & left humerus of *Bos Primigenius* (Urus) from Maids Cross gravel, Lakenheath. Horn core of *Bison priscus*? from undisturbed river drift gravel at Warren Hill, Mildenhall. A lumbar vertebra (imperfect) of & epiphysis of femur of *Elephas* (???) also from Warren Hill river drift gravel.

Pursuing this via the Corpus Christi College Cambridge Archivist and the University Museum of Zoology has identified 22 Norgate-donated small mammals and birds, '3 specimens of extinct mammalia', and a possible line of enquiry regarding lepidoptera specimens. Norgate's five accompanying letters (1876–82) anticipated use of his specimens for preservation or dissection and offered many more if required. Maybe a Will holds clues to other destinations? And where are those Lackford stone coffins now?

My own reading of the diary is far from complete and much remains to be discovered. It is a treasure trove of wide-ranging snippets of information, including some very full descriptions and diagrams. Constraints on their practical use lie in cross-referencing related items, possibly achievable with computer technology using text recognition and data referencing, plus a team of volunteers first transcribing the handwritten pages.

### **Norgate's Obituary**

The obituary below was published in the journal *British Birds* (1919, Vol. XXIII, pp.21-22).

## **THE LATE FRANK NORGATE**

BY the death at the age of 75, on February 20th, 1919, of Frank Norgate, of Sparham, son of the late Canon Norgate, rector of Sparham, Norfolk has lost one of its most painstaking and accomplished field-naturalists. Mr. John Henry Gurney, with whom he frequently corresponded, describes him as 'an extraordinarily acute and accurate observer'; who 'was very much crippled with asthma, which hung to him all his life, on account of which he would spend whole days, and sometimes nights, too, out of doors.' This, in a letter, Norgate confirmed, with some lucidity, as recently as November 27th, 1918.

He writes : 'I [am] sorry about the felling of my happy hunting ground—Foxley Wood [by the military] where, when I was trying to sleep on the ground one night, three foxes kept racing round and round me barking.'

Norgate's activities carried him into various branches of natural science: birds' eggs, lepidoptera, botany, and especially ornithology receiving his careful attention. His collection of eggs was a considerable one, and has been described 'as second to none'; it contained Cuckoo's eggs from the nests of no less than thirty species of birds. In a note to Mr. Gurney he states that 'I have found time to soak your Kite's egg to pieces, and have restored it, as well as I can from the inside, with shellac and tissue paper.' This egg is noted by him as 'Norfolk, about 1825. Given by Edward Lombe of Melton to John Henry Gurney.' From some letters lent me by Mr. Gurney, Norgate seems to have somewhat mercilessly robbed desirable nests, and being unable to climb, taught the Brandon boys to assist him, more especially in his quest of Crossbill's eggs.



Nevertheless, it is refreshing to know that his great experience was used in 1873, when he gave evidence before the Select Committee on Wild Bird Protection, whereat he told a story of a gamekeeper who always destroyed Nightingale's nests, for fear the birds should keep his Pheasants awake at night! He rendered valuable assistance to Dr. Hind when compiling the *Flora of Suffolk*, and besides being the first to record the nesting of Crossbills on the Norfolk and Suffolk borders, he also was one among the first to capture and record the oleander moth. Flint implements and folklore also claimed his attentions.

It is a great pity that Norgate's notes and observations have not been placed in permanent book form by him, his extreme modesty making him content to impart his knowledge to others, with the result that Norfolk ornithological literature has, to an extent, gained something by his evidently unceasing labours. Stevenson, in 1866 (*Birds of Norfolk*) frequently acknowledges his estimable assistance, speaking of him as 'a young naturalist who takes considerable interest in the habits and formation of birds.' This is shown in regard to waterfowl, particularly on nesting-habits of Pochards and Tufted Ducks, given in diary form from daily observation, which Stevenson deemed extremely valuable, remarking that 'it would be impossible to condense without detracting from their value.' He also quoted Norgate's observations on Crossbills, to the breeding-habits of which two whole pages are devoted.

