

# Blakeney Esker – an exercise in public awareness

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## 1 Introduction

The Blakeney Esker in North Norfolk is England's best-developed and well known esker. It is a 3.5km ridge running south-eastwards from west of Blakeney, to Wiveton Downs, north-west of the village of Glandford. The ridge is sinuous with several near right angle bends and it varies between 40 and 100m wide and rises to approximately 20m above the surrounding topography.

Student groups and local schools frequently visit it for educational purposes, as well as local residents taking advantage of the views provided by the elevated height. The origin of the feature remained unresolved until relatively recently (Gray, 1997; Hoare and Gale, this guide). Ironically, the sand and gravel quarrying that has greatly altered the appearance of the feature, has revealed important information regarding the origins of the landform. Much of the quarrying took place prior the 1980s, before the esker was designated a geological Site of Special Scientific Interest (SSSI).

As part of an exercise to raise public awareness of the esker, the British Geological Survey were funded by the Aggregate Levy Sustainability Fund to develop an educational website and noticeboard for public display at the locality. The purpose of this paper is to outline the importance of the esker from a historical and land-use aspect as well as geological, and explain more about the project and how it has interacted with the public.

## 2 Blakeney Esker Research History

Various genetic models have been presented to explain the origin of the Blakeney Esker. West (1957) interpreted the ridge as a transverse ice marginal outwash feature, the relatively small size indicating a short standstill within the ice margin. In 1964, Sparks and West concluded that the ridge formed in an open ice-crevasse. Straw (1973) interpreted the Glaven Valley north of Glandford as entirely erosional in character, rejecting earlier hypotheses, suggesting that the ridge was a linear remnant of a larger sheet of outwash sand and gravel. Further interpretations have included that it formed in a supraglacial channel on the surface of a glacier, and that it formed either as an englacial esker (Gale & Hoare, 1986) or subglacial esker (Gale & Hoare, 1986; Gray, 1997).

The structures and sedimentology revealed by the most recent quarrying at the southern end of the ridge, mainly the discovery of Nye channels at the base of the ridge, led to the final conclusion that the ridge was deposited as a subglacial esker (Gray 1997).

## 3 Eskers and Man

Since pre-historic times, humans have had an interest in eskers for very practical reasons, using them for a variety of purposes, due to their height, shape and geology:

### 3.1 BUILDING MATERIAL

Along Blakeney Esker there are five major disused quarry sites, the largest being at Wiveton Down. Quarrying took place on the esker from World War II, when permission was granted to extract sand and gravel from Wiveton Down. Quarrying along the esker continued, on and off,

until the early 1990s when all the useful sand and gravel had been extracted. The Down is now a Local Nature Reserve and evidence of the quarrying is still obvious today. All of the esker is designated as a Site of Special Scientific Interest (SSSI) and prohibits any further quarrying. The other relic pits can be seen along the esker if the bridle path is followed from Wiveton Down Local Nature Reserve to the coast. Many of the surrounding churches and buildings have been built using local flint, and although much of this will not have originated from the esker, it shows how long man has used the regional geology as a resource.

### **3.2 SETTLEMENTS**

In the past, in flat open landscapes, with cold winds and harsh weather, eskers have provided people with protection from the elements. In fields alongside Blakeney esker, fine flint axes have been found suggesting that settlements were located in the lee of the esker, protecting them from the bitter winds. Settlers would also have found the neighbouring source of sand and gravel a useful resource.

In contrast to this, from Roman times, settlements and houses were generally built on higher ground as it provided a good vantage point. Interestingly, the name Wiveton originates from the Latin 'Wiburti Villa', perhaps suggesting that the esker was once the site of a Roman villa?

If left unmanaged, the heathland and acid grassland vegetation soon overrun esker ridges. In Arctic Canada, many eskers have become 'oases' of bushes, trees and wildlife. The frozen ground beneath the surrounding lower lying areas prevents this sort of growth. There is archaeological evidence that humans used Canadian eskers for shelter and hunting, and using the trees for weapons and firewood.

### **3.3 ROADWAYS**

Humans have used eskers as natural elevated roadways since prehistoric times, allowing safe passage through the landscape. Being made of relatively free draining sand and gravel, they are easier to walk on than the surrounding boggy clayey ground. A famous example of this is in Ireland, between Dublin and Galway, where the Eiscir (Celtic for esker) Riada allowed safe travel above the bogs and wetlands between the two cities. In places, the esker still carries the modern N4/N6 road. In Nova Scotia, paths along the top of eskers are used not by man, but local moose and deer, who obviously also find it easier to walk on this glacially constructed natural highway.

