

# *the Forth Naturalist and Historian*

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## THE GEOMORPHOLOGICAL SETTING OF FLANDERS MOSS

D.E. Smith and L.K. Holloway

### Introduction

Flanders Moss (East Flanders Moss) lies at the western limit of the Forth Valley lowland (Figure 1). In this account, the main features of the lowland as a setting for Flanders Moss are described, with particular emphasis being given to the impact of sea level change during and following the last glacial episodes. Field evidence for late Quaternary relative sea level change in the western Forth lowland, together with the evolution of the Moss, is discussed.

### Geology and Glaciation

The lowland may well have originated during the Cretaceous Period from an eastward draining valley superimposed across the area from a uniform cover of chalk (*e.g.* Bremner, 1942; Linton, 1951, and as summarised in Sissons, 1967, 1976). However, if this mantle of chalk did exist, it has now been removed by erosion, and it is the older rocks beneath which now provide the geological setting. The underlying geology of the Forth lowland is largely sandstones of the Devonian Old Red Sandstone. The Highland Boundary Fault crosses the lowland at its western end and marks the edge of the largely Pre-Cambrian igneous and metamorphic Grampian Highlands. Towards its eastern end, near Stirling, a constriction in the lowland is caused by Carboniferous dolerite intrusions, where the Wallace Monument and Stirling Castle now stand (*e.g.* MacGregor and MacGregor, 1948).

The present form of the Forth lowland owes much to the two to three million years of repeated Quaternary glaciations. On many occasions, ice streams would have flowed eastwards through the lowland, ultimately producing a wide but relatively shallow rock trough (rockhead rarely exceeds a depth of 10 m below Ordnance Datum). The last ice to fully occupy the lowland was that of the maximum of the last glaciation, the Devensian, probably somewhere between 17 000 and 20 000 yr BP. As this ice withdrew it left a landscape of streamlined ridges of till (boulder clay), principally on the northern side of the lowland and on neighbouring interfluves. These ridges are flanked at their lowland edge by fluvioglacial outwash terraces. A major stage in the retreat of Devensian ice was the Perth Stage, when the retreating ice margin stabilised in the Kincardine area, then across the constriction in the lowland at Stirling, before finally withdrawing from the lowland sometime before *circa* 13 500 yr BP (Sissons, 1974) (Figure 1).

This episode of glaciation was not the last occasion on which ice occupied parts of the Forth lowland. After a period of ameliorating climate (the Windermere Interstadial), a worsening of climate led to the re-expansion of glaciers in the Highlands and an ice stream re-entered the head of the lowland

during the Loch Lomond Readvance of *circa* 11 000-10 000 yr BP. This event formed a prominent moraine complex crossing the lowland between Port of Menteith to the north and Arnprior to the south. Termed the Menteith Moraine, it consists of a series of parallel ridges of clays, silts, sands and gravels, and is intersected by breaches through which meltwater was discharged. Ultimately, Loch Lomond ice withdrew as climate ameliorated at the beginning of the present episode of warm climate (the Flandrian, or Holocene).

It is around and amongst the landforms of ice advance and decay that the deposits of successive sea levels accumulated to form the basis for the development of Flanders Moss. Figure 2 depicts the setting of the Moss in the context of these glacial, fluvial and estuarine deposits.

### Sea Level Change in the Forth Lowland

The sequence of changes in sea level in the Forth lowland during and following the decay of both Perth and Loch Lomond ice, and during the subsequent Flandrian, was broadly established in the 1960s by Sissons (*e.g.* 1965, 1966). Prior to this, the area had long been a focus of sea level studies, with Jamieson (1865) having established the concept of glacio-isostasy (in which the weight of ice depressed the land, and subsequent ice decay brought about renewed land uplift), from his observations made near Blairdrummond. Based on detailed and extensive morphological and stratigraphical information, Sissons produced a model of relative sea level change in the Forth lowland, which reflects the interaction of glacio-isostasy and sea level change (Figure 3). In this model, based on many altitudinal measurements, the shorelines are shown declining eastwards, reflecting greater land uplift in the west as a consequence of thicker ice masses in that area.

In Sissons' model, the decay of the Perth Stage ice was accompanied and succeeded by an invasion of the lowland by the sea. Morphological evidence (raised marine terraces along the sides of the lowland) reflects a staircase of former shorelines, the lower members of which extend progressively farther westward as a result of marine invasion followed by land uplift as the ice decayed. Stratigraphical evidence from the the eastern lowland discloses a mélange of glacial deposits above the sandstone bedrock. This is overlain, probably without major lacunae, by estuarine silts and clays, again supporting a marine invasion during or following deglaciation.

The model envisages a continued fall in relative sea level throughout the Windermere Interstadial. This was succeeded by a rise, or stabilisation, in sea level as the climate deteriorated with the advent of the Loch Lomond Stadial. This is thought to have resulted in the erosion of some areas of bedrock, together with underlying glacial and estuarine sediments, to produce a lag gravel layer termed the Main Lateglacial Shoreline. This, now buried, feature can be traced most notably east of Stirling at *circa* -6 m OD (Sissons 1969, Sissons and Rhind, 1970), and possibly also in the western Forth lowland, reaching about 7 m above OD (this paper).

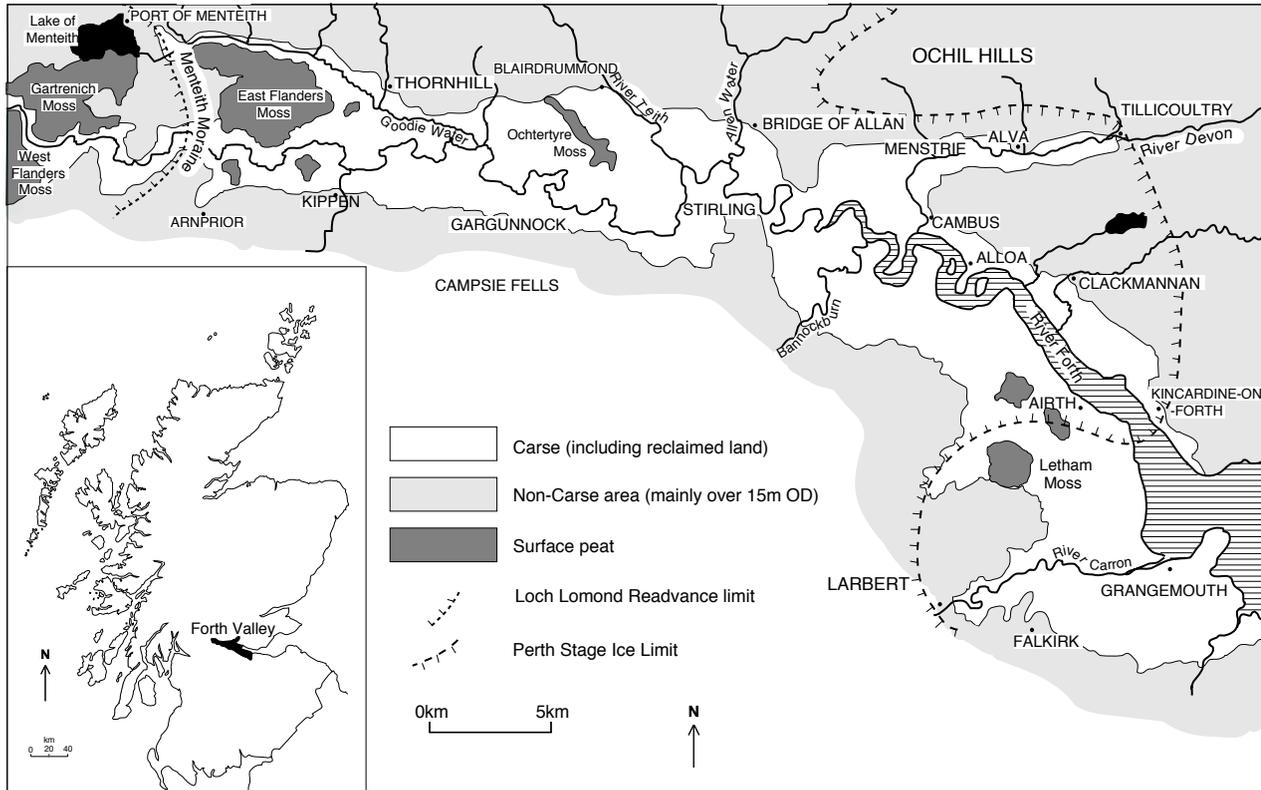


Figure 1 The Forth Valley Lowland (Carselands) (after Kemp, 1979).

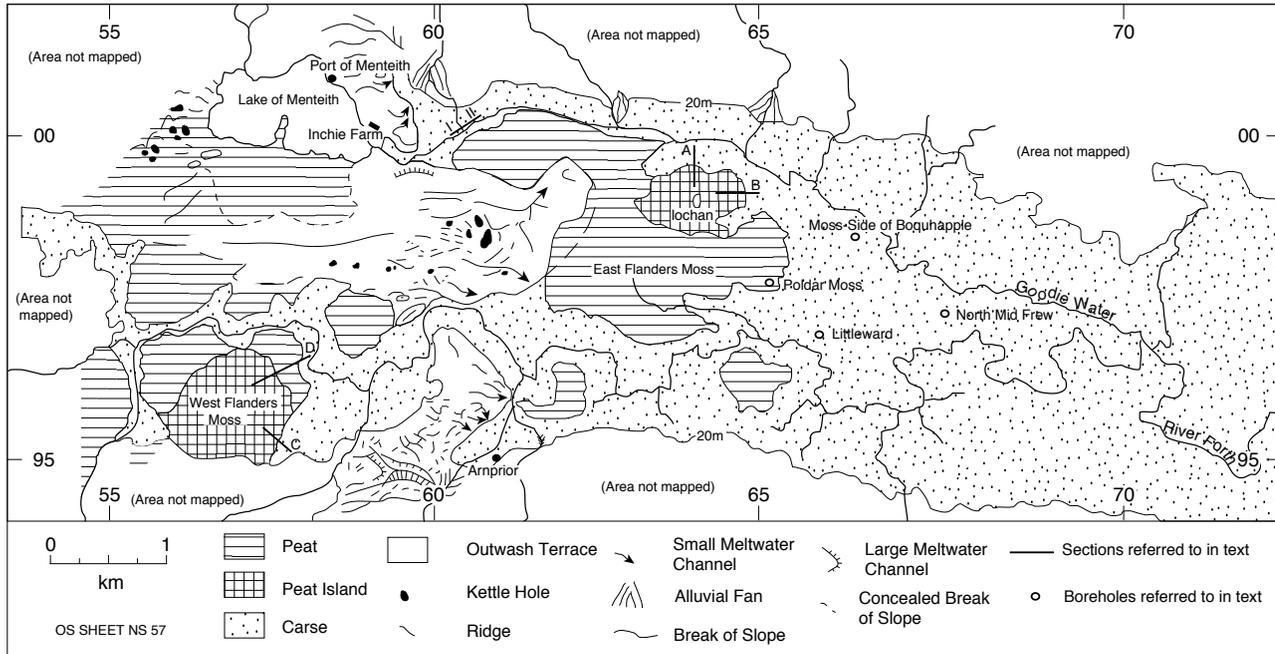


Figure 2 The Geomorphology of the Western Forth Lowland (after Smith, 1993).

The subsequent arrival of a Loch Lomond glacier into the head of the lowland probably removed most of the depositional features which had accumulated in that area during and following the decay of Perth Stage ice. Incorporated in the deposits of the Menteith Moraine are estuarine deposits containing shells. Near Inchie Farm (Figure 2) a specimen of *Mytilus edulis* from these deposits has been dated at  $11\,800 \pm 170$  yr. BP (*i.e.* radiocarbon years before 1950, the benchmark year for radiocarbon dating) (Gray and Brooks, 1972). Evidently the Loch Lomond glacier at the head of the valley had advanced into an area of estuarine sediments, disturbing them and mixing those sediments with deposits of the moraine.

Sea levels at the head of the lowland when the ice formed the Menteith Moraine are unknown. In terms of establishing a minimum sea level for the Loch Lomond Stadial, it is known that the fluvioglacial sand and gravel deposits which formed at and in front of the Loch Lomond ice margin in the western end of the valley (and as deployed through the gaps in the Menteith Moraine), can only be traced in boreholes for a limited distance and, as yet, have never been traced descending to altitudes below that for the Main Lateglacial Shoreline feature. This suggests that the minimum Loch Lomond Stadial sea level never fell lower than it did during the formation of the Main Lateglacial Shoreline (*circa* 7 m OD in the western lowland). Current understanding is that there was in fact a marine transgression, as Loch Lomond Stadial ice still lay at the moraine. Estuarine silts and clays (*circa* 13 m OD) have been traced on top of areas of outwash, forming a feature known as the High Buried Beach (in fact an estuarine terrace deposit, rather than a "beach" *sensu stricto*) (Figure 3). The lack of this feature in the sedimentary sequence behind the moraine is taken as evidence of its contemporaneity with the presence of an ice mass at the head of the lowland. A maximum age of *circa* 10 300 yr BP has been estimated by Sissons (1966) for this feature.

Ultimately, the Loch Lomond glacier decayed and the development of an extensive estuarine deposit, below the altitude of the High Buried Beach, points to renewed sea level fall. This feature, termed the Main Buried Beach, heralds the start of the accumulation of Flanders Moss. The Main Buried Beach, at its upper surface, lies consistently at *circa* 11 m OD in the western Forth lowland. Unlike the preceding terrace, the Main Buried Beach is present both east and west of the Menteith Moraine (Sissons and Smith, 1965), demonstrating that it formed after ice had vacated the area. As sea level continued to fall, the upper surface of the Main Buried Beach became subaerially exposed, initially in an intertidal environment and eventually lying above the influence of the tidal cycle. Exposures of this deposit, visible in the banks of the Forth at Faraway, disclose macrofossil evidence of reedswamp development at its surface, and both pollen analyses (*e.g.* Newey, 1966, Sissons and Brooks, 1971 and Brooks, 1972) and diatom analyses (*e.g.* Robinson, 1993) indicate gradually decreasing marine influence as peat accumulation began across the sediment surface. Radiocarbon dates from the base of the peat at several locations by Robinson (1993) indicate that peat accumulation began around 9600 yr BP, perhaps as early as around 9900 yr BP. Obtaining an accurate

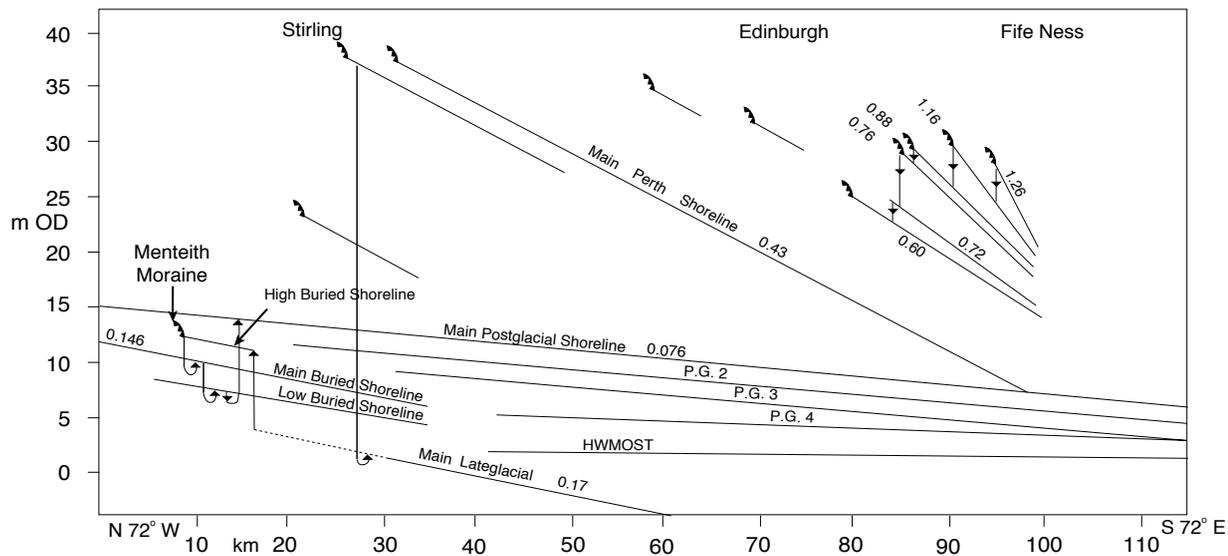


Figure 3 Height-Distance Diagram of Shorelines in South-East Scotland. Gradients are in  $\text{m km}^{-1}$  (after Smith 1965 & Sissons, Smith and Cullingford 1965, as previously published in Smith, 1997).