Norgate contributed a few papers to the Transactions of the Norfolk and Norwich Naturalists' Society, the first being read in March, 1876, 'On the Nesting habits of certain birds, with a view to their encouragement by the erection of nesting-boxes,' a curiously naive recommendation by such an egg-expert. This paper covers eleven pages. In 1878 he devotes twelve pages to bats and other mammals, three of these dealing with the breeding-habits of moles. Two or three other papers followed, described as 'Miscellaneous Notes', 'Nesting of Crossbills', 'Nesting of the Hobby', and 'Entomological Notes'. The List of the Norfolk Mammalia in Mason's History of Norfolk (1884) was also contributed by him.

## Acknowledgements

Kelvin Smith, archivist, for unearthing the Diary of Frank Norgate.

The Norfolk Record Office, County Hall, Martineau Lane, Norfolk NR1 2DQ for support and permission to use the Diary (MC 175/12–13, 638X2) in this publication.

Friends of Thetford Forest [www.fotf.org.uk](http://www.fotf.org.uk) and A.J. Spidy for the photograph of Mildenhall Hall Warren Lodge bedstead.

The Breckland Society [www.brecsoc.org.uk](http://www.brecsoc.org.uk) for their *Warrens of Breckland Survey* (2010) and *Flint in the Brecks Report* (2016)

Cambridge University Museum of Zoology

Archivists at Corpus Christi College, University of Cambridge, and Cambridge University Museum of Zoology



## Nature conservation, ground disturbance and protecting archaeological remains on Brecks heaths

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### Introduction

The Norfolk and Suffolk Brecks is one of the warmest and driest parts of the United Kingdom, with a markedly less maritime climate than other parts of England.<sup>1</sup> This, combined with free-draining sandy and chalky drought-prone soils and a 6000-year history of woodland clearance and grazing, led to the development of acid and calcareous grass and heather-dominated heaths (Fig. 1). By the late medieval period, the landscape was characterised by large areas of heath (including over 20 warrens devoted to the farming of rabbits<sup>2</sup>) on the higher ground, with open fields and sheep-fold fallows on chalkier soils and lush pasture and meadows in the valleys.<sup>3</sup> These conditions have resulted in a unique assemblage of heathland, Mediterranean and continental steppe species unlike anywhere else in the United Kingdom.<sup>4</sup>

The agricultural improvement movement of the seventeenth to nineteenth centuries saw large areas of heath converted to arable and woodland. This conversion accelerated in the twentieth century, during which expanding cultivation and the creation of Thetford Forest saw the loss of over 15,000ha of heath,<sup>5</sup> a 76 per cent decline over a 100-year period.<sup>6</sup> This major localised loss fits into a much wider story. The United Kingdom now has about 16 per cent of the heathland that existed in 1800—from an area the size of Cornwall only the equivalent of the Isle of Wight survives. If this loss did not give the conservation of heaths enough priority, the UK contains over 20 per cent of the world's heathland, a habitat that is rarer than rainforest.<sup>7</sup>

The remaining grass heath resource has itself undergone rapid transformation during the last 60 years. The introduction of myxomatosis to the UK in 1953 resulted in the sudden collapse of rabbit populations. These declines have had a dramatic effect, with the grass heath habitat transforming from an open landscape dominated by lichens, winter annuals and cushion-forming mosses, to a more vegetated habitat dominated by rank grasses.<sup>8</sup> Remaining areas of grass heath are still important for priority Brecks species, some of which are found nowhere else