### **3.4 AGRICULTURE**

Today, plants that require sandy, well-drained, acidic soils dominate the vegetation on the esker. Good quality, clayey, arable land that retains nutrients and water, lies adjacent to the esker and historic maps dating from the 1880s demonstrate that these areas have been cultivated for crops. By contrast, for the last one hundred and thirty years the esker has existed almost exclusively as grassland and heath and used for grazing livestock such as sheep.

### **3.5 BURIAL GROUNDS**

At the northern end of the Blakeney esker, near the village of Morston, Bronze Age burial grounds are visible, shown as tumuli on modern maps. The location of these burial grounds are confined to the sandy soils of the esker because firstly, it was believed that burial in an elevated site would take the bodies closer to heaven, and secondly, that the soils were easier to dig than the surrounding stiff clayey soils.

### **3.6 RECREATION**

In more recent times, the well drained soils and naturally undulating landscapes associated with eskers have been utilised by humans for leisure activities and sports. A good example are golf courses, such as the Esker Hills Golf Course in Ireland, which takes advantage of the natural lakes, woodlands, plateaus and ridges of the Eiscir Riada.

Many eskers around the world, such as Esker Lakes in Ontario, Canada, are now used as venues for activity holidays, providing lakes, hiking and woodlands with a large range of geo- and biodiversity all in close proximity.

### **3.7 GEOLOGICAL RESEARCH**

Blakeney Esker has provided Quaternary geologists with information that has improved their knowledge of Norfolk's glacial past. It has shown the extent of glaciers in the region, and the quarrying has revealed the origin of the esker. Integrating this knowledge with other features of the Norfolk landscape allows geologists now to have a far better understanding of Norfolk's geography has evolved over the past two and half million years.

## **4 Biodiversity of Blakeney Esker**

As well as being an important geological site, Blakeney Esker is also home to an interesting variety of plants and animals. Norfolk County Council (NCC) owns the southern part of the esker, and this is divided into two sites - 'Wiveton Down Local Nature Reserve' in the east, and 'Blakeney Esker' in the west.

### **4.1 HEATHLAND VEGETATION**

All the plants currently found growing on Blakeney Esker have colonised the site since the early 1990s as the entire surface of the site was reworked due to quarrying. Since the quarrying has finished, plants have colonised and NCC management has checked this process with occasional fires, intense rabbit grazing and the mechanical cutting of gorse in parts of the site. Without this, the whole site would by now be covered in scrubby woodland.

The type of vegetation found on the esker is heathland and acid grassland. This is made up of a collection of plants that require sandy, acidic soils with free drainage. Local stories have it that in more recent times, the progression to gorse and bramble used to be controlled by fire. Traditional uses of heathland, like grazing and collecting firewood, declined and it is likely that burning was used to counter the build-up of woody vegetation. It has been reported that the heather that once grew on the top of Wiveton Down, disappeared because of a wartime fire that could not be controlled. The fire burnt off all the heather and the organic soil, leaving a bare gravel surface that provided a foothold for the gorse that now dominates.

### **4.2 GRAZING**

Rabbits heavily graze sections of Blakeney Esker. Once they have finished the grassland and herb species they start on the gorse. Weird shapes appear as the rabbits nibble their way up the gorse. On the Wiveton Down site, the rabbit grazing was not sufficient to halt the bracken and scrub encroachment. This side has now been fenced and is grazed by sheep.

### **4.3 GORSE MANAGEMENT**

Gorse is an important part of the site. However, if it is left unchecked, even with intense rabbit grazing, it can take over the site and shade out other more interesting species. Gorse is cut from the floors of the palaeochannels (Nye channels), to emphasise their location and orientation along the length of the esker. Norfolk County Council leaves a bank of gorse around the edge of the site as this acts as a natural windbreak.

### **4.4 TREES**

The stand of beech trees on Blakeney Esker is rather unusual for a heathland. However, it is an important landscape feature, instantly recognisable for miles around. Any deadwood cut from the trees is left in situ to provide rotting wood habitats for invertebrates. In spring on the Wiveton Downs side of the esker, carpets of bluebells grow amongst scattered trees and open grassland. It is unusual to see bluebells growing on such an exposed site. This area is managed by controlling the spread of bracken and gorse. The bluebells at Wiveton Down are the native British variety, and not Spanish bluebells which are increasingly found in many of our woodlands.