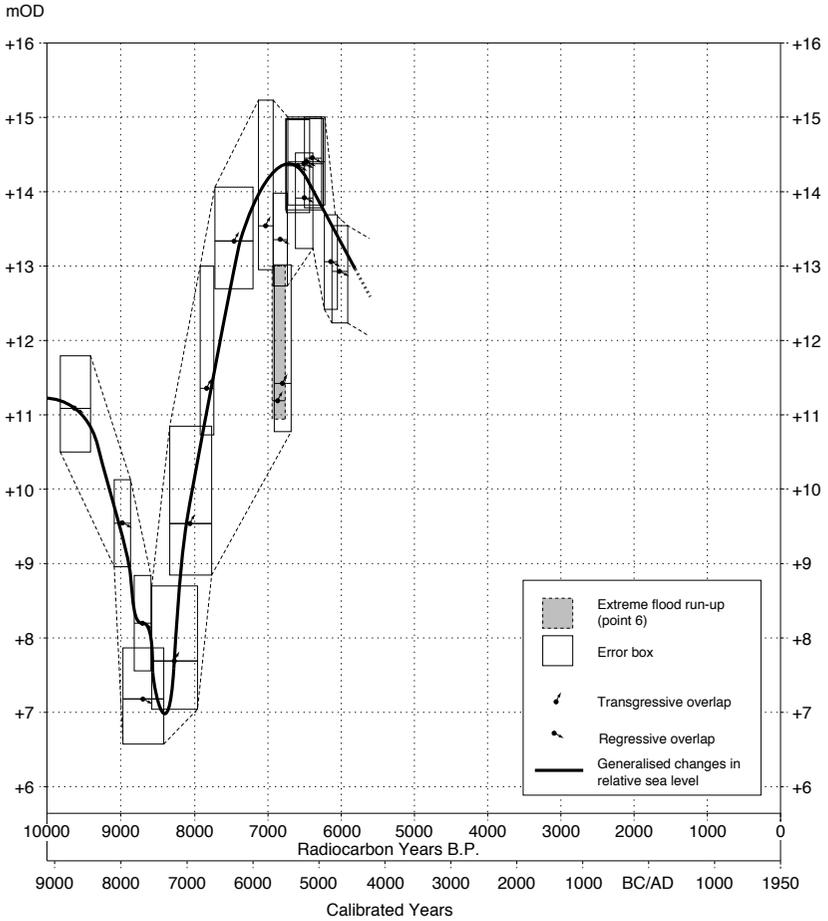


Figure 4 Flandrian Relative Sea Level Change, Western Forth Lowland (after Sissons and Brooks, 1971; Robinson, 1993).

estimate of the age at which the first Flanders Moss peat began to accumulate is problematic, given that existing ages span the 9000-10 000 yr BP radiocarbon timescale which has two known "plateau" periods where true radiocarbon ages are difficult to determine with certainty (Kromer, 1991).

Below the Main Buried Beach lies a third estuarine terrace, formed in response to a transgressive pulse interrupting the generally regressive sea level trend of the early Flandrian. Termed the Low Buried Beach, and reaching 8 m OD, this deposit is confined to a narrow zone broadly along the axis of the Forth lowland (Sissons, 1966). This surface also became abandoned as sea level continued to fall and peat accumulation developed across it. Abandonment of the Low Buried Beach is placed at about 8700 yr BP by Robinson (1993). It seems likely that by *circa* 8500 yr BP, the three estuarine surfaces of High, Main and Low Buried Beaches were extensively occupied by peat mosses, perhaps presenting a similar appearance to the peat-covered carselands of the early eighteenth century before peat clearance began. Strangely, the High Buried Beach has not yet been found to possess a peat cover older than that across the Main Buried Beach, implying that conditions may have been inimical to the accumulation of peat on its surface until the abandonment of the Main Buried Beach.

The fall in sea level in the Forth Estuary was apparently arrested by about 8400 yr BP, when at Airth, to the east of Stirling, peat became overlain by silts and clays of the early carseland deposits (Godwin and Willis, 1961). Relative sea level graphs of Sissons and Brooks (1971) and Robinson (1993), here amalgamated in a composite graph, chart the rise in the western Forth lowland (Figure 4). For each datum, the sea level index points plotted are comparable points marking the approximate limit of the Mean High Water Spring tides (mHWS), and are surrounded by boxes giving the likely errors of these points according to recent studies (*e.g.* Cullingford, Castledine and Gotts, 1980). The marked rise in sea level, the Main Postglacial Transgression (named by Sissons in 1974), was rapid, amounting to perhaps  $4.5 \text{ mm yr}^{-1}$  from data obtained by Robinson (1993). As the transgression progressed, most of the peat areas then developing were submerged and buried beneath accumulating carse silts and clays. However, on the sites of both West and East Flanders Moss, peat islands were able to persist and resist inundation by the carse sea (see Figure 2). The areas of these islands have been determined by detailed boring and with reference to Peat Survey of Scotland borehole records (Smith, 1965; Sissons and Smith, 1965; Cullingford, Smith and Firth, 1991). In East Flanders Moss, the island would have been about  $2 \text{ km}^2$  as the transgression reached its maximum. Stratigraphically, the former islands can be detected today by identifying the limits of tapering wedges of carse sediment, which can be traced widely across East Flanders Moss.

Culmination of the Main Postglacial Transgression was achieved at about 6900 yr BP according to Robinson (1993) from data obtained across one such tapering wedge of carse sediment extending into West Flanders Moss. The carse sediments of the western Forth lowland reach an altitude of not more than 14.9 m OD in and around the mosses at the Main Postglacial Shoreline. A

recent map showing altitudes for this shoreline across Scotland, analysed by Trend Surface Analysis to produce a contour map, effectively an isobase map (Figure 5), show it to have attained its highest value in the western Forth lowland. Dates on deposits associated with the shoreline demonstrate that it is time-transgressive across Scotland, ranging in age from *circa* 6900 yr BP to *circa* 6000 yr BP. Thereafter, sea level fell back, probably in stages, revealing lower terraces in the carselands to the east of Flanders Moss (Smith, 1968), to achieve its present levels in the Forth estuary, possibly sometime after 2000 yr BP (by inference from sites elsewhere in Scotland). As sea level fell, peat accumulation continued at East Flanders Moss, as well as on the then exposed carseland surface, leading to the widespread development of the lowland raised mosses of the Forth valley, visible before the moss clearances.

Recent stratigraphical investigations at West Flanders Moss, have provided evidence for a major marine flood event in the Forth lowland which appears to have occurred close to the culmination of the Main Postglacial Transgression. At Over Easter Ofference, in the buried peat just below a tapering wedge of carse sediment, a sheet of micaceous silty fine sand has been traced (Sissons and Smith, 1965, Figure 9, transect D, this paper). Diatom analysis (Robinson, 1993) revealed the sand layer to be rich in broken fragments of marine and estuarine algal species. Additionally, its stratigraphical position (surrounded above and beneath by predominantly terrestrial peats), suggests that the sediment sheet accumulated during a high energy event. The underlying peat was dated to *circa* 6870 yr BP (Robinson, 1993) and the sand layer is thought to correspond in origin to other similar deposits known to be widespread in eastern Scotland (Smith, Cullingford and Haggart, 1985). It is believed that this deposit was laid down during a tsunami associated with a large underwater landslide on the continental slope off south-west Norway, the Second Storegga Slide (Dawson, Long and Smith, 1988) and it is believed to have reached eastern Scotland at about 7100 yr BP (the slight age difference to the Over Easter Ofference date being within a combined radiocarbon and sampling error). Although traceable as a continuous sediment sheet at Over Easter Ofference, the deposit cannot be traced extensively throughout all peats of similar age in the western Forth lowland. Macrofossils found in corresponding sediments elsewhere in Scotland, and from Norway, indicate an event in the autumn, and the distribution of the layer across eastern Scotland suggests that it was laid down in the Forth lowland at perhaps mid or low tide on the tidal cycle, providing an explanation of why the sand deposit is not more extensively found.

### **Field Evidence for Sea Level Change at East Flanders Moss**

The majority of field evidence for sea level change in the western Forth lowland has been gained from sites around the periphery of East and West Flanders Moss. In addition to this information, recent sedimentological work on four deep boreholes (undertaken by the Dutch Geological Survey in 1995), at Moss-Side of Boquhapple, Poldar Moss, Littleward and North Mid Frew, located to the east of East Flanders Moss, illustrates the influence that relative

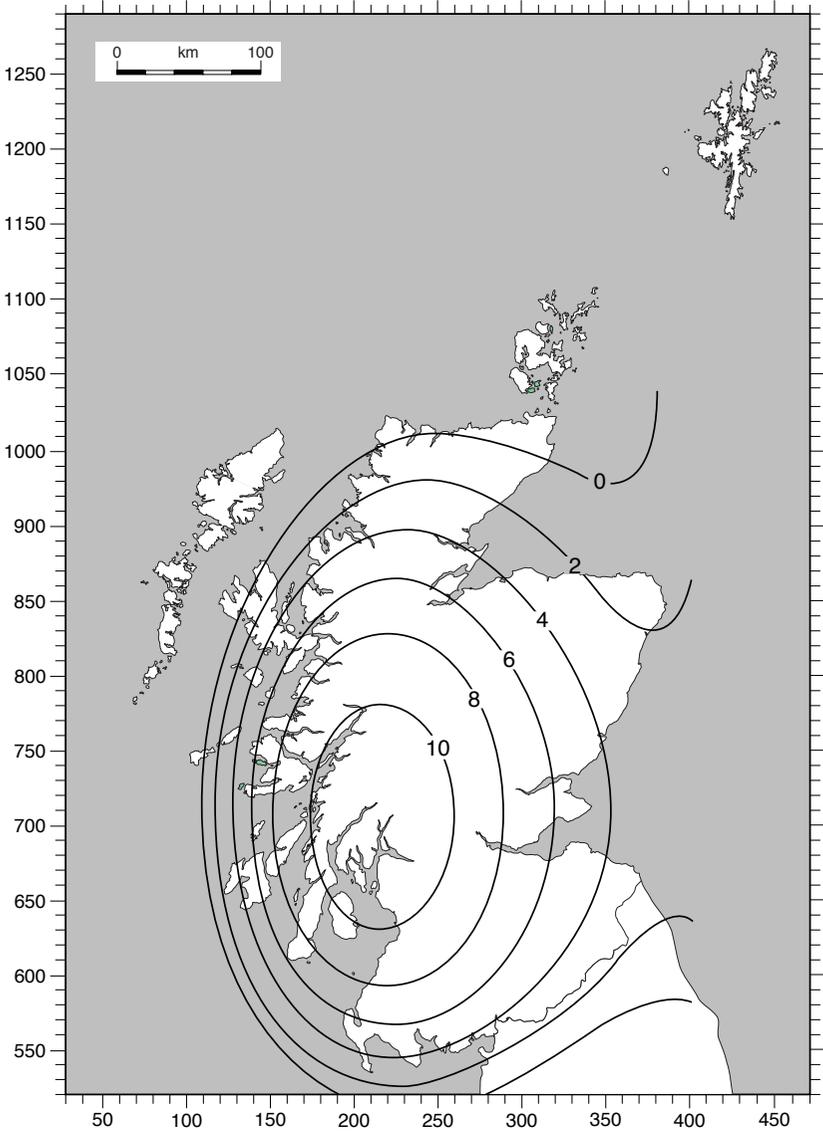


Figure 5 Isobases for the Main Postglacial Shoreline (values in metres above High Water Mark of Spring Tides) as Determined by Cubic Trend Surface (after Smith *et al.*, 1995)

sea level changes have had on the evolution of the Moss.

Some of the earliest evidence for sea level change in the Forth lowland can be seen along the Goodie Water channel to the north of East Flanders Moss, and was first interpreted by Sissons, Cullingford and Smith (1965). As the channel is followed draining south-east from the Lake of Menteith, it is flanked by sand and gravel terraces, a series of relict outwash terraces once deployed from the Loch Lomond ice margin through a breach in the Menteith Moraine (near Inchie Farm, Figure 2). These terraces fall consistently in altitude along the Goodie Water channel, and eventually descend beneath the carse and occasional remnants of surface peat. Through excavations in the channel banks, the carse clay can be seen to rest on a buried peat layer overlying a blue-grey silty clay (Main Buried Beach) deposit, overlying the descending outwash material (Figure 6). This sequence represents an early Flandrian marine transgression followed by a marine regression and initiation of terrestrial peat growth, before another phase of marine inundation (Main Postglacial Transgression), and accumulation of the carse, the surface of which was then revealed following a subsequent fall in relative sea level allowing the surface peat to accumulate.

The Flandrian estuarine and peat sequence to the east of East Flanders Moss is not thought to rest on outwash gravels discharging from the Menteith Moraine ice limit, for as borehole evidence from Moss-Side of Boquhapple reveals, the Flandrian sequence overlies earlier Lateglacial deposits of shelly red clay with stones, capped with a thin gravel layer. Molluscan and ostracod evidence suggest that the pink clay represents a fjord-style, cool water, estuarine environment. AMS radiocarbon assays suggest that the clay is Winderemere Interstadial in age (*circa* 13 000 yr BP). Ostracod evidence confirms this deposit is probably an undisturbed, down-valley continuation of the estuarine material displaced by advancing ice and incorporated into the Menteith Moraine at the head of the valley. Sea level interpretations are tentative, but from at least 13 000 yr BP to 11 800 ± 170 yr BP (the date on a shell from the Menteith Moraine, Gray and Brooks, 1972) high relative sea level conditions can be envisaged for the area.

Above the pink clay deposit frequently lies a *circa* 10cm thick gravel deposit. In the case of the borehole at North Mid Frew, the gravel contains molluscan fragments. It is believed that this feature (traced at *circa* +6-7 m OD in the western lowland) can be correlated with the lag gravels to the east of Sirling (at *circa* -6 m OD), and represents the western extent of the Main Lateglacial Shoreline, envisaged by Sissons (1969), reflecting low sea level conditions during the Loch Lomond stadial.

The Flandrian record itself, to the east of the Moss, is similar to that visible in the banks of the Goodie Water to the west (Figure 7). The Poldar Moss core demonstrates the surface peat cover overlying the carse clays. The consistency in altitude of the lower contact of the buried peat surface between Poldar Moss and Moss-Side of Boquhapple illustrates the flat shoreline surface of the Main Buried Beach as it became colonised by terrestrial vegetation. Notably, in the

core from Littleward, the buried peat lies at just over 7 m OD, representing the colonization of the exposed Low Buried Beach surface by vegetation. The absence of buried peat at North Mid Frew possibly reflects erosion by the rise in sea level of the subsequent Main Postglacial Transgression.

Laboratory analysis of the size of particles forming the suite of Flandrian estuarine deposits can be used as a proxy indicator of energy conditions in the estuary at the time the minerogenic deposits accumulated (Figure 8). It is consistently the case that the lower portions of both the carse sediments and the Buried Beach deposits are generally sandier and frequently laminated. The Buried Beach deposits have been found to be coarser grained, with a higher percentage of sand-sized grains relative to the predominantly clay- to silt-sized grains forming the carse sediments. The dynamics of estuarine sedimentation are complex, but it can be noted that peat accumulation follows the "quiet water" environment, near the upper portion of the estuarine material, when clays and silts predominate. Conversely, at North Mid Frew, where the buried peat is absent, the carse sediment contains a significant proportion of sand, suggesting that energy conditions during the Main Postglacial Transgression were high enough to erode any intervening peat deposits at this locality.

It can be observed that at *circa* 12 m OD a clustering of laminations is frequently observable within the usually massive carse clays (Figure 8). In the case of the Poldar Moss and Moss-Side of Boquhapple cores, this is also accompanied by a coarsening in particle size (Figure 9). This may correlate with the minerogenic sediment sheets found within the peat (Sissons and Smith, 1965, and Robinson, 1993).