1 Natural England, 2015

2 Mason & Parry, 2010

3 Dolman *et al*, 2011, p.230; Wade Martins & Williamson, 1999, pp.12–13

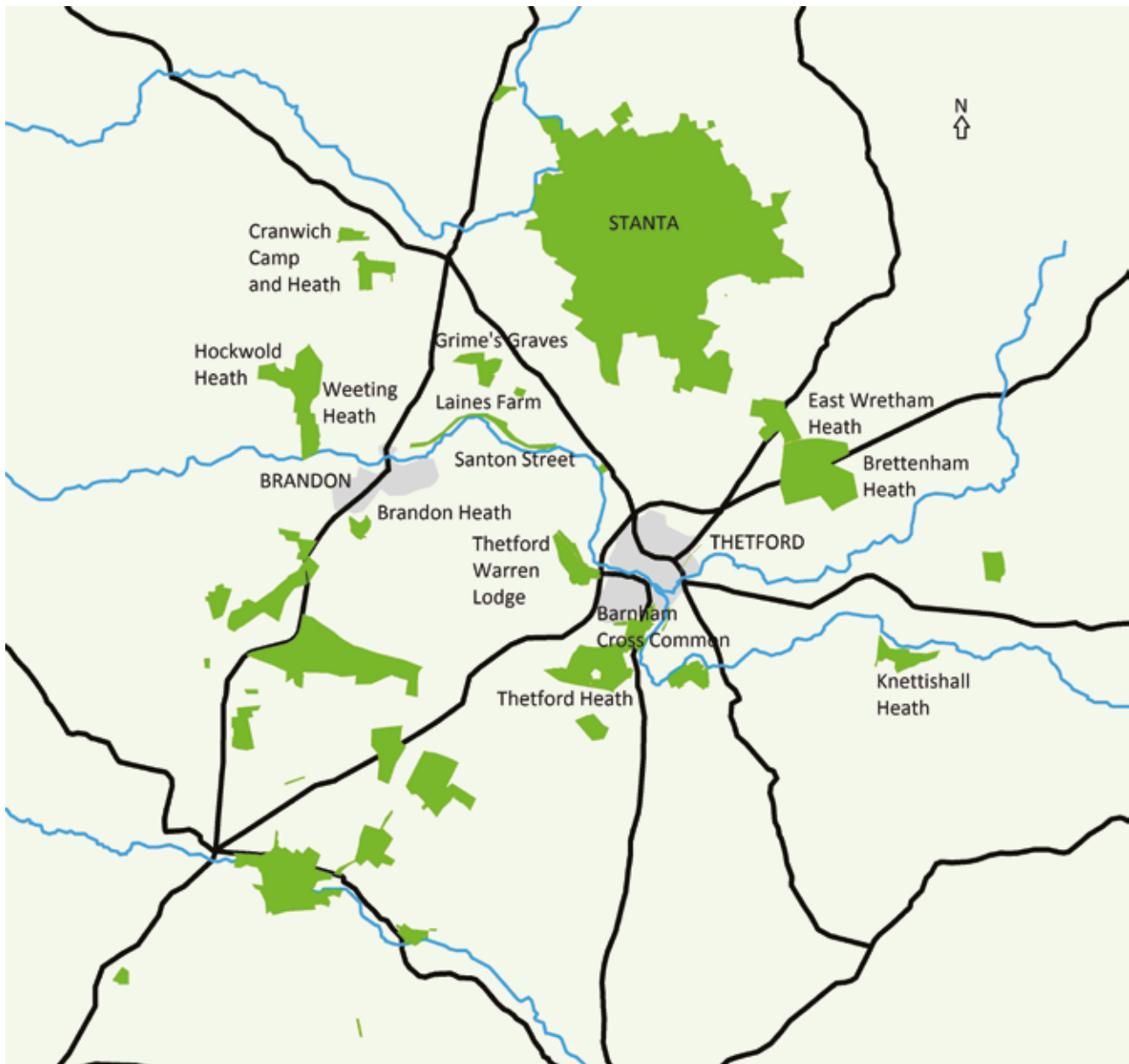
4 Dolman *et al*, 2010, p.11

5 Dolman *et al*, 2011, p.231

6 Dolman *et al*, 2010, p.7

7 English Nature 2002, pp.1–2

8 Dolman & Sutherland, 1992



in the UK; however, many of these species have suffered range and population declines. Recent conservation efforts have successfully restored sheep grazing to most sites, but sheep grazing alone does not create areas of bare open ground, nor does it deliver the same intensity of grazing as rabbits.