### **4.5 BIRDS**

Heathlands tend to be very good sites for birds. Blakeney Esker is particularly rich due to being so close to the north Norfolk coast, a major bird sanctuary, and the first section of coastline that birds arrive at when migrating. The site therefore has its regular species, many of which will breed there, but it will also occasionally attract rarities.

Some birds that have been spotted at Blakeney Esker on a summer's day include: blackcap, linnet, stonechat, swallow, kestrel, sparrowhawk, whitethroat, lesser whitethroat, skylark, mistle thrush, goldfinch, blackbird, dunnoek and yellowhammer. On a winter's day species such as the great grey shrike, waxwing, short-eared owl and hen harrier have been recorded.

### **4.6 BUTTERFLIES**

Heathlands are good sites for butterflies, and on a bright sunny day green hairstreaks have been seen feeding on flowers like birdsfoot trefoil. Purple hairstreaks also live on the site, but they live in self-contained colonies on oak trees. More common species spotted in the summer months include orange tip, peacock, meadow brown and painted lady.

## **5 The Blakeney Esker Explored – A Geodiversity Project**

Geodiversity has been given many definitions over the last 30 years, but one of the most recent and understandable is outlined by Murray (2004):

*“The natural range (diversity) of geological (rocks, minerals, fossils), geomorphology (landform, processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems”.*

The British Geological Survey collaborated with Norfolk County Council and Queen Mary, University of London for the Blakeney Esker Explored project. The 9-month project completed in April 2006. The project was funded by the Aggregate Levy Sustainability Fund (ALSF), and administered by English Nature.

The projects main aim was to raise public understanding of this well-preserved glacial feature, including how it formed, the strong relationship between the eskers geo- and bio-diversity, and the role that mans' activities has played in the understanding of it's formation. The end-users were both local secondary school teachers and the general public who visit the site frequently, for educational or recreational purposes.

## **5.1 STAKEHOLDER FEEDBACK**

Throughout the project, input from the local community and secondary school teachers provided direction. Without this regular "stakeholder feedback" the project outputs would have been very different.

### **5.1.1 Onsite Noticeboards**

The initial outline of the project included an "Ice Age Trial", a short walk guiding you along the length of the esker, with accompanying informative noticeboards along route. These would have covered topics that related to the scenery at specific viewpoints. Following consultation with the local council it became clear that the local community were not in favour of the erection of noticeboards on the esker as this would change the feel of the site and make it appear less "natural". Based on this strong feedback the decision was made to produce a website that provided the same information, including a printable leaflet. One noticeboard was erected at the entrance to Wiveton Down LNR, replacing an existing Norfolk County Council one that was showing signs of aging. This succeeded in informing all visitors to the site about the project website and provided a summary of the geo and biodiversity of the esker.

### **5.1.2 Teacher involvement**

Local secondary school Geography teachers were consulted at the start and end of the project and provided useful advice on all aspects of the aids.

Firstly they provided invaluable advice on which age groups to aim the teaching aids at and how they would be used in the classroom. Many teachers now use Microsoft PowerPoint presentations as a tool for teaching and requested we provided both teaching aids that would be printed off for the pupils, and an accompanying PowerPoint presentation. Due to cost, most teachers requested aids that could be printed as black and white handouts.

Many also explained the issues encountered when organising field trips and suggested that teaching aids for the classroom may be more useful than those that relied upon a fieldtrip to Wiveton Down LNR. This also allowed the teaching aids to be used at a national level. This led to the teaching aids and website providing more photos and images of the site than initially planned, and also containing suggestions for further classroom based discussion points and homework topics.

The variety of ways that teaching aids are use in the classroom became apparent, therefore aids that are editable are much more useful. For example, teachers wanted to be able to edit them to teach different age groups and areas of study, to combine other topics being taught and to fit into their individual styles of teaching. Based on this the project provided two versions of the teaching aids on the website, one in Adobe PDF (small file size) and one in Microsoft Word (editable version).

Finally, a number of the teachers mentioned that it would be useful if the links between geology and the flora and fauna at the site were explained in detail, as this would fit closely to the subjects they were required to teach. Due to this request, the Chief Ecologist of NCC became involved in the project, providing expertise in the sites biodiversity.

Following the final consultation and the positive feedback received from the teachers, it became clear that the teacher involvement had been vitally important to the success of the project and that the importance of end user consultation should not be underestimated.

## 5.2 THE END PRODUCTS

The end products were a website and an information board at the esker. The website provides free downloadable A-level teaching aids, which can be edited for different topics or age groups. Topics covered include: climate change, esker formation, biodiversity and eskers & man. For the general public, there are summary pages, a virtual fieldtrip and a printable leaflet. To find out more, visit the website at [www.bgs.ac.uk/blakeney](http://www.bgs.ac.uk/blakeney).