### **The Evolution of East Flanders Moss**

Not only does Flanders Moss contain some of the most detailed evidence for Flandrian sea level change in Scotland, but the accumulation of these estuarine sediments has significantly determined the evolution of the Moss throughout the last *circa* 9000 years. Figure 9 illustrates the stratigraphic setting of the peat islands of West and East Flanders Moss, and the periods of marine inundation around the edges of these islands. New sedimentological information confirming the drop in energy conditions associated with the upper portion of the Buried Beach material (this paper), together with palaeontological information demonstrating the tailing-off in marine influence in the overlying organic material with the transition from marine to terrestrial dominance (Robinson, 1993), illustrates how the environmental conditions of falling sea level allowed the initiation of Flanders Moss *circa* 9000 yr BP. The perpetuation of an island of peat in East Flanders Moss, as well as one in West Flanders Moss (Figure 2), whose vertical rate of accumulation evidently must have outstripped the rate of sea level rise associated with the Main Postglacial Transgression, can be partly explained by their geomorphological setting. The deepest zones of peat are to be found exclusively at the western limit of the Forth lowland. Here, marine erosion in the almost land-locked estuary would have been at its least influential. The two zones of deep peat are some distance

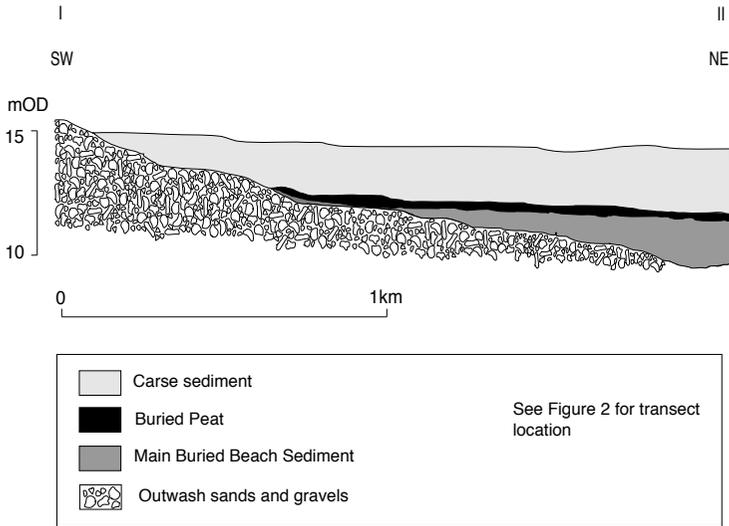


Figure 6 Schematic Stratigraphy of the Western Forth Lowland (after Sissons, Smith and Cullingford 1965).

from the present-day channels of the Forth and Goodie, and presumably in the past peat would have accumulated first, and most successfully, in locations farthest from tidal channels. It is known that the Buried Beach deposits accumulated on both Loch Lomond outwash and older Windermere Interstadial sediments, and it could be that peat growth here was supported by favourable hydrological conditions. The presence of the small lochan at the centre of the Moss, and near the centre of the former peat island, could be because peat compaction in this area is less than in surrounding areas (where carse sediment occurs), and, as a consequence, the peat is more waterlogged.

East Flanders Moss is thus more than a remnant of the peat clearances. Its stratigraphy and morphology reflect complex changes in sea level, sediment accumulation and peat growth. The length and detail of this record demonstrate the unique character of this fine lowland peat moss.

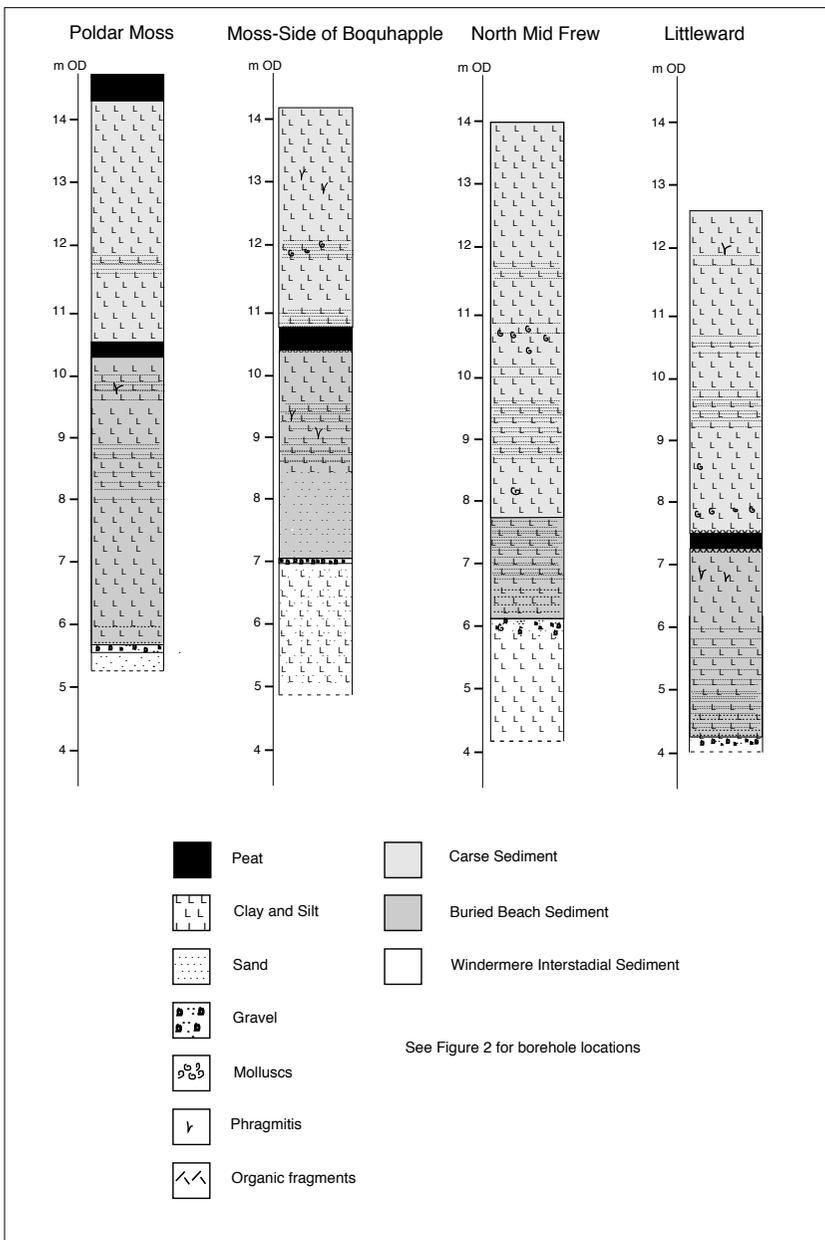


Figure 7 Selected Borehole Stratigraphy, Western Forth Lowland.

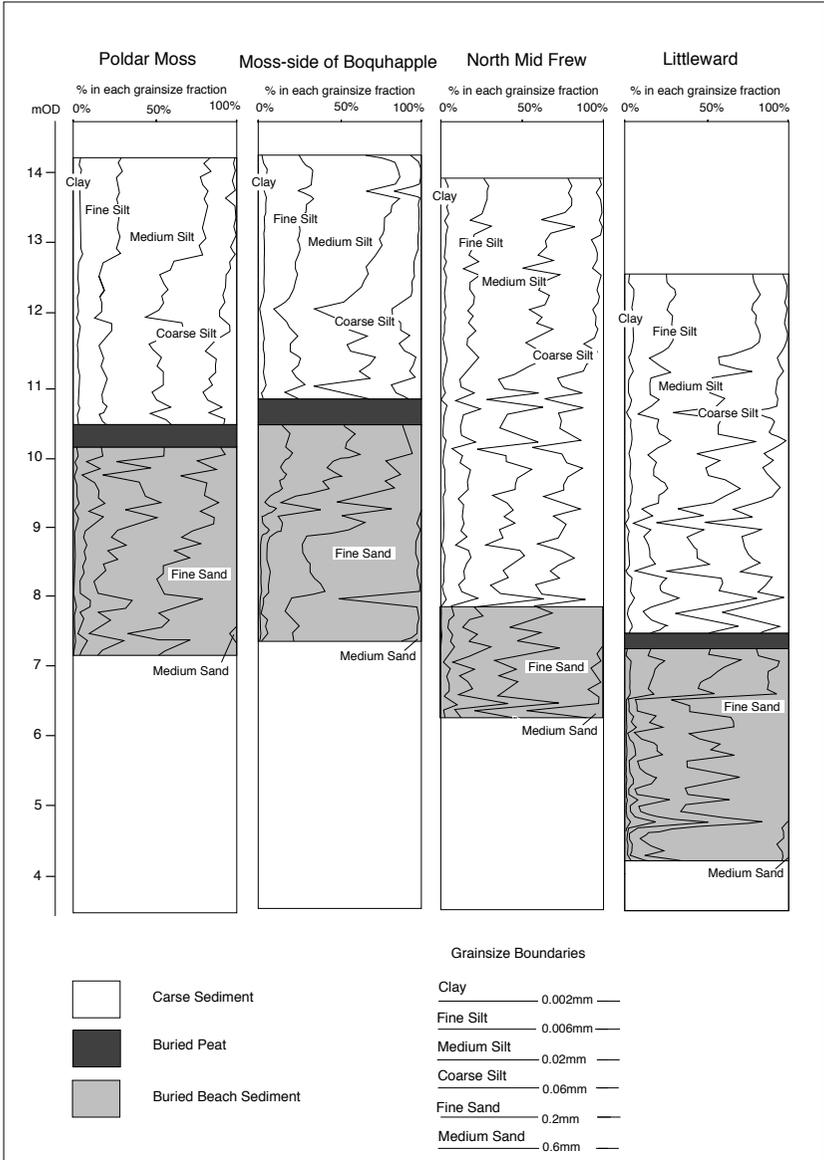


Figure 8 Particle Size Variation in the Sediments of the Western Forth Lowlands.

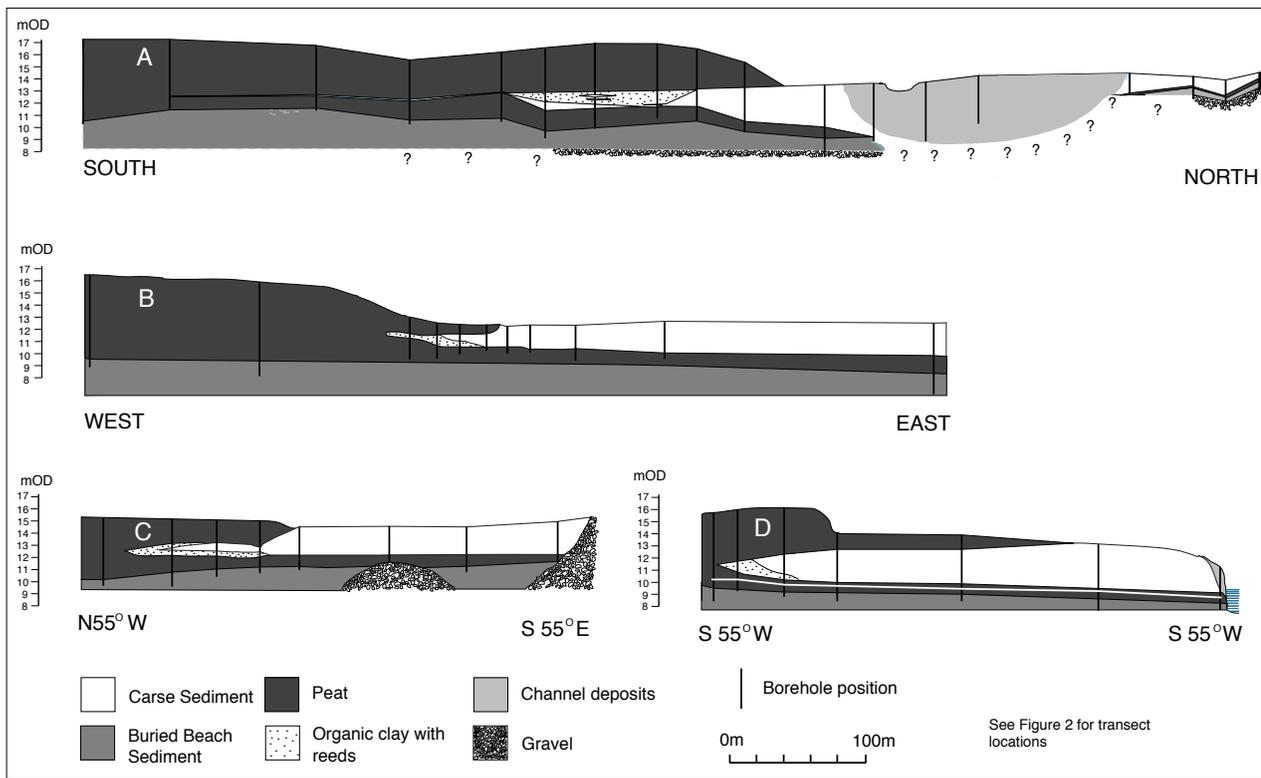


Figure 9 Carse Wedge Stratigraphy, East and West Flanders Moss.

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## A VEGETATION SURVEY OF EAST FLANDERS MOSS, NORTHERN SECTION AND A COMPARISON WITH THE SOUTHERN

Alan Booth

### Introduction

The existing Site of Special Scientific Interest, including a National Nature Reserve and a Scottish Wildlife Trust Reserve at East Flanders Moss had attracted a great deal of academic and amateur interest. The resultant reports on the flora, fauna and hydrology of the southern site were both diverse and detailed. However, the amount of research undertaken on the northern section of the Moss was limited. Even though the area was a Nature Conservation Review Site, no up to date habitat map existed of this part of the Moss and the following survey was undertaken to provide information on the vegetation types in the northern SSSI extension.

Two pieces of work played a primary role in the survey design. The work of Bannister (1977) described the vegetation in the southern section of the Moss; and the National Vegetation Classification (NVC) for Mire communities (Rodwell 1987) had recently become available as I started the field work in July 1988. The NVC is intended as a practical tool for identifying vegetation types, describing and mapping sites and comparing their floristic resources within a comprehensive and systematic national framework. It was hoped that the methodology of the present survey would be compatible with both these descriptions.

A small study, from aerial photographs, of the trend in Birch colonisation in the northern section was also undertaken and related to Bannister's 1978 report, for the south.

### Methods

The area of the survey is shown in figure 1. The Forestry Commission, Aberfoyle kindly provided a set of 1:10,000 aerial photographs of the area, taken in July 1987, which was used on site, with a compass, also from them, to position the intersects of a north-south, east-west grid with a 200 metre interval. At, or close as possible to these grid intersects a 2 m x 2 m quadrat was positioned in vegetation representative of the area and identified on the aerial photograph. The exact sample location followed the guidelines of the NVC field manual i.e. "located wholly within stands of vegetation judged by eye to be floristically and structurally homogeneous."

Sixty quadrats (Fig. 1) were sampled with all but two (without homogeneous vegetation) within 10 m of the ground interpretation of the intersect point.

From each quadrat the following data were recorded:

1. Vegetation height.
2. Hummock-hollow height.

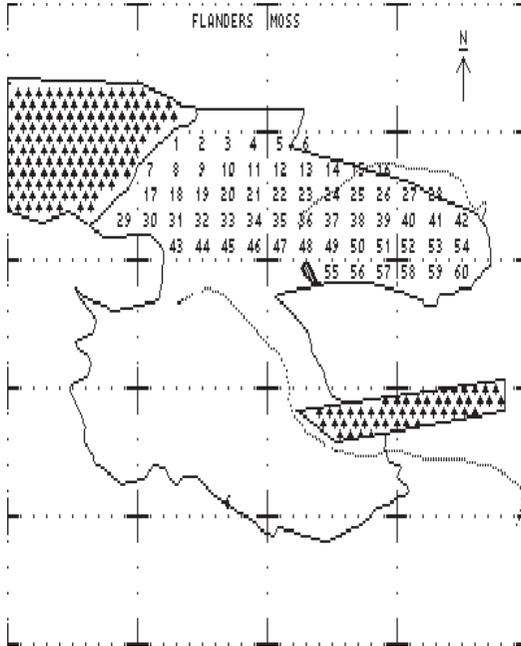


Figure 1 Location of the quadrats within the survey area.

3. Number of tree seedlings and saplings below 1 metre in height.
4. Wetness of the substrate was assessed on a 1 to 5 scale with 1 being dry and 5 being very wet.
5. Grazing was assessed on a 1 to 5 scale, 1 reflecting no grazing and 5 reflecting relatively heavy grazing.
6. Notes on the surrounding vegetation, animal droppings and other salient features.
7. Species were recorded and given a number on the Domin scale, except for some *Sphagnum* species which were retained for laboratory identification and only recorded as being present or absent.

Other species which proved difficult to identify in the field were retained for expert confirmation of identification. The liverworts and lichens which fell into this category were also given a Domin scale ranking. The identification of *Polytrichum juniperinum* was confused with *Polytrichum alpestre* at the start of the survey, *P. alpestre* is much more common on the Moss, however *P. juniperinum* is present and both species were aggregated as *P. juniperinum/alpestre*.