Despite major landscape transformation, many of the Brecks' important archaeological sites survive well on the remaining areas of heath (particularly when heaths are compared to the adjacent arable land that has experienced intensive agricultural practices since the 1940s). In the early twentieth century W.G. Clarke explained how 'Few districts in England are more attractive to the archaeologists than Breckland,' and described many of the significant heathland features: prehistoric flint artefacts, Neolithic and post-medieval flint mines (including Grime's Graves), prehistoric burial mounds (Fig. 2), Iron Age/medieval linear earthworks, Roman settlements, and warren and parish boundaries. To this list we can add medieval warren lodges (Fig. 3), woodland, heath and field boundaries, sheep-fold enclosures and features associated with nineteenth and twentieth century military training (Fig. 4).

*Figure 1.*  
The location of surviving and recreated areas of heath in the Norfolk and Suffolk Brecks, with sites named in the text labelled.  
© David Robertson/  
Norfolk County Council/Crown,  
reproduced from an  
Ordnance Survey map  
HMSO 100019340.  
Not to scale.



*Figure 2.*  
Hut Hill, a prehistoric  
burial mound on  
Knettishall Heath.  
*Photo:*  
David Robertson  
© Norfolk County  
Council.



*Figure 3.*  
Thetford Warren's  
medieval lodge, with  
an area stripped  
of litter in the  
foreground.  
*Photo:*  
David Robertson  
© Norfolk County  
Council.







*Figure 4.*  
The earthworks of  
a gun emplacement  
used during military  
training on Weeting  
Heath.

*Photo:*  
David Robertson  
© Norfolk County  
Council.

### **The importance of ground disturbance**

Many Brecks' species are reliant on physical ground disturbance. The ground disturbance that came with rapid warming and thawing of tundra at the end of the last Ice Age allowed open-ground species to colonise. These may have been supported by mobile sand dune geomorphology and by larger mammals grazing in the woodland that subsequently colonised, and would have been encouraged by the clearance of trees in the Neolithic, Bronze Age and Iron Age.<sup>9</sup> They would have thrived in the sheep-grazed fallows of the medieval open fields, in 'brecks' (fields cultivated on long rotations), areas of heath that were cultivated and then abandoned (*Fig. 5*), intensively rabbit-grazed warrens, mobile sand dunes, and pits dug for sand, gravel, chalk and flint.



*Figure 5.*  
Historic cultivation  
marks uncovered  
by soil stripping at  
Knettishall Heath.

*Photo:*  
David Robertson  
© Norfolk County  
Council.

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<sup>9</sup> Murphy, 1984, pp.20–22



Figure 6.  
Bur Medick *Medicago minima*, a species  
in the physical  
disturbance and  
intensive grazing guild.  
Photo:  
© Tim Pankhurst/  
Plantlife.



The need for physical ground disturbance on grass heaths has long been recognised, but its importance was only recently evidenced by the Brecks Biodiversity Audit (BBA).<sup>10</sup> The BBA identified 12,845 species, over 2000 of which were considered a priority for conservation (eg, species in Red Data Book or Biodiversity Action Plan lists and/or nationally scarce/rare). The ecological requirements of all priority species were identified to provide management advice on their conservation (species with similar requirements were grouped into management 'guilds'). It confirmed that 149 priority species require physical disturbance and intensive grazing (Fig. 6), whilst 220 require physical disturbance with little or no grazing (Fig. 7). Both of these management guilds support the largest number of priority grass heath species, and can be catered for by creating physically disturbed habitats.