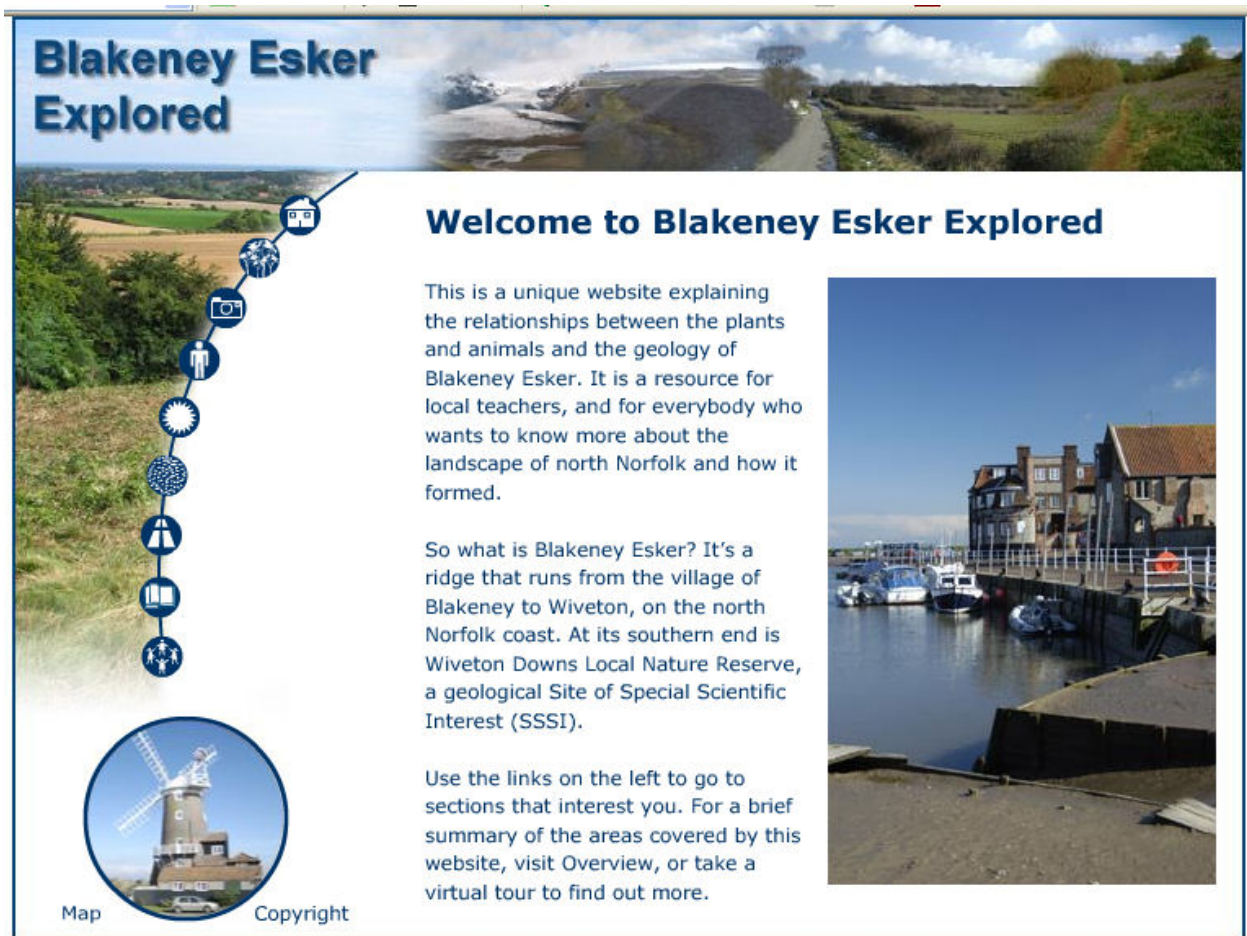


Figure 1: The home page of the Blakeney Esker Explored website

## 5.3 FUTURE WORK

Since the completion of this project there has been much interest in building on this website to provide teaching aids aimed at university undergraduate students. This would be a worthwhile evolution of this project, should funding become available.

It is hoped that in the future similar projects can be carried out at other important geological sites across the country. Should anyone have any suggestions of sites that would benefit from this type of work, preferably that are already visited by educational groups, please contact the authors.

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