Daniels and Eddy (1985) was the primary text for *Sphagnum* identification, Smith (1978) and Watson (1968) for confirmation of other mosses and liverworts. Dobson (1979) and Duncan (1970) for lichens. Although the range

of chemical tests was used on *Cladonia* spp. some samples were confirmed only after ultra violet light testing by B. Coppins at the Royal Botanic Garden, Edinburgh. Clapham, Tutin and Warburg (1981); Hubbard (1978); Jermy, Chater and David (1982); and Fitter, Fitter and Farrer (1984), were the main texts used to identify the remaining flora.

The species distribution and abundance were then processed using A.J.C.Malloch's Vespan main-frame computer program and an indicator species analysis using TWINSpan, a polythetic divisive method of classification was carried out to describe vegetation groupings on the northern Moss. The raw data from Bannister's southern study were separately analysed and a set of all records was also processed, to determine if different vegetation types occupy the two areas.

## Results

Classification of vegetation groups.

From TWINSpan analysis of the 1988 data nine vegetation groups were recognised. These groups were distributed over the northern section as shown in figure 2 below.

These 9 groups are arrived at by considering all 58 samples and dividing them into 2 groups by distinctive species associations, these two groups are further sub divided into 2, giving a maximum of 4 groupings and so on. In this

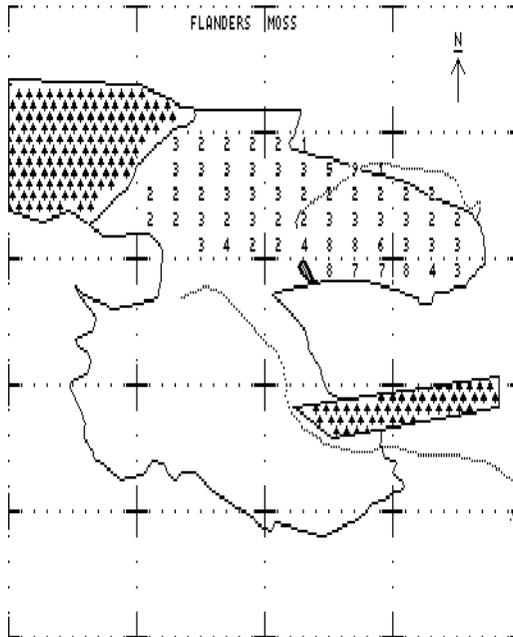


Figure 2 Nine vegetation groups.

case 4 divisions were made giving a maximum of 16 end groups. Obviously a group of one sample can not be split which accounts for the lower number of actual end groups. These end groups, decided by distinctive species associations, represent particular vegetation types.

A table to show the various end groupings relationship to one another, and the number of samples in each group follows:

Group	1	2	3	4	5	6	7	8	9
Division 1	0	0	0	0	0	1	1	1	1
Division 2	0	1	1	1	1	0	0	0	1
Division 3	0	0	1	1	0	1	1		
Division 4	0	1	0	1	0	1			
No of samples in group	2	23	21	3	1	1	2	4	1

The samples that make up groups 1-5 inc. are separated from groups 6-9 inc. at the first division. When the samples contained in groups 1-5 are considered at the next division, group 1 is determined to be sufficiently different from the rest to be split off. At the third division of groups 2-5 inc. the samples in group 2 and 3 are deemed to be similar to one another and different from groups 4 and 5. Finally, division 4 splits group 2 and 3 by differences in the species presence and abundance in the samples.

It can be seen that groups 2 and 3 are more strongly related to one another than group 3 is to group 4 and so on.

The main vegetation groups are described below:

The first division of the data split vegetation groups 6, 7, 8 and 9 from the rest, with one quadrat as borderline; this quadrat (group 9) is separated out at the next division (by *Deschampsia flexuosa*) and represents an area of rough grazing next to a drainage ditch.

Groups 6, 7 and 8 are separated from the remainder by a complete lack of *Calluna vulgaris*, *Eriophorum vaginatum*, *Erica tetralix*, *Sphagnum capillifolium* and *Odontoschisma sphagni*. The presence of *Myrica gale* (above Domin scale 7) and *Juncus effusus* (above Domin scale 4) complete the division which separates this area in and around open Birch woodland which has had a huge nutrient input from a gull colony. *Holcus lanatus* or *Phalaris arundinacea* occur in large stands with much *Rumex acetosa*.

Group 1, represents sheep grazed fields on a modified rand slope, fenced off from the main bog. *Molinia caerulea*, *Deschampsia flexuosa*, *Potentilla erecta* and *Polytrichum commune* are constant in this grouping. *Juncus effusus*, and *Luzula multiflora* occur in the damper areas with *Anthoxanthum odoratum*.

Groups 4 and 5 are separated from the main bog types by having some *Molinia caerulea*; at least 5 % *Deschampsia flexuosa*, and no *Odontoschisma sphagni* or *Vaccinium oxycoccus*. Both groups are on the edges of the main bog groupings and are indicative of a higher nutrient flux (Rodwell, 1986)

The main bog groupings 2 and 3 are described by the constants *Calluna vulgaris*, *Eriophorum vaginatum*, *Erica tetralix*, *Sphagnum capillifolium* and *Odontoschisma spheni*. *Molinia caerulea* and *Potentilla erecta* are absent. These two groups are separated by *Polytrichum commune* and *Betula pubescens* with *Drosera rotundifolia* and small amounts (<Domin 2) of *Narthecium ossifragum* in community 3.

These two groupings have a high constancy of *Sphagnum tenellum* (77 %), *S. magellanicum* (80 %), *S. palustre* (55 %) and *Eriophorum angustifolium* (45 %).

Two tables of the data set for this survey ordered in groups and with divisive species marked, are included in the appendix.

The groupings, 2 and 3, are covered by the National Vegetation Classification M18 *Erica tetralix* – *Sphagnum papillosum* Raised and Blanket mire. The lower than expected levels of *Sphagnum papillosum* (10%) in the samples, although commonly seen on the mire surface, could be due to mis-identification, however the steps taken to ensure accurate identification (including sectioning the leaves of any borderline sample and microscopic examination for papillae) leads me to the conclusion that in this mire, *Sphagnum magellanicum* has, perhaps because of the very poorly developed pool hummock formations compared with those found in other raised bogs, attained a higher dominance.

The description of the physiognomy of this NVC community gives a good portrayal of groups 2 and 3. It states that “*Sphagnum papillosum* is primarily a species of the surrounds to wetter depressions and of flats and it often predominates there, with *S. magellanicum* and a little *S. tenellum*. *S. magellanicum* extends a little higher above the water table than does *S. papillosum* but on hummock sides and on tops both typically give way to an abundance of *S. capillifolium*”. The balance between these species helps define the two sub communities of the M18 type. The samples from Flanders Moss fall into the *Sphagnum magellanicum* – *Andromeda polifolia* sub community. Group 2 has relatively more *Sphagnum magellanicum* and less *Andromeda polifolia* than group 3 indicating slightly wetter conditions. Group 3 also indicates a drying substrate with the establishment of Birch and the large amounts of *Polytrichum commune*. *Betula pubescens* is not mentioned as a species of the M18 community. The increase in this species, together with *Dryopteris carthusiana* and *Empetrum nigrum* in the area occupied by group 3, lead to the assumption that the M18 community is likely to change. The 44 quadrats which make up this grouping could be further divided into more narrowly defined sub-communities, however this action would not be worthwhile considering the scale of the site and the number of quadrats available to describe it. The lack of resolution when projecting communities onto a map would lead to confusion. The scale of the quadrat sample is not able to pick up the different associations apparent on top of a hummock and in a hollow which were aggregated with the 2 m x 2 m quadrat used.

The variation within and around the dome can be assessed using the NVC

description of trends and succession. Flanders Moss, like many other lowland raised mires has been cut, burnt and grazed. The resultant lowering of the water table tends to shift the balance within an *Erica* – *Sphagnum* Mire towards the *Empetrum* – *Cladonia* sub community and sometimes towards a more overwhelming dominance by *Calluna vulgaris*, *Eriophorum vaginatum* or *Molinia caerulea*. This effect can be noted, from aerial photographs, by the ring of *Myrica* on the rand face and in the drainage systems of the small streams. Continuation of such a trend could convert the *Erica* – *Sphagnum* Mire into a *Scirpus* – *Erica* Wet Heath, with the loss of *Eriophorum vaginatum* and *Sphagnum* lawns.

Once the surface has ceased to be waterlogged, woody plants, typically *Betula pubescens* and *Pinus sylvestris* can colonise, developing a community which could progress to *Quercus* – *Betula* – *Dicranum* woodland. This path is unlikely to explain the present Birch and Pine development in group 3 due to the low incidence of *Scirpus caespitosus* in the area, however it does indicate the future likely development of this zone.

Eutrophication of the mire surface or ground waters around, be it from burning, surface disturbance, run off or drift, is a frequent determinant of vegetation change. An increase in *Sphagnum recurvum* densities is an indication of this process and is shown in groups 4 and 5 of this survey.

Although change from the M18 type of mire vegetation can be the consequence of past and present management, it must be remembered that East Flanders Moss is the only bog of its kind in the east of Britain and the lower rainfall and possibly higher evaporation than more westerly and southerly sites could account for a certain amount of divergence from the M18 type.

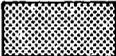
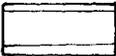
Site 29 was a more freely drained soligenous area where *Myrica gale* and *Molinia caerulea* were abundant in a complex mosaic. This area formed part of the head of the High Moss Pow and grades into a *Carex paniculata* swamp (NVC S3) just off the original survey area.

Using the above information and field target notes a habitat map of vegetation communities based on the 1987 aerial photographs was made and is included as figure 3 below.

It can be seen from the vegetation map (Figure 3, page 8) that there is a considerable area of the northern section of the site which has a covering of Birch. In an attempt to gain more information about the Birch, three aerial photographs were studied, dated 1960, 1974 and 1987. A belt transect 100 m wide on the ground was drawn to scale on these three photographs, running from the lochan north north west, the 1300 m of the western edge of this belt was divided into 100 m sections and squared off to give 13 one hectare plots, which are shown in figure 4 (page 9).

The number of trees (over 2 metres in height) was then measured in each plot, for each year. The 1960 photograph was a mosaic and measurement of height was by shadow length, the 1974 and 1987 photographs were stereo

## KEY TO HABITAT TYPES ON MAP (page 8)

	GROUP 2 VEGETATION TYPE
	GROUP 3 VEGETATION TYPE WITH SPARSE BIRCH SCRUB
	GROUP 3 VEGETATION TYPE WITH ESTABLISHED BIRCH
	MOLINIA GRASSLAND
	MYRICA GALE
	JUNCUS MIRE
	GROUP 6, 7 & 8 VEGETATION TYPE
	WILLOW / BIRCH / ALDER WOODLAND

For Figure 3 Vegetation map of Northern Part of Site turn to page 8.

pairs, giving a better distinction between trees and scrub. The results are tabulated below.

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1960	0	5	0	0	17	32	8	3	0	0	0	0	0	65
1974	5	5	0	0	19	40	40	45	30	0	0	0	0	184
1987	27	32	10	0	27	42	73	64	30	0	0	0	0	305

It can be seen that between 1960 and 1987 both the number of trees and the number of plots in which there are trees have increased.

Although this is not a thorough investigation of Birch colonisation of the mire surface, it does tend to confirm that the trend to Birch colonisation, reported by Bannister in 1974, on the south of the Moss was mirrored by a similar trend in the north.

#### Comparison with the southern site.

Amalgamation of the 1988 quadrat data with Bannister's 1977 data provides

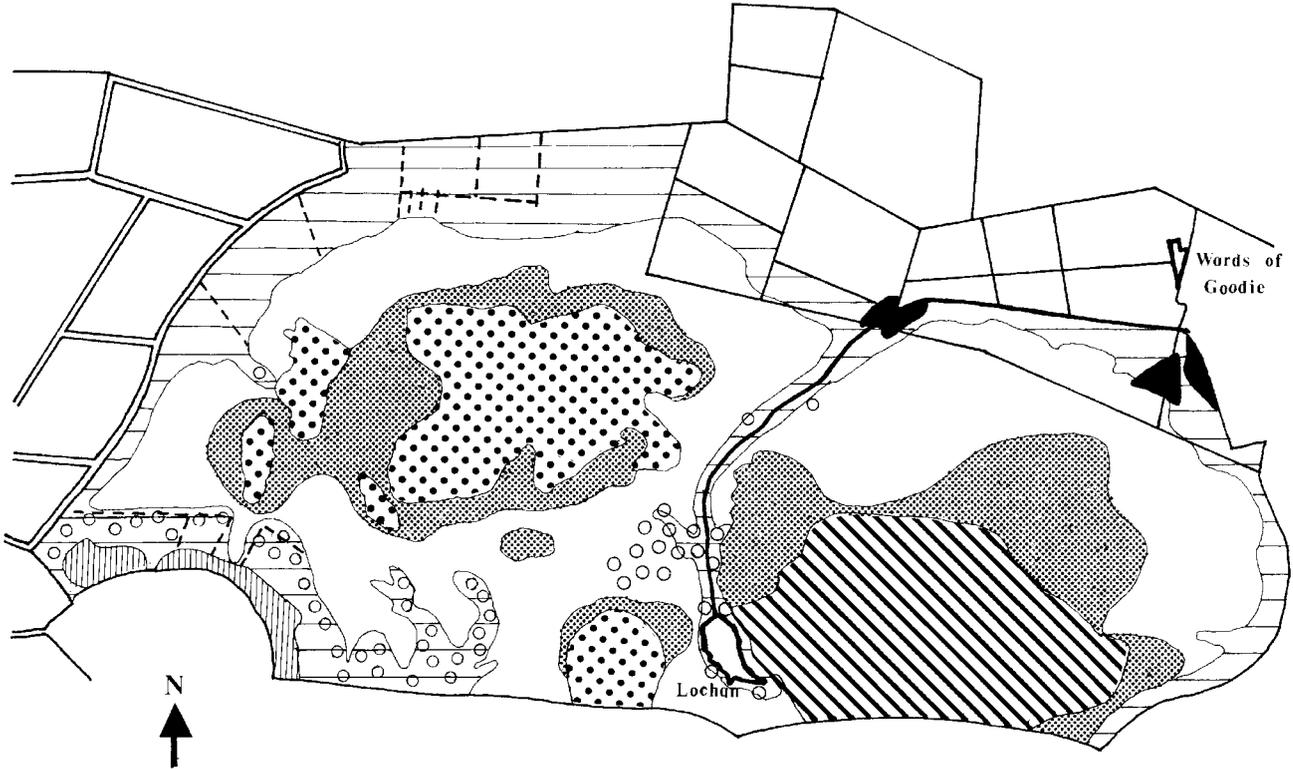


Figure 3 Vegetation Map of Northern Section.

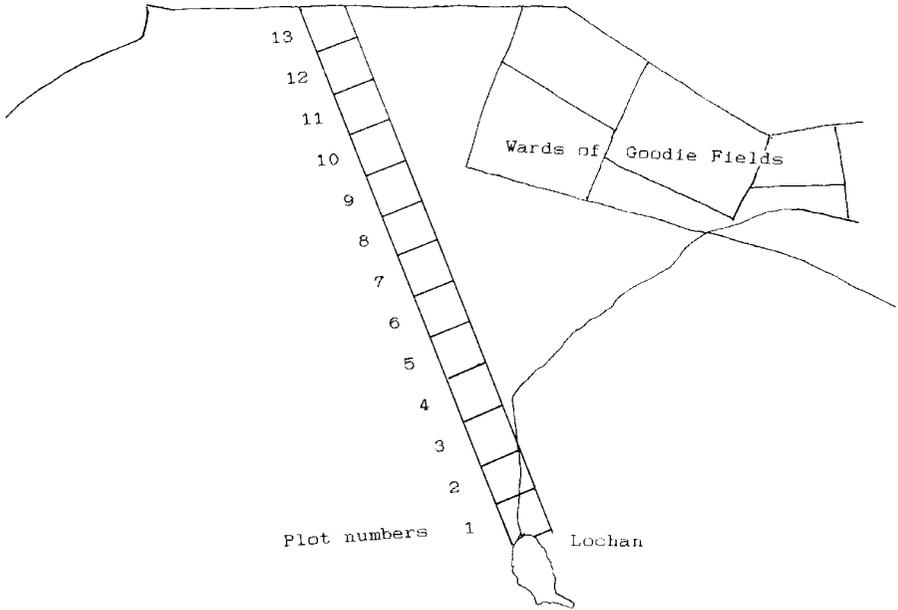


Figure 4 Position of Belt Transect.

some interesting results. Bannister's 53 survey points added to the southern section of the Moss are shown in figure 5.