Restoring rabbit populations will create disturbed and well-grazed grass heath habitats; however, conservation efforts over the past 30 years have failed to sustain high enough populations long term.<sup>11</sup> An alternative option is to create patches of disturbed ground in heathland, arable and forest through a variety of different cultivation and soil removal techniques (see below). This approach is supported by the BBA and experimental studies, which have demonstrated that soil disturbance and soil stripping can encourage early successional, disturbance-dependent, species typical of the Brecks.<sup>12</sup>

Since the publication of the BBA the use of mechanical ground disturbance as a management prescription has expanded across many Brecks grass heaths, funded through government agri-environment schemes, landfill grants and the Breaking New Ground Landscape Partnership Scheme/Heritage Lottery Fund (BNG) ground disturbance project. Work has focused on the expansion of physically disturbed

<sup>10</sup> Dolman *et al.*, 2010

<sup>11</sup> Dolman *et al.*, 2010, p.21

<sup>12</sup> Dolman & Sutherland, 1994, Pedley *et al.*, 2013



areas through a variety of different techniques. Importantly, work at STANTA (Stanford Training Area) and other grass heath sites is currently subject to close ecological monitoring to uncover how different taxonomic groups, many of which are under-recorded, respond to different disturbance techniques across different grass heath types.<sup>13</sup> Evidence gathered from these ongoing experiments will inform future initiatives.



*Figure 7.*  
Spanish Catchfly  
*Silene otites* at  
Cranwich Camp, a  
species in the physical  
disturbance with little  
or no grazing guild.  
*Photo:*  
© Tim Pankhurst/  
Plantlife.

### **Liaison between archaeologists and conservation organisations**

Contact between archaeologists and conservation organisations in the Brecks has a long history, as the work of W.G. Clarke and the Breckland Research Committee demonstrates.<sup>14</sup> In 1988 the Ministry of Agriculture, Fisheries and Food's Environmentally Sensitive Area (ESA) agri-environment scheme was applied

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<sup>13</sup> Hawkes, 2016

<sup>14</sup> Clarke, 1937



## Ground disturbance techniques used in the Brecks

<b>Banking</b>	The creation of a bank or banks, often as a consequence of the use of other techniques.
<b>Cultivated uncropped margins</b>	The cultivation of arable field margins without subsequent planting of arable crops disturbs the ground and encourages species in the no/little grazing guild.
<b>Destumping</b>	The removal of tree stumps, dug out using a mechanical excavator or pulled out using a tractor.
<b>Discing (disc harrowing)</b>	An agricultural implement with upright discs is used to break up the surface and upper layers of the soil.
<b>Harrowing</b>	An agricultural implement with spike-like teeth or upright discs is used to break up the surface and upper layers of the soil.
<b>Litter stripping</b>	Leaf litter is removed using a mechanical excavator ( <i>Figure 3</i> ).
<b>Ploughing</b>	A conventional agricultural plough is used to loosen or turn over the upper layer of soil ( <i>Figure 8</i> ).
<b>Rabbits</b>	Rabbit grazing, scraping, digging and burrowing creates disturbance.
<b>Rotavating</b>	A rotavator is used to break up the surface and upper layers of the soil ( <i>Figure 9</i> ).
<b>Scarifying</b>	A scarifier is used to remove vegetation and debris from the ground surface; variable height settings enable differing amounts of bare ground to be generated.
<b>Scrub pulling</b>	The removal of bushes, pulled out using a mechanical excavator or a tractor.
<b>Soil inversion</b>	Equipment is used to bring mineral deposits or subsoil to the surface, while burying surface soils.
<b>Soil stripping</b>	Soil is removed using a mechanical excavator. The depth of stripping can vary, but usually exposes the underlying mineral soil ( <i>Figure 5</i> ).
<b>Tracks</b>	Disturbance caused by vehicles and/or people on the line of tracks. This can be of benefit on heaths and in Thetford Forest.
<b>Trenching</b>	Trenches are created using a mechanical excavator.
<b>Turf stripping</b>	Turf is removed using a mechanical excavator to expose unvegetated soils (usually does not expose mineral soil).





*Figure 8.*  
A conventional agricultural plough.