A standard analysis by TWINSpan of the 111 samples, with 6 division levels, yields the following 17 groups.

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Division 1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Division 2	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
Division 3	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	
Division 4	0	0	0	1	1	1	0	0	0	1	1	1	1	0	1		
Division 5	0	1	1	0	0	1	0	0	1	0	0	1					
Division 6	0	0	1	0	1	0	0	1	0	1	0	1					
Number of samples in group	2	4	8	16	15	6	2	11	14	3	16	1	4	2	1	4	2

It can be seen that the eutrophic Birch wood, previously discussed, separates out first as 15, 16 and 17 with the edge vegetation 14. Of the remainder, the grazing fields (group 1) are next to be divided, the third division of this group separates the Moss almost perfectly into north and south. The path to this division is now examined:

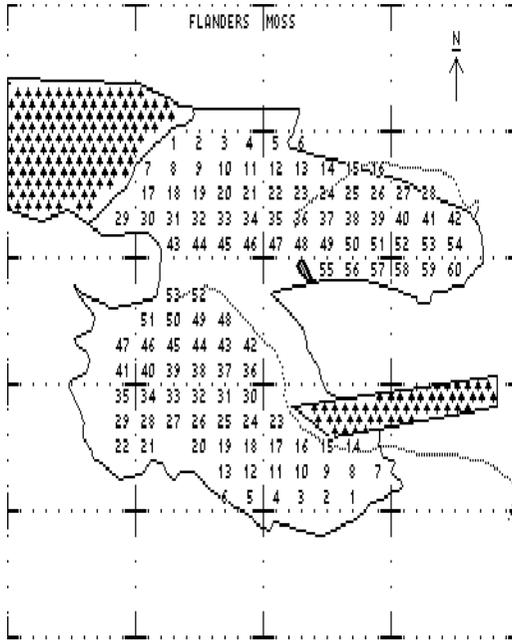


Figure 5 North and South quadrats.

*Calluna vulgaris*, *Eriophorum vaginatum*, *Erica tetralix*, *Odontoschisma sphagni* and *Parmelia physodes* are “constants” with less than Domin 7 *Myrica gale* and Domin 4 *Juncus effusus*, completing the first division. The absence of *Potentilla erecta* from the sample passes the second division. The main split between north and south comes with *Sphagnum tenellum* and *S. capillifolium* which is a “constant” in the north and much less frequent in the south. This would tend to the impression that groups 2, 3, 4, 5, 6 and 7 represent an even further modified M18 mire than the northern section.

Groups 2, 3 and 4 have more *Betula pubescens* and *Empetrum nigrum* and less *Eriophorum angustifolium* and *Drosera rotundifolia* than groups 5, 6 and 7.

A lack of *Odontoschisma sphagni* group in 7 separates it from 5 and 6. An absence of *Eriophorum angustifolium*, *Andromeda polifolia*, *Vaccinium oxycoccus* and *Drosera rotundifolia* in group 6 leaves group 5 as the vegetation community closest to M18. It can be noted from the distribution of this group in the northern section that it reflects the relatively disturbed community on the edges of the bog.

**Conclusion**

One was drawn to the conclusion that the southern section of the mire was

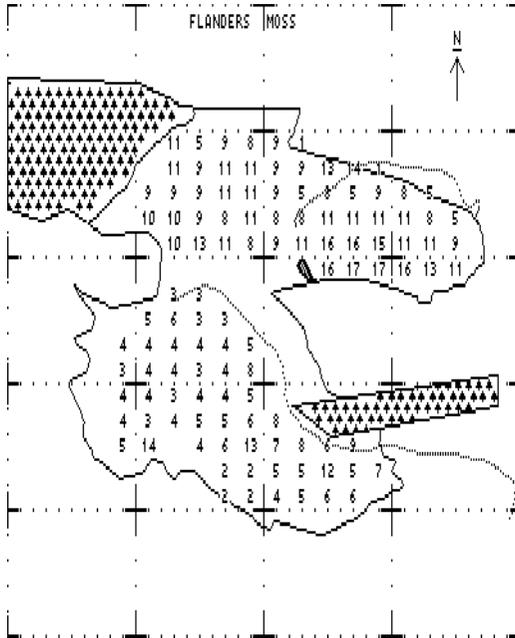


Figure 6 The distribution of the 17 groups.

more disturbed than the north and the northern zone itself had been modified in the past and was likely to be undergoing change at the time of survey. Both areas were being colonised by Birch trees.

Given that the main aim on the site was to conserve the vegetation of a Raised Mire, one may then place a priority on management intervention and recommend immediate attention be given to the southern area.

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### **Appendix**

Tables 1 and 2 Quadrat data of vegetation groups.



Table 2 Vegetation Survey of northern section – Quadrat records for vegetation groups 1, 4, 5, 6, 7, 8 and 9

Species	Quadrat Number	1	4	4	5	1	5	5	5	4	5	5	5	1	
Present		6	6	4	8	9	4	1	6	7	9	0	5	8	5
<i>*Vaccinium oxycoccus</i>					3										
<i>*Odontoschisma sphagni</i>				2											
<i>Parmelia physodes</i>					3										
<i>Sphagnum magellanicum</i>					x										
<i>Betula pubescens</i>					4										
<i>*Calluna vulgaris</i>		3		4	5	3	2								
<i>*Erica tetralix</i>		3		3	4	3									
<i>Eriophorum vaginatum</i>		5		6	6	3									
<i>Polytrichum Juniperinum/alpestre</i>					4										
<i>Cladonia portentosa (Dufoir)</i>					4										
<i>C. chlorophaea</i>				2											
<i>Sphagnum palustre</i>					x	x									
<i>*S. capillifolium</i>					x	x	x								
<i>S. tenellum</i>					x	x									
<i>Empetrum nigrum</i>					4										
<i>Carex nigra</i>		3													
<i>Luzula multiflora</i>		3		1											
<i>Hypnum curpressiforme</i>				3	3		4								
<i>Pleurozium schreberi</i>				3	4	3	7								
<i>Cladonia glauca (Florke)</i>				2											
<i>Sphagnum cuspidatum</i>							x								
<i>S. recurvum</i>		x		x	x	x	x								
<i>*Deschampsia flexuosa</i>		7	3	6	6	5	5								2
<i>Aulacomnium palustre</i>					3	4				3		3			
<i>Dicranium scoparium</i>							3								
<i>Dryopteris carthusiana</i>				3	4		2	4	3						
<i>*Polytrichum commune</i>		5	5	4	4	5	2	4	3	3	3	3	3	3	3
<i>*Potentilla erecta</i>		3	4												2
<i>*Molinia caerulea</i>		7	9	6	5		6								8
<i>Anthoxanthum odoratum</i>															3
<i>Gallium saxatile</i>							4								2
<i>Rhytidiadelphus squarrosus</i>															3
<i>*Juncus effusus</i>					3			9	9	7	8	4	7		8
<i>*Myrica gale</i>			4												
<i>Holcus lanatus</i>							4			8	7	9	6		
<i>Rumex acetosa</i>								4	5		3	4	3		
<i>Phalaris arundinacea</i>							10								
<i>Campylopus paradoxus</i>							3								
<i>Pohlia nutans</i>							3	3							
<i>Brachythecium rutabulum</i>													3		
<i>Eurhynchium prelongum</i>								3							
GROUP		1	1	4	4	4	5	6	7	7	8	8	8	8	9

Domin scores for spp in quadrat

Sphagnum presence = x

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### **Forthcoming Papers**

Volume 24 will be appearing as interest increases in the coming at last of Scotland's first National Park, Loch Lomond and the Trossachs, so a paper on the Trossachs in Art by Louis Stott will be timely. A substantial book on Menstrie Glen by RCAHMS will be published in 2001 to which a paper on Pollen Analysis at Ashentrool, Menstrie Glen; approaches to historic landscape change, will be relevant. And we have an addition to the People of the Forth series in a paper on Gilbert Cunningham of Alva, printer, translator, polymath. And a survey of Spiders on Flanders Moss by J.A. Stewart.

## CONSERVATION AND TREES AT FLANDERS MOSS

Olivia Bragg

### Introduction

Flanders Moss is one of the most important lowland raised mires in the United Kingdom. In this paper, historical evidence for its high conservation status is reviewed, and some questions are raised about its management. In particular, despite concerted efforts to reinstate the undrained, non-wooded character of the mire surface, trees continue to regenerate in numbers which threaten to overwhelm management capability. Are we approaching this problem constructively?

### Conservation importance of Flanders Moss within the U.K.

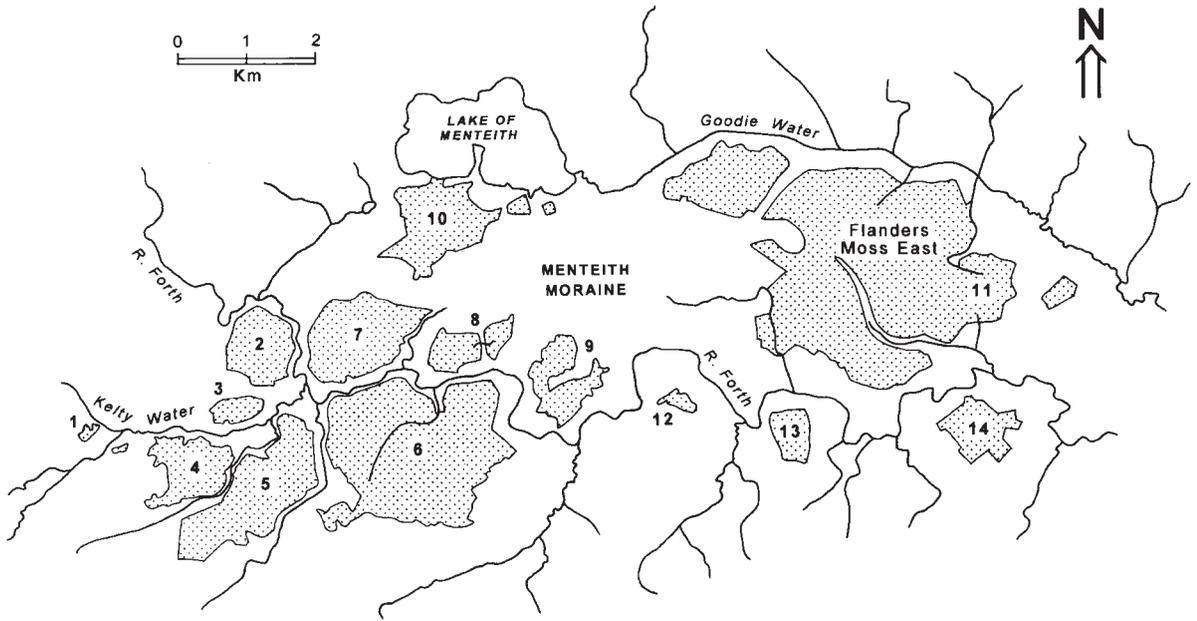
In 1976, the peatlands team of the Nature Conservancy Council set out to trace the history of land use changes on lowland raised mires in mainland Great Britain over as long a period as possible. The results have been collated, but remain unpublished (Bragg, 1984). The work focussed on the Upper Forth Valley, the Solway, South Cumbria and the Lancashire Lowlands; areas which each contained a number of raised mires below 30 metres a.s.l.

Sources of data were chosen on the basis that they offered comparable information for all four study areas collected over five periods of 3-25 years which were, therefore, short in relation to the timescale of the study – 1840-1978 (Table 1).

Table 1 Sources of data employed in the Nature Conservancy Council's historical survey of U.K. lowland raised mires. From Bragg (1984).

Source	Survey date	
Ordnance Survey first edition	I	1840 – 1865
Ordnance Survey second edition	II	1883 – 1900
Post-War air photographs	III	1945 – 1949
Recent air photographs	IV	1959 – 1975
Field survey	V	1975 – 1978

In total, 116 mire sites were identified from first edition Ordnance Survey maps, and their boundaries were defined. The extent of each land use within each site boundary was then recorded at the subsequent survey dates, yielding a time series of data for every site. The data were summed in various ways, in order to examine temporal and geographical trends. Sites and boundaries recorded for part of the Upper Forth Valley are shown in Figure 1, and land use categories are listed in Table 2.



- |                        |                      |                                       |
|------------------------|----------------------|---------------------------------------|
| 1 Claggans Burn Moss   | 6 Flanders Moss West | 11 Flanders Moss East ( Poldar Moss ) |
| 2 Arnochoile Wood Moss | 7 Gartrenich Moss    | 12 Station Wood                       |
| 3 Easterhill Moss      | 8 Gartur Moss        | 13 Killorn Moss                       |
| 4 Offerance Moss       | 9 Collymoon Moss     | 14 Little Kerse Moss                  |
| 5 Garchell Moss        | 10 Cardross Moss     |                                       |

Figure 1 Map of part of the Upper Forth Valley showing the extent of raised mires (shaded) in the mid-19th century, derived from first edition Ordnance Survey maps.

Table 2 Land use categories employed in the Nature Conservancy Council's historical survey of U.K. lowland raised mires. After Bragg (1984).

<i>Category</i>	<i>Description</i>
Moss	Unmodified peatland; essentially areas where the original bog surface remained, but including areas which had been burnt or which carried scattered trees.
Agriculture	Areas of mire converted to fields and other agricultural uses.
Drained moss	Identified by the presence of ditches.
Peat cuttings	Both traditional and commercial enterprises.
Woodland	Deciduous, coniferous and mixed woods, both semi-natural and planted, scrub; commercial forestry plantations.
Urban	Buildings (including farms), railways, motorways, airfields, refuse tips and mineral workings.

Between the mid-19th century and the 1970s, 82 (71 %) of the sites and 12,454 ha (87 %) of the mire area were converted to other uses (Table 3). These data featured prominently in justification of the case for urgent conservation of the U.K.'s remaining lowland raised mires (Plantlife, 1992).

Table 3 Summary of results of the Nature Conservancy Council's historical survey of U.K. lowland raised mires (Bragg, 1984). The number of sites retaining unmodified surface and the total extent of "Moss" (defined in Table 2) in each study area at survey dates I (mid-19th century) and V (1970s) are listed. Totals for sites in Scotland and England are also shown.

SURVEY DATE	I	V	Area of Moss		
			I	V	
Study area	Number of sites		(hectares)	(% remaining)	
Upper Forth Valley	19	8	2586	632	24
Solway	38	9	5671	1004	18
South Cumbria	37	14	1771	156	9
Lancashire	22	3	4229	11	0
Scotland	41	11	5559	840	15
England	75	23	8698	963	11
Total	116	34	14257	1803	13

The time course of change in the fraction of total mire area under each land use is shown in Figure 2. This diagram indicates almost-linear decline in the area of unmodified Moss during the period covered. However, the principal causes of change varied with time. Conversion to agricultural use

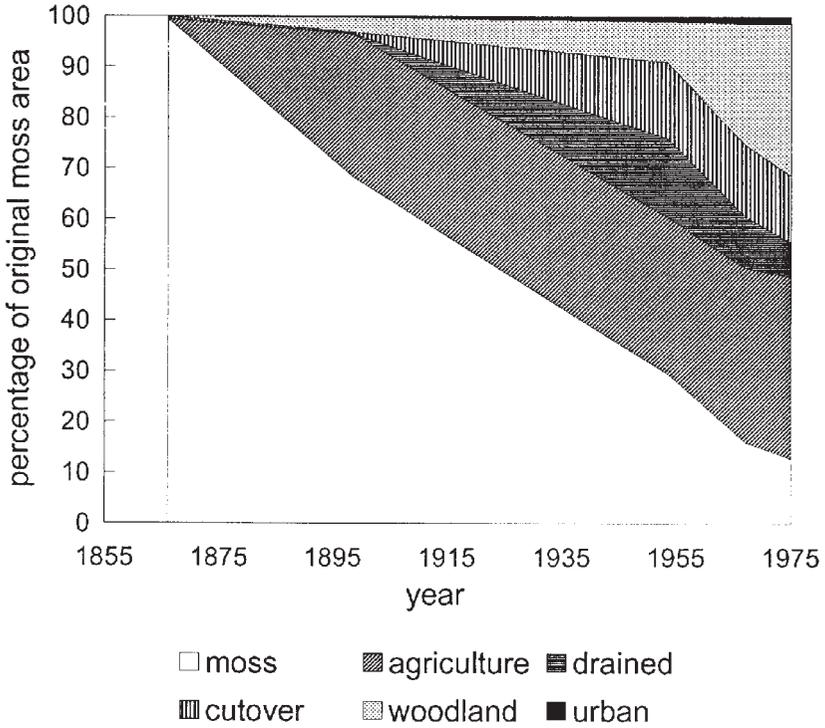


Figure 2 Changes in land use on the total area of lowland raised mire included in the Nature Conservancy Council's historical survey of U.K. lowland raised mires.

predominated during the latter half of the 19th century, whereas the main activities on previously unmodified mire during the first half of the 20th century were drainage and peat cutting. The area of woodland increased gradually during the first 100 years of the study, then expanded rapidly after 1950 when techniques were developed to establish forestry plantations on mires.

The patterns of change on mires in Scotland and England are shown separately in Figure 3. The early agricultural expansion was slight in Scotland so that 90 % of the original Moss area remained here at the end of the 19th century (compared with 54 % for England). However, greater proportional impacts of drainage, and afforestation in Scotland had significantly reduced this difference by the 1970s.

The 548 hectares of intact surface at Flanders Moss (east) was the largest individual area of primary mire remaining at the end of the survey (Table 4), accounting for 30 % of the total. In local terms, it is the only substantial

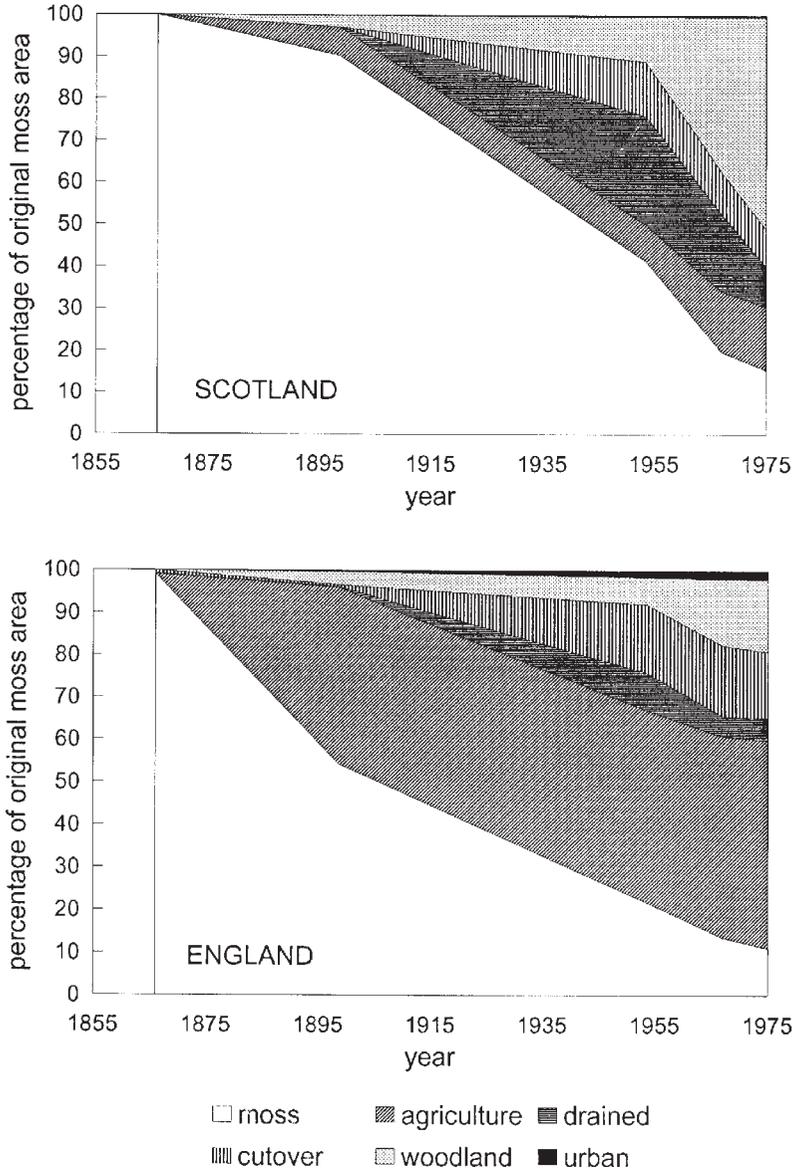


Figure 3 Changes in land use indicated by the Nature Conservancy Council's historical survey of U.K. lowland raised mires for sites in Scotland and England.

representative of the mires that once covered the Carse of Stirling, since the other seven mire remnants in this area together extend to only 84 hectares.

### **History of conservation management at Flanders Moss**

The part of Flanders Moss south of the High Moss Pow, including the 45 hectare Scottish Wildlife Trust (SWT) reserve, was first notified as a Site of Special Scientific Interest (SSSI) in 1971, and most of this area, now known as the “old NNR” was elevated to National Nature Reserve status in 1982 (Figure 4). At re-notification in 1989 the SSSI area was increased by 489.7 hectares (to 732.5 ha). This included the 548 ha of primary mire surface plus drained and wooded parts of the Moss and an adjacent area of geological interest, but excluded those parts which were under forestry or subject to planning permission for peat extraction. Control of approximately 50 % of the excluded area was eventually achieved by Scottish Natural Heritage in 1998, through purchase of forestry and peat-cutting rights. The northwestern section of the Moss, to the west of the over-deepened Pollaby Pow, remains under mature forestry and outside the SSSI.

The SWT reserve was already being managed for conservation in 1987. Priorities were elimination of burning, draining and grazing, and cutting of bracken at the site margins. By the early 1990s, the amount of birch and pine colonisation on the Moss was deemed undesirable, and restoration work was undertaken on both SWT and NNR areas. The operations carried out were the installation of dams in existing drains and the removal of trees. Large pines were, however, retained on the NNR at the request of the landowner. By 1995, widespread regeneration, especially of birch, could again be observed, and efforts to control this continue.

### **Why are trees a problem on raised mires?**

In recent years, the standard management prescription for raised mire conservation has been to remove trees and block drains. At one level, this is a direct approach to the perceived need to conserve “characteristic” features of the mire surface. It is, however, underpinned by reasoning based on our understanding of the way in which the mire ecosystem works.

The justification for tree removal is that, once established on a raised mire, trees are expected to exert a drying influence on the system through modification of the surface water balance; they are a *cause* of hydrological disturbance. Part of the justification for drain-blocking is that drains alter the moisture status of the surface making it unnaturally suitable for establishment of self-sown tree seedlings. Thus trees are regarded also as a *symptom* of hydrological disturbance.

The outcome of such management is not always satisfactory – as at Flanders Moss, where there appears to be a continuing need for scrub removal after such treatment. Perhaps, then, the fault lies in our initial assumption that

Table 4 Locations and sizes of all areas of mire surface remaining undisturbed at the end of the Nature Conservancy Council's historical survey of U.K. lowland raised mires. Study areas are indicated as follows: FOR: Upper Forth Valley; SOL: Solway; SCUM: South Cumbria; LANCS: Lancashire Lowlands. Asterisks preceding site names indicate that they are in Scotland. Data from Bragg (1984).

Study area	Site	Area of Moss remaining (ha)
FOR	* Flanders Moss east	548
SOL	Bowness Common	439
SOL	Wedholme Flow	179
SOL	* Longbridge Muir	170
SOL	Drumburgh Moss	88
SOL	Glasson Moss	70
SCUM	Nichols Moss	31
SCUM	Wreaks Moss	29
FOR	* Offerance Moss	28
FOR	* Killorn Moss	22
SOL	* Kirkconnel Flow	20
SOL	White Moss	19
SOL	* Priestside Flow	18
SCUM	Stribers Moss	16
SCUM	Heathwaite Moss	13
FOR	* Collymoon Moss	13
SCUM	Shaw Moss	12
FOR	* Little Kerse Moss	12
SCUM	Deer Dike Moss	10
SCUM	Meathop Moss	10
SCUM	Foulshaw Moss	10
SCUM	White Moss	8
LANCS	Chat Moss	5
SCUM	Newland Moss	5
FOR	* Wester Moss	5
LANCS	Heysham Moss	4
SCUM	Leece Mosses	4
SCUM	The Mosses	3
SCUM	Arrow Moss	3
LANCS	Cockerham Moss	2
SCUM	Savinhill Moss	2
FOR	* Garchell Moss	2
FOR	* Flanders Moss west	2
SOL	Cowper Bog	1

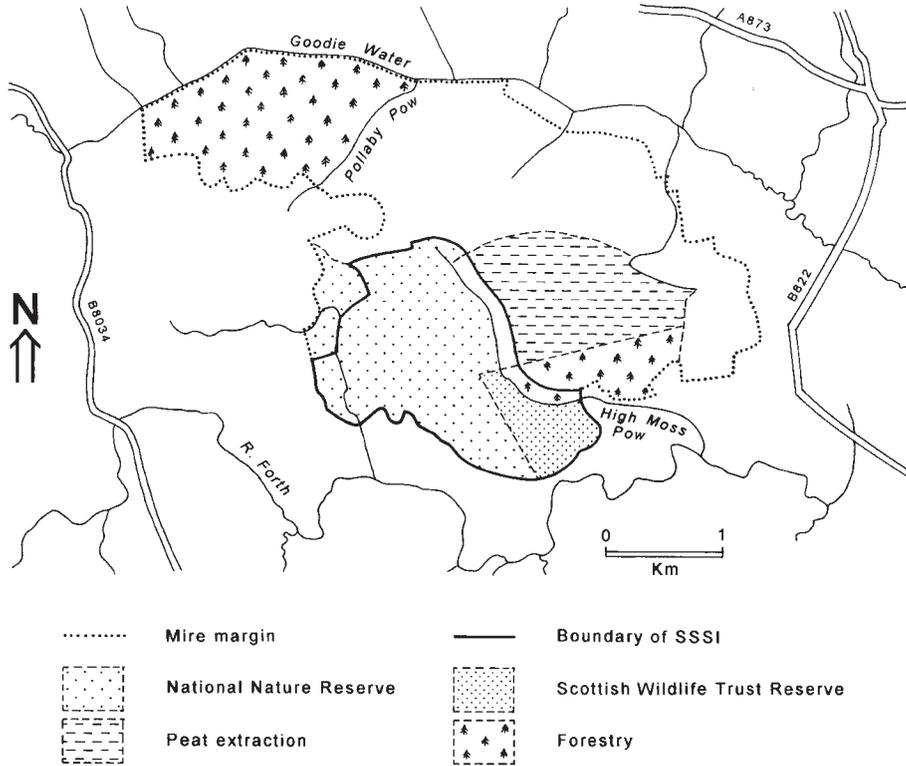


Figure 4 Land use and conservation status of Flanders Moss in 1982. By 1998, the conservation boundary had been expanded to include the whole site except for the area northwest of the Pollaby Pow.

traditional management by burning and grazing is antagonistic to conservation objectives, as suggested by Ingram (1997).

Hard evidence for any of these viewpoints is fragmentary. The first systematic study of the influence of birch on surface hydrology at Flanders Moss was carried out after most of the trees had been felled (Kelemen, 1996). The project was hampered by technical difficulties (Kelemen and Ingram 1999) but tentative interpretation of the results indicates that evapotranspiration rates on open mire and beneath trees are, in fact, similar (Kelemen and Ingram in press). 1980s air photography shows ditches marked by lines of birch, offering persuasive support for the view that drains provide nuclei for tree development. On the other hand Offerance Moss, 10 km to the west of Flanders Moss (Figure 1), boasts an almost treeless mire expanse despite obvious surface drains. Here, an adjacent Mediaeval settlement indicates long human association and this site is still grazed regularly by livestock. Even the idea that treeless raised mires represent a cultural climax, in which grazing is required to offset the intended effect of drains in encouraging fodder production (Stewart and Lance 1983), appears flawed when reversal of both influences does not stop scrub development. Moreover, at Purgschechenmoos in the Austrian Alps, where different traditional management leaves the mire expanse undrained, scrub development and invasion by birch still occurs. Here, it seems that hydrological disturbance is attributable only to drainage and peat extraction at the edges of the system, which have increased the height-to-width ratio of the peat body or catotelm (Joosten, 1992; Bragg and Steiner, 1995), and thus altered the hydrological regime of the mire surface through modification of the hydraulic gradients governing seepage losses (Bragg, 1995).

Flanders Moss has indeed been subject to influences which tend to modify its hydrological boundaries. Canalisation of the Goodie Water at the northern side of the site is dated at 1780, whilst the present mire margin was largely established by 1844 through wholesale stripping of peat from the Carse of Stirling, described with charming illustrations by McKerracher (1987). Subsequent management for grazing is evident from burn marks on air photographs and new drains on maps. However, such "damaging operations" were excluded as the "conservation fence" was assembled during the 1970s and 1980s.

Thus, a combination of influences operates at Flanders Moss, rendering identification of the initial cause of tree invasion difficult. However, failure of the expensive conservation work completed so far to arrest scrub and tree invasion indicates that the underlying rationale may be at least incomplete, if not faulty.

### **Testing some of the hypotheses**

The Historical Survey offers some information relevant to this discussion. In particular, it covers most of the period since the Moss Lairds finally abandoned their work at the margins of east Flanders Moss (Table 5 and Figure 5).

Table 5 Historical land use data for Flanders Moss from the Nature Conservancy Council's historical survey of U.K. lowland raised mires. After Bragg (1984).

Survey date	1862	1899	1946	1973	1978
<i>Land use</i>			<i>area (ha)</i>		
Moss	842	833	684	548	548
Agriculture			19	23	23
Drained moss			85	166	38
Peat cuttings			9	39	39
Woodland		9	45	66	66
Forestry					128

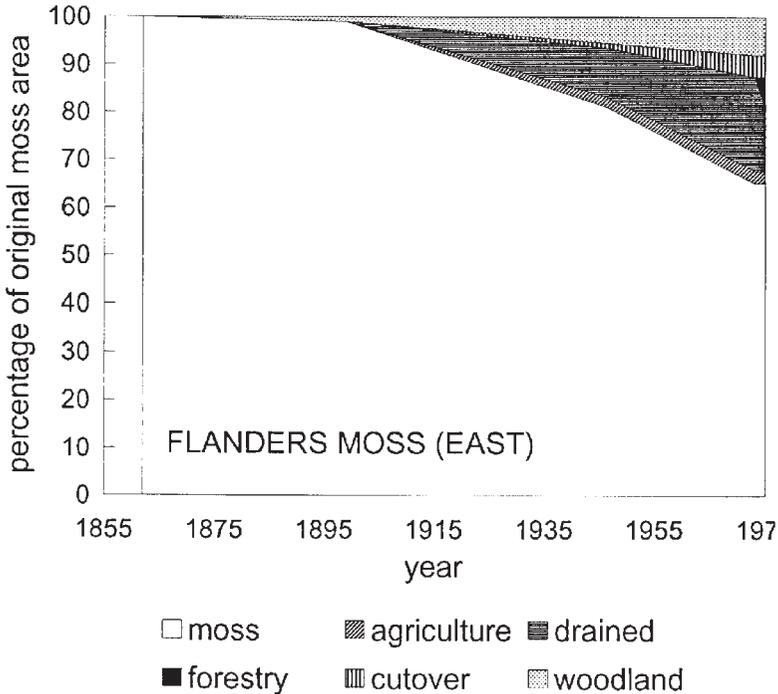


Figure 5 Changes in land use on east Flanders Moss, 1862 to 1978, as recorded by the Nature Conservancy Council's historical survey of U.K. lowland raised mires. Urban land use did not occur, and areas of woodland and forestry are shown separately.

The data indicate gradual spread of trees throughout the 150 years of the survey. However, the effect of management for conservation appears to have halted all land use changes except for afforestation of an area that had already been drained, between 1973 and 1978. Later information is available as a map showing the extent of scrub and tree cover in 1995/6, which was produced as part of the Scottish Raised Bog Land Cover Survey (Parkyn and Stoneman 1997). The period of the historical survey is extended to show the fraction of tree-covered surface in the 1990s, and the timing of boundary modification and exclusion of grazing superposed, in Figure 6. The apparent check in the spread of trees during the late 1970s may have been temporary or spurious.

More detailed information on spread of trees on a small part of the site is available from a study by Hedger (1992). This work involved tree counts using air photographs of a study area in the vicinity of the SWT reserve. Between 1946 and 1966, the number of trees increased at an average rate of 12 trees per year, from 322 to 567. The average rate of increase rose to 42 trees per year after 1966, and by 1988 there were 1487 trees in the study area.