*Figure 9.*  
A rotavator breaking up the surface and upper layers of soil.



to the Brecks to 'conserve and extend heathland by the use of careful grazing management, by avoiding the use of chemicals and by reverting arable land to heath'. Land managers signing up for ESA agreements and grants were expected 'to farm land so that scheduled ancient monuments and other features of historic interest that you know of are not damaged'.<sup>15</sup> To fulfil this condition land managers needed accurate information about archaeological features on their land and, as a consequence, the first formal consultation process was established. This saw Norfolk and Suffolk County Councils' archaeological services regularly provide the ESA Project Officer with information on known archaeological features, who then passed relevant details on to land managers. Land managers were also actively encouraged to seek information and management advice from the relevant archaeological service.<sup>16</sup>

Since the inception of the Norfolk card index in the 1930s, it has been recognised that the databases now known as Historic Environment Records are partial records of known archaeological features, rather than complete datasets of all surviving archaeological sites. Soon after the designation of the Breckland ESA it was acknowledged that land managers required a more comprehensive record and, in recognition of this need, Norfolk and Suffolk County Councils and English Heritage established the Breckland Archaeological Survey 1994–6.<sup>17</sup> One approach used by this project was earthwork investigation, during which all areas of existing heath and pasture were visited and archaeological earthworks were recorded. Many banks, enclosures and four burial mounds were newly identified during this work,<sup>18</sup> including burial mounds on Weeting and Thetford Heaths.

In the mid-1990s the Forestry Commission agreed to commission rapid identification surveys (RIS) of recently felled plantations where tree stumps were due to be mechanically removed.<sup>19</sup> In the late 1990s, one phase of RIS included some of the areas of Thetford Forest where heaths were later re-established as part of the Tomorrow's Heathland Heritage project. This work ensured archaeological remains were protected ahead of ground disturbance associated with de-stumping at Hockwold and Cranwich heaths.<sup>20</sup>

The introduction of the Environmental Stewardship (ES) agri-environment scheme in 2005–6 saw the phasing out of the ESA scheme and further formalisation of contacts between archaeologists and conservation organisations. Every applicant for the Higher Level Stewardship (HLS) part of ES had to have a historic environment report produced by the relevant county council archaeological service. Many managers of Brecks heaths commissioned these, with sites covered including East Wretham, Weeting, Cranwich, Cranwich Camp, Santon Street and STANTA. With ES now closed for applications, it is expected that heaths will be subject to applications for replacement agri-environment schemes and updated historic environment consultations in the future.

In 2006, members of the Association of Local Government Archaeologists (ALGAO) raised concerns about the impact that conservation ground disturbance works were having on archaeological sites, after which Norfolk County Council's archaeological service (NLA) recommended protection of archaeological remains

<sup>15</sup> Sussams, 1996, pp.1–2

<sup>16</sup> Sussams, 1996, pp.2, 139–141

<sup>17</sup> Sussams, 1996, p.2

<sup>18</sup> Sussams, 1996, pp.26, 36, 38

<sup>19</sup> Robertson & Paterson, 2010, p.15

<sup>20</sup> Pendleton & Sommers, 1998

during ground disturbance works in HLS consultation reports. These referenced published guidance<sup>21</sup> and explained the need for RISs before, and monitoring during, ground disturbance. Archaeological investigations followed on a number of heaths, including Barnham Cross Common and Brettenham Heath.<sup>22</sup> Where surveys identified earthworks, conservation organisations were willing to work around them.

The year 2011 saw conservation organisations raise concerns about the cost of archaeological investigations and the need for a strategic, rather than site-by-site, approach. NLA reviewed its procedures and came up with a revised approach. It agreed to assess areas of proposed ground disturbance in Norfolk and then spend up to half a day in the field looking for earthworks. If a few earthworks were discovered, they would be recorded immediately; only if numerous features were seen would an RIS be recommended. Monitoring or archaeological excavation would be suggested only if there was no way for ground disturbance to avoid archaeological remains. Hockwold Heath was among the first to be visited, where a previously unrecorded burial mound was discovered and subsequently protected during deep ploughing. To address concerns raised by ALGAO colleagues, in 2012 NLA presented the new approach to the Institute for Archaeology's conference.

BNG extended the revised Norfolk approach to Suffolk and is supporting the development of an integrated strategic approach. It was agreed that areas of heath included in the ground disturbance project would be visited by the relevant archaeological service, the outcome of which was the recording of earthworks at Santon Street, Laines Farm, Weeting and Brandon heaths, and a number of Roadside Nature Reserves.<sup>23</sup> Follow-up monitoring was undertaken only at the most archaeological-sensitive areas.<sup>24</sup> Both archaeological services are currently working with conservation organisations to help volunteers undertake RISs and on a Historic Environment Opportunities Map (HEOM). The purpose of the map is to ensure conservation organisations can work in some areas without consulting archaeologists, while advising them of their first step in protecting archaeological remains (which could be to avoid known features or consult the relevant archaeological service).

## Conclusions

The Brecks heaths are of immense importance for both their biodiversity and archaeological remains. To ensure the continued survival of both, it is vital that natural and archaeological conservation organisations work together. They have done so for many years, increasingly so in the last thirty. Developments in agri-environment schemes and the recognition that ground disturbance is vital for many Breckland specialist species have drawn the two interests closer together than ever before. As part of BNG, collaborative relationships have strengthened and a strategic approach is being developed that can be used for many years. It is hoped both will act as exemplars for natural and archaeological conservation organisations elsewhere in the UK.

## Acknowledgements

This paper has been informed by over ten years of partnership working between Norfolk County Council and a range of conservation organisations. Many

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<sup>21</sup> Hawley *et al.*, 2008

<sup>22</sup> Brooks, 2009; Brooks, 2011

<sup>23</sup> Robertson, 2015; Hoggett, 2015a & 2015b

<sup>24</sup> Wallis, 2016



individuals have been involved, including Bev Nichols, Ian Levett, Dave Weaver, Carrie Bewick and Chris Hainsworth (Natural England), Andy Palles-Clark, John Milton, Daryl Stevens, Bill Boyd and Matt Blissett (Norfolk Wildlife Trust), Tim Pankhurst (Plantlife), Sharon Hearle (Butterfly Conservation), Neal Armour-Chelu and Rachel Riley (Forestry Commission), Nick Dickson (BNG), Neil Featherstone (Future Environments), Dominic Ash (Defence Infrastructure Organisation), Scott Perkin (Norfolk and Suffolk Biodiversity Partnership), Heidi Smith (Norfolk FWAG), the late Colin Pendleton and Richard Hoggett (Suffolk County Council) and Brian Cushion (freelance archaeological surveyor). The BNG HEOM is being funded by the Heritage Lottery Fund. Tim Pankhurst commented on an earlier version of this article.

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“

Here we feel in touch with man in his early days, with all that is primitive and prehistoric. The tawny bents that border the winding cart-tracks in the sand, seem as though they must have been the product of a thousand years; the heathland road on which one may wander for mile after mile without seeing any human being, seems as though its only fitting user would be a skin-clad hunter with his flint-tipped arrows; the shrill whistle of the stone-curlew and the pipe of the ringed plover sound to-day as they sounded maybe in the far-off times when the clash of battle and the shouts of men engaged in a fierce hand-to-hand struggle told of the fight for supremacy between Saxon and Dane; while the placid pools that lie in hollows on the heathland still mirror the giant pines as they did in days gone by.

”

W.G. Clarke *In Breckland Wilds* (1925).



In March 2014 the Heritage Lottery Fund (HLF) confirmed the award of nearly £1.5 million to the Breaking New Ground Landscape Partnership, enabling a £2.2 million scheme to deliver a range of heritage and landscape projects in the heart of the Norfolk and Suffolk Brecks. As part of this scheme, grant funding was made available for the compilation and publication of the inaugural volume of  
*The Journal of Breckland Studies.*

The JBS project was managed by the Breckland Society, which was set up in 2003 to encourage interest and research into the natural, built and social heritage of the Brecks. It is a membership organisation working to help protect the area and offering a range of activities to those who wish to see the special qualities of this unique part of England protected and enhanced.



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