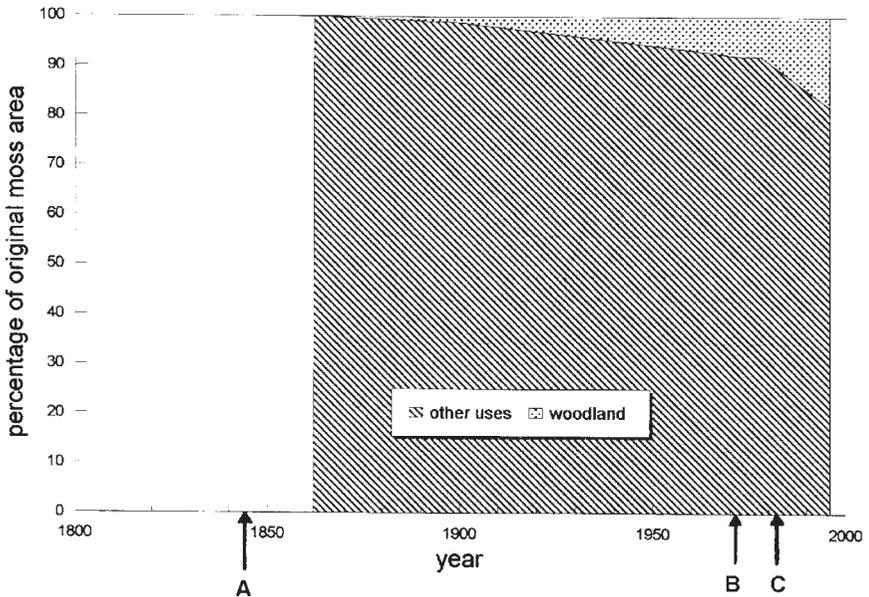


Figure 6 Historical context of the spread of woodland at Flanders Moss during the 19th and 20th centuries. The period of the Nature Conservancy Council's historical survey has been extended using data from the Scottish Raised Bog Land Cover Survey. Vertical arrows indicate (A) abandonment of peat-stripping in the Carse of Stirling, (B) the first SSSI notification of Flanders Moss and (C) establishment of NNR status.

## Conclusion

The rate of spread of trees at Flanders Moss appears to have increased at least since 1978, whilst Hedger's data suggest that this trend began earlier (post-1966) on the SWT reserve. Taking into account the lengths of intervals between survey dates, this analysis does lend support to the view that grazing and burning are necessary to control the spread of trees under present circumstances. However, the underlying slow increase in the wooded area of the Moss throughout the twentieth century cannot be attributed to conservation management, suggesting that the fundamental opportunity for tree colonisation may be a legacy of hydrological disturbance to the site margins.

Whilst the evidence is insufficiently detailed to be regarded as conclusive proof of such an hypothesis, existence of this possibility has implications for site management. Both the direct solution of re-establishment of old hydrological boundaries and the practical approach of allowing the system to adjust to new boundaries (Bragg, 1995) involve adjustment of peat formation and decomposition equilibria which are likely to be long-term. Moreover, for the latter objective, work from Switzerland indicates that effective management may not involve early felling of trees. In fact, Schneebeli (1989) suggested that afforested bogs should be harvested as late as possible since, whilst the trees are growing, compression of peat by their increasing weight should reduce both the height-to-width ratio of the catotelm and its hydraulic conductivity. When the trees are eventually removed, reducing interception and evapotranspiration, the water table will recover rapidly, precluding further opportunity for tree growth. The important implication is that the opposite management prescription to the one which has been applied at Flanders Moss is proposed.

Perhaps, then, there is a case for consolidation of results of existing projects, and for consideration of the historical and hydrological context on a site-specific basis, before further implementation of rigid and expensive conservation management programmes for raised mires.

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## BOOK REVIEWS

**Ancient Trees: trees that live for 1000 years.** Edward Parker and Anna Lewington. Collins and Brown in association with WWF. Hardback £25.

A long time environmental photographer for WWF for Nature Edward Parker gives here a showcase of his work, observing some 20 species of trees in many places, including California's Sequoia National Park's giant redwood, 95 m tall 1.2 mkgm weight. 2700 years old, the Scottish yew of an incredible 9000 years (says WWF), and the dwarf tree of the Namib desert that lives up to 2000 years.

**Listen to the Trees.** Don MacCaskill. Luath Press. 220pp. ISBN 0.946487.65.0. £9.99.

Sadly the author has passed on, taken as he walked his beloved woods. We can here savour this memorable finely written account of his early years as a forester at Ardgarten by Arrochar. It is full of fascinating experiences with birds, animals, nature, forest workers.

An acutely observed book by a great naturalist and wildlife photographer, survived by wife, naturalist companion, Bridget.

An 'afterword' by Philip Ratcliffe is notable, and akin to his presentation to our Woodlands symposium, on the role of forestry and people in the development of Landscape.

**Insectorum sive minimorum animalium Theatrum: the Butterflies and Moths.** George Thomson. Published by the author, Z. Ravenhill, Lochmaben. DG11 1QE. £65. Limited edition of 500.

The author was a founder member of the Forth Naturalist and Historian, notable for his standard book *Butterflies of Scotland*. The Theatrum of Insects was the earliest book on natural history other than herbals, and the first on insects published in Britain. This is a thorough study of the Theatrum and its surviving manuscript, detailed identification of species, and translation and facsimile of the moths and butterflies section.

**Red Sky at Night.** John Barrington. Luath Press. 250pp. ISBN 0.094.648760.X. £8.99.

This is a delightful, informative, well written account of a shepherd/naturalist's year – from his home Glengyle, Rob Roy's old house, and spanning the great sheep farm of Loch Katrine, heart of the Trossachs.

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The biology, distribution, migration are fully discussed with status for Britain, Europe and North America; the author's 40 year odyssey in search of this enigmatic Arctic bird; fine colour plates and full bibliography – all commend this to the bird community.

## THE PALAEOENVIRONMENTAL AND ARCHAEOLOGICAL POTENTIAL OF FLANDERS MOSS EAST

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### Introduction

AOC Archaeology was commissioned by Historic Scotland to assess the archaeological and palaeoenvironmental potential in the Upper Forth River Valley, with particular reference to the wetland zones. This paper will present some of the findings and results of this research centred on the raised moss of Flanders Moss East. The paper is divided into two sections. The first will present a brief resume of previous palaeoenvironmental research, followed by the results of the palaeoecological work within Flanders Moss East. The second section includes a review of wetland archaeology in the Upper Forth River Valley and presents some preliminary results of an archaeological evaluation of a buried wooden structure located within remnant peat deposits at Parks of Garden, near Flanders Moss East. This assessment of the Upper Forth River Valley was carried out as part of a programme to enhance understanding of the palaeoecological and archaeological potential of the Scottish wetlands (see Hingley *et al.*, 1999).

### Palaeoenvironmental Research

#### *Resume of palaeoenvironmental research*

The topography of the Upper Forth Valley is dominated by the flat Carse of Stirling which trends east – west (Figure 1). Most of the Carse is underlain by postglacial marine sediments which form a plain about 4 to 5 km wide and which slopes from about 14 m above OD in the west to 8 m OD in the east (Laxton and Ross, 1983). Sissons (1966) demonstrated that at about 8800 to 8500 cal BP a bed of peat (the sub-carse peat) started to form on the poorly drained surfaces of lateglacial raised beaches in the western part of the Carse of Stirling. During a postglacial transgression much of the sub-carse peat was buried by marine carse clay, deposited between  $8421 \pm 157$  and  $5481 \pm 130$  cal BP (Francis *et al.* 1970, Brooks, 1972). However, in some areas peat formation was not terminated, demonstrated by one of the deepest peat successions in Flanders Moss East which included pollen zones V to VII (Durno, 1956).

The original extent of peat cover in the Upper Forth Valley is difficult to estimate following the removal of vast tracts of peat in the eighteenth and nineteenth centuries; but it is reasonable to assume that Cadell's account of a 12 mile stretch of moss from 1 to 2 miles broad is fairly accurate (Cadell, 1913).

Palynological research on Flanders Moss West, which lies across the River Forth to the south-west of Flanders Moss East (Figure 1), identified a recurrence surface which was dated to  $2712 \pm 120$  uncal BP (Turner, 1965, 1981); and

although there may be some doubt about the accuracy of older radiocarbon dates the identification of a recurrence surface is important in itself. A recurrence surface is characteristic of a change in the growing surface of a raised peat bog from a well humified (decomposed) peat formed when the bog surface is relatively dry and oxygenated, with a vegetated surface of predominantly cotton grass and heather, to a weakly humified (poorly decomposed) peat, formed when the bog surface is wet for a considerable time and dominated by bog moss (*Sphagnum* spp.). The change in peat type is seen as indicative of a change in climate from a relatively warm and dry one to a cooler and wetter one and is therefore indicative of climatic deterioration. This is because the drainage and groundwater level of a raised bog is isolated from the surrounding landscape and therefore changes in these can only occur through climatic change and/or human interference (e.g. Tipping, 1995). Turner (1965; 1981) also identified a short lived regional clearance assigned to the Roman period and other small temporary clearances which continued until the final mid to late seventeenth century regional clearance, a result of the expansion of iron bloomeries. Durno (1956) palynological research from Flanders Moss East divided a core into a series of pollen zones based upon periods of relatively constant vegetation, with changes from one zone to the next indicative of environmental change. However, Durno's analysis needs to be regarded with caution, as it was based upon selected taxa and also used chronological controls based upon Godwin's English and Welsh research. Both Durno's (1956) and Turner's (1965) palynological work demonstrate the potential for long records and for detailed analysis and interpretation.

#### *Recent palaeoenvironmental work*

The principal aim of the recent palaeoenvironmental work reported in this paper was to assess the present condition and potential of the peat deposits of Flanders Moss East.

Flanders Moss East was surveyed by the Department of Agricultural and Fisheries as part of the Scottish peat survey (1965); this survey included the mapping of the bottom and surface contours of the bog. This data has been converted, by Margaret McKeen at the Maculay Institute, into absolute depths of peat deposits from the current bog surface (Figure 2). Using these depth data, three reference cores (cores described in the field and kept for laboratory based analysis) and three reconnaissance cores (cores just described in the field) were taken from Flanders Moss East (Figures 1 and 3).

A basic stratigraphic pattern can be traced in all of the cores (Figure 3 and Appendix A for stratigraphic descriptions). Within the deep basin, initial peat development commences with a compact wood-rich 'fen' peat. Wood gradually becomes less dominant, replaced by fibrous, but well humified peat rich in cotton grass (*Eriophorum* spp.). There is a gradual replacement of cotton grass by *Sphagnum* spp. The *Sphagnum* rich units tend initially to be well

humified, but are gradually, and occasionally abruptly, replaced by poorly humified, *Sphagnum* dominated peat. There are some variations, for example FMR1 (Figure 3) has *Phragmites* rich units near the base. The apparent lateral extent of stratigraphic units across the bog will be confirmed by an extensive programme of radiocarbon dating.

Humification is a measure of how decomposed and degraded organic matter is. The degree of humification was estimated according to the method devised by von Post (*cited* in Department of Agriculture and Fisheries, 1965). The humification results from Flanders Moss East show many subtle and relatively rapid shifts in bog surface conditions, which may demonstrate climatic changes within this raised bog regime (Figure 4a and b). A change from well humified peat to poorly humified *Sphagnum* peat can be seen in all but one of the cores, at around 2.00-1.50 m depth. This change in humification and stratigraphy may be interpreted as a recurrence surface. A smaller apparently laterally extensive poorly humified *Sphagnum* unit occurs at about 3.5 m; this unit is clearly visible in the humification data and may mark an earlier episode of regional climatic deterioration.

Also of interest is the first core, FM1, taken on the edge of the moss near to Wards of Goodie (Figure 1 and Figure 3). The shallow depth of surface peat is a consequence of the core being located outside the deep basin, but also a consequence of peat cutting and drainage. The core shows a lower peat horizon below the carse clay and it is thought that this is the sub-carse peat (e.g. Brooks, 1972); radiocarbon dating should resolve this.

The full length of the three reference cores were x-rayed to check for the presence of mineralogical material of a fluvial origin (i.e. a tsunami, see Smith this volume) or aeolian source (e.g. volcanic eruption) within the organic deposits (Ellis unpublished). Mineralogical material within the peat was rare and where detected was in such small quantities that no significant event could be attributed to its occurrence. Four samples from Core FMR12 were also rapidly assessed to appraise the condition and palaeoenvironmental potential of the pollen component of the bog (Mills unpublished). This work was carried out to ascertain whether the relatively recent deterioration and vegetation change of the bog surface (see Stoneman, 1998) had affected the preservation of buried palaeoenvironmental information. The condition of the samples was generally good, although the sample derived from 164-165 cm, a poorly humified *Sphagnum* peat, had low concentrations of pollen; this may have been due to rapid accumulation rather than deterioration. However, humification analysis coupled with a rapid palynological assessment of samples from Flanders Moss West revealed that much of the six to seven metres of peat has in the past been, or is currently being decomposed. Although further work is required to determine the precise cause of this decomposition and degradation, one plausible explanation is that the established conifer plantation may be introducing and circulating oxygen rich water through the peat profile.

## The Archaeology

### *Review of the wetland archaeology*

A large proportion of the known archaeological structures and artefacts recovered from peat deposits in the Upper Forth River Valley were unearthed during eighteenth and nineteenth century extensive peat clearance and drainage. The Old Statistical Account (OSA, 1799) gives a comprehensive description of the methodology followed in the removal of Blairdrummond/Kincardine Moss. Prior to its removal Blairdrummond Moss covered a vast area of some 10,000 acres (OSA, 1799), stretching from near the confluence of the River Forth and River Teith westward up the Forth River Valley for about four miles. Other historical peat clearance in the area includes that of Poldar Moss located below Thornhill (Cadell, 1913) and 'improvements' along the northern margins of Flanders Moss East and around Flanders Hill (Johnson, 1792).

A broad range of organic and non-organic artefacts, the fate of many unknown, have been recorded by various eighteenth and nineteenth century antiquarian authors. Those from Flanders Moss East include a timber trackway uncovered near Pallabay Pow which may have been associated with some form of float or jetty and the remains of a log boat (Anderson, 1967). Also near Pallabay Pow were found two swords, reputedly lying in a cross position (Ordnance Survey, 1866). Other finds from Flanders Moss East comprise: a Romano-British glass bangle (Stevenson, 1976) and a Late Bronze Age sword from Poldar Moss (Burgess and Colquhoun, 1988).

However, the largest collection of finds results from the clearance of Blairdrummond Moss (Figure 1). Probably the most important of these finds is a tripartite disc wheel dated to  $2810 \pm 85$  bp, *circa* 1255 to 815 cal BC (NMRS MS/735/1), which was reported to have been found 10ft below the surface of the moss (Piggott, 1959). This wheel was found in association with three other wooden wheels. It may be supposed that these are the remains of a horse-drawn vehicle perhaps trapped in the peat as it made its way across the moss. Access into and across Blairdrummond Moss appears to have been facilitated by at least one wooden road, the remains of which were uncovered on Blairdrummond Moss in about 1793 (RCHAMS, 1979). It was described as being constructed from tree trunks lying the full length of the surface of the carse clay and with small pieces of timber crossing at right angles; the whole was covered with brushwood and measured some 4ft in width (Tait, 1794; RCHAMS, 1979). A third recorded wooden trackway was first recorded as 'the remains of a supposed Roman Road' (Ordnance Survey, 1866) located just a couple of kilometres to the west of Flanders Moss East. The road was described as 'a causeway composed of the trunks of trees, with marks of bolts in the longitudinal sleeps' (Wilson, 1878).

Further finds from Blairdrummond Moss include: a wooden mortar (Archaeology Society, 1890); antler implements (e.g. Ordnance Survey, 1866); arrow heads (Piggott, 1959); several polished stone axes and maceheads (Wilson, 1863); three flanged bronze axes, a socketed bronze axe, three socketed

bronze spearheads, a bronze sword and bronze cauldrons (O'Connor and Cowie, 1995); and a faience bead (Callander, 1906). There are also two examples of Medieval homesteads located on the edge of the moss in the Upper Forth River Valley; one occurs on the western edge of Flanders Moss East and this site may have been a hunting lodge (NMRS NS 69 NW 5).

The presence of prehistoric artefacts recovered from beneath and within the mosses, and the occurrence of sturdy wooden routeways within these demonstrates that access to and probably across the moss was perceived to be important enough to expend a considerable amount of time and energy in achieving this goal. Unfortunately until now there has been no modern evaluation or excavation of archaeological material from the raised moss deposits in the Upper Forth Valley and so current understanding of the environmental and anthropic context of this archaeological record is at best limited and even rudimentary.

*A recent archaeological evaluation; Parks of Garden wooden platform*

Because of its SSSI status and the anticipated significant depth of peat (up to 7 m) no invasive archaeological works were carried out on Flanders Moss East. However, an archaeological evaluation was carried out at Parks of Garden, which is located to the west of Flanders Moss East (Figure 5); this evaluation in the context of this conference serves to demonstrate the potential of archaeological remains within Flanders Moss East.

As mentioned above, the site was first shown on the 1866 First Edition Ordnance Survey as the 'remains of a supposed Roman Road'. The archaeological site is located in a wedge of peat which lies between the glacial moraine deposits forming the higher ground on the west and the carse clay, from which peat has been cleared, to the east. The glacial moraine deposits stretch from Arnprior to Mentieth forming a ridge of higher ground across the Upper Forth River Valley (Sissons, 1966) and it is probably significant that this is the first high and relatively dry north-south crossing point across the valley to be reached travelling westwards from Stirling.

To determine the presence and precise location of the wooden feature, a relatively large area was initially evaluated using peat probing and non-invasive ground penetration radar (GPR) techniques; both methods enabling the detection (but not identification) of sub-surface anomalies within a peat profile. Peat probing works through the manual penetration of a thin metal rod into the ground; the passage of this rod stops when it meets resistance such as that caused by a stone or large timber. GPR operates on the same principles as conventional radar. At Parks of Garden both methods produced evidence of a series of sub-surface anomalies. To determine the nature of some of these sub-surface anomalies a series of trial trenches were opened (Figure 5).

Archaeological remains were found to occur within Trench A at a depth of between 0.40 to 0.60 m (Figure 6). No archaeological features were fully excavated, as the objectives of the archaeological works were to determine the

presence of archaeological deposits and to assess and evaluate the nature and condition of preservation of the archaeological record.

The archaeology comprised an area of at least nineteen parallel oak and alder roundwood (Context 004) and oak planks (Context 006), probable brushwood (Context 010) and associated sedimentary contexts (Figure 7). The planks and roundwood timbers may be of the same phase of construction. Smaller split roundwood laths (Context 003) occur above the roundwood and may represent repair or an upper tier of construction. Smaller, mainly birch twigs appear to have been roughly laid or even dumped upon the planks and in some places upon the roundwood.

Any discussion or interpretation of this wooden structure re-discovered at Parks of Garden is at this stage tentative because palaeoenvironmental analyses and radiocarbon dates are not yet available.

Determination of the function of the wooden structure, as exposed by the present archaeological evaluation, is elusive because the extent of the structure has yet to be defined and its form, orientation and location with respect to the local topography is at odds with the description and ascribed function of Wilson (1878). In general, excavated trackways tend to comprise either single or double planks with their long axes oriented to the direction of 'traffic', such as the Sweet Track (Coles *et al.* 1984), or are constructed from shorter roundwood or planked timber laid transverse to the direction of traffic, a good example being the Iron Age Corlea Track in Ireland (Raftery, 1990). In addition, if the structure re-discovered at Parks of Garden is part of a trackway, its course would have hugged the lowermost contour of the glacial moraine slope. Because slightly higher and therefore drier ground following the same orientation occurred immediately to the west of the structure the reasoning behind its location remains elusive.

A second possible interpretation of the structure is as a wooden platform, used as a 'get ready point' for excursions into and across the bog, a parallel would be the Neolithic Baker Platform (Coles *et al.* 1984); but again there would appear to be more immediately suitable locations elsewhere on the morainic spur. However, such a platform may have acted as a site from where ritual activities associated with the moss took place; although no 'votive' finds have so far been recovered from this site.

A third possible function is that the timbers represent the base of prehistoric dwelling constructed on the moss margin to free limited dry land resources for grazing or arable use; the Bronze Age platforms at Clonfinlough, Ireland (Moloney *et al.* 1993) represent a parallel. There is also a slim possibility that this wooden structure is the remains of a moss house built by the men employed to clear the land of peat. These dwellings on the High Moss (peat 6 to 12 ft deep) were scooped out of a pillar of *in situ* peat with 4 ft thick and 12 ft high walls surrounding the carse clay floor (Cadell, 1913, p 275). At other places on the Low Moss (the peat was up to 3 ft deep) the houses were set on wooden floors laid directly onto the surface of the moss (Cadell, 1913, p 275). However, the

recording of the site as a road on the first edition Ordnance Survey (1865) makes this last explanation unlikely as a generation familiar with the techniques of moss clearance would have probably set the record straight if a mistake had occurred and indeed it is probable that a member of that generation was responsible for the inclusion of the 'Roman road' on the Ordnance Survey map.

The Parks of Garden platform lay upon a fibrous peat which is interpreted as the old ground surface upon which the structure was built. Turner (1981) suggests that the construction of the many of the wooden trackways seen throughout Europe were built as a direct consequence of increased bog surface wetness equated to climatic deterioration characterised by increased precipitation. Palaeoenvironmental laboratory work is currently being undertaken on samples taken from adjacent to the structure to explore this idea. Unfortunately no finds were recovered during the evaluation, and confirmation of the structure as prehistoric (between 4000 and 2000 cal BP) awaits the return of radiocarbon dates samples.

## **Conclusion**

The palaeoenvironmental data thus far obtained indicate that the preservation potential of organic archaeological materials within the moss is good. Palaeoenvironmental analyses have demonstrated that the peat deposits from Flanders Moss East are in a stable, generally reducing state. These peat deposits are deep and hold the potential for long palaeoenvironmental records, within which the potential of the environmental information has been demonstrated (e.g. Turner, 1965), but which would benefit greatly from modern analysis utilising development of theory and scientific techniques. The rediscovery of a wooden structure is encouraging for future research into the nature of human interaction and exploitation of the mosses of the Carse of Stirling and also serves to demonstrate that despite recent agricultural improvements organic archaeological material may survive in isolated pockets of peat; unfortunately with continued agricultural 'improvements' and the afforestation of mosses the outlook for the long term future of such material is less than rosy.

## **Postscript**

Subsequent to the submission of this paper eleven radiocarbon dates have been obtained the reference cores taken from Flanders Moss East with dates falling between 11626-11172 BP to 1260-970 BP. Eight radiocarbon dates have also been obtained from Flanders Moss West reference core with dates falling between 10636-10221 BP to 2729-2349 BP. Five radiocarbon dates have been obtained from the platform and these show that it is Neolithic  $4445 \pm 40$  BP. A full excavation has also been undertaken on the Neolithic wooden platform and post-excavation analyses show that the most likely function was as an

assembly point for expeditions across the moss into the estuary beyond. The results of these works are in preparation and will be offered for publication in the *Holocene* and *Proceedings of the Prehistoric Society*.

### Acknowledgements

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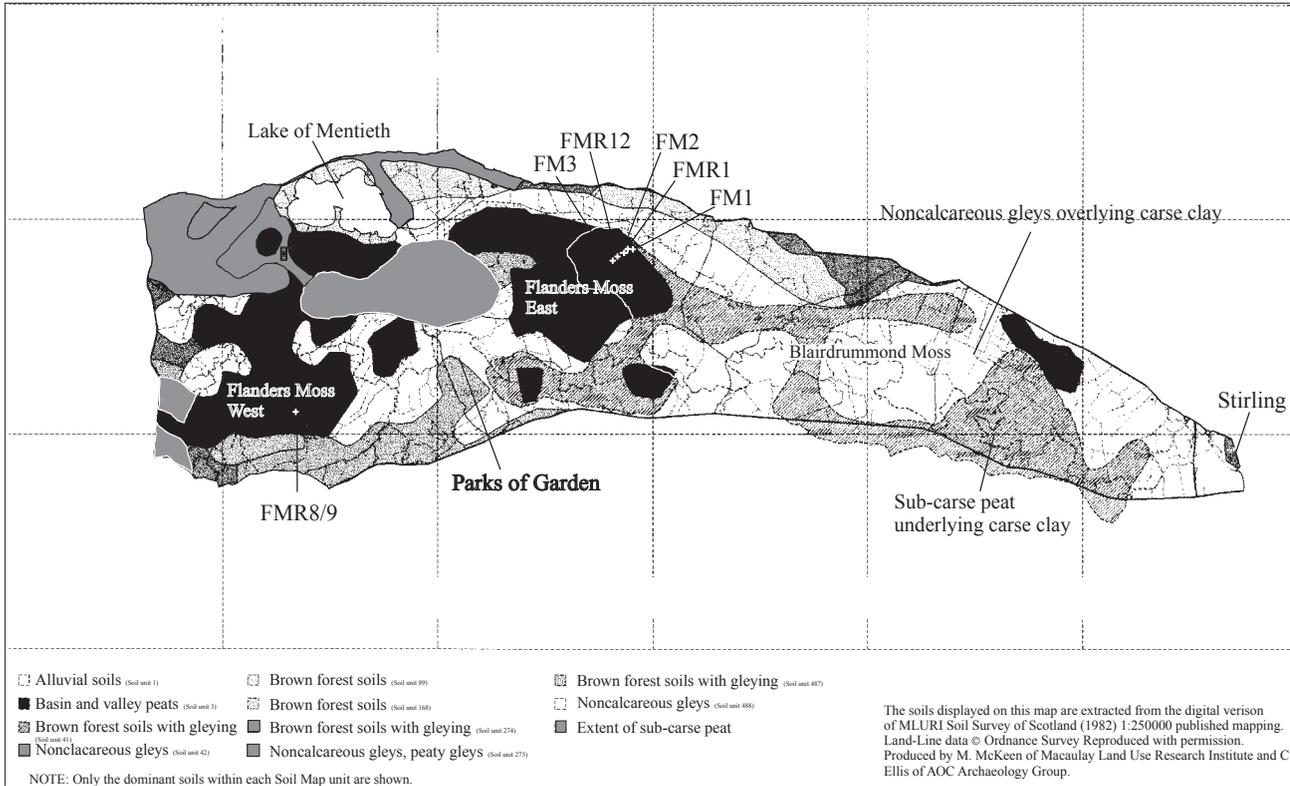
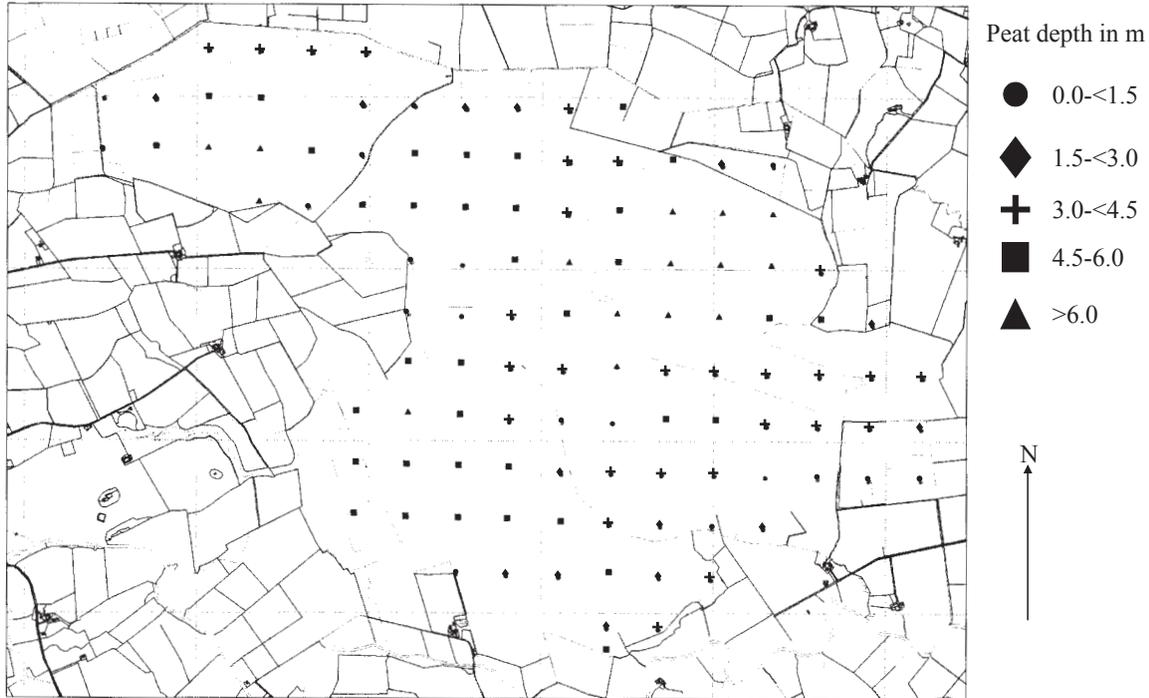


Figure 1 The present extent of peat deposits (according to Macaulay Institute) of Flanders Moss East (and other 'wetland zones'). Also shown are the broad soil classifications of the Upper Forth River Valley, the location of peat cores (FM1, FMR1, FM2, FMR12, FMR13, FM3 and FM4) and the location of the archaeological evaluation.



Produced by M. McKeen of Macaulay Institute.  
 Data digitised from Scottish Peat survey Mapping work  
 completed 1950. Land-Line data © Ordnance Survey reproduced with permission.

Figure 2 The peat depths of Flanders Moss East as surveyed by the Department of Agriculture and Fisheries 1965 and digitised by M. McKeen, Macaulay Institute, 1997. A deep basin can be seen in the north-eastern corner of the moss.

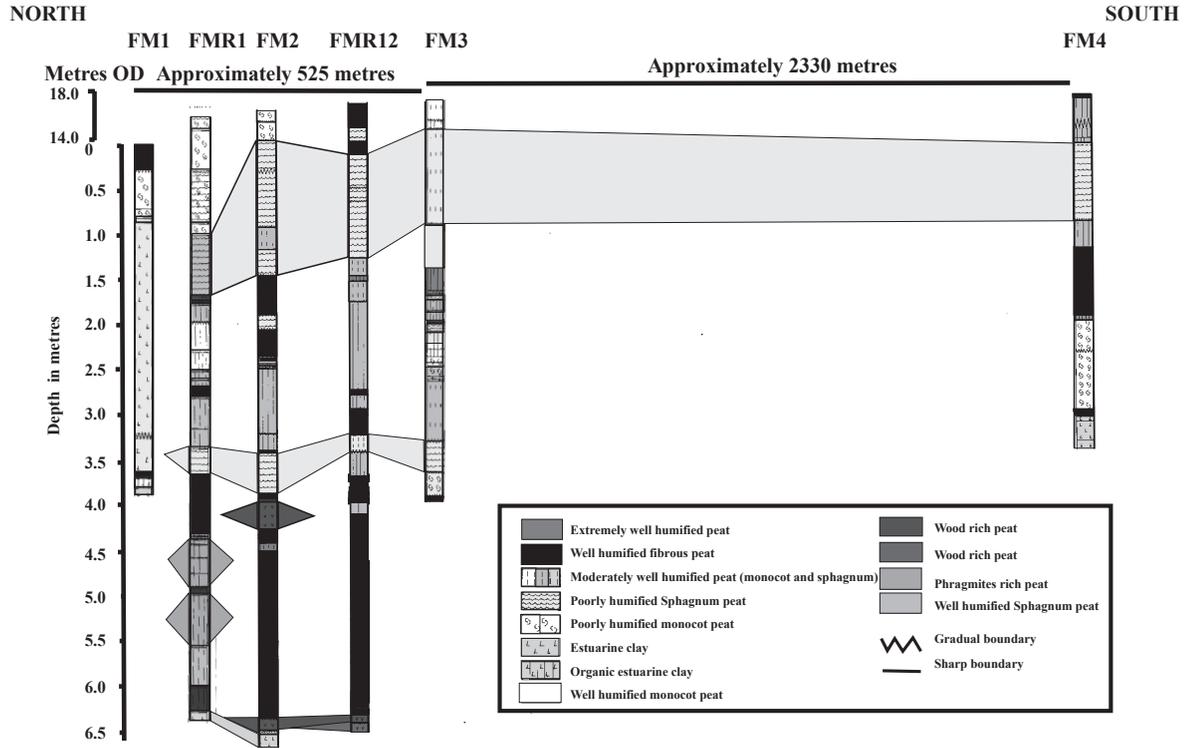


Figure 3 A schematic and simplified stratigraphic transect across Flanders Moss East. FM (Flanders Moss East) identifiers refer to individual peat cores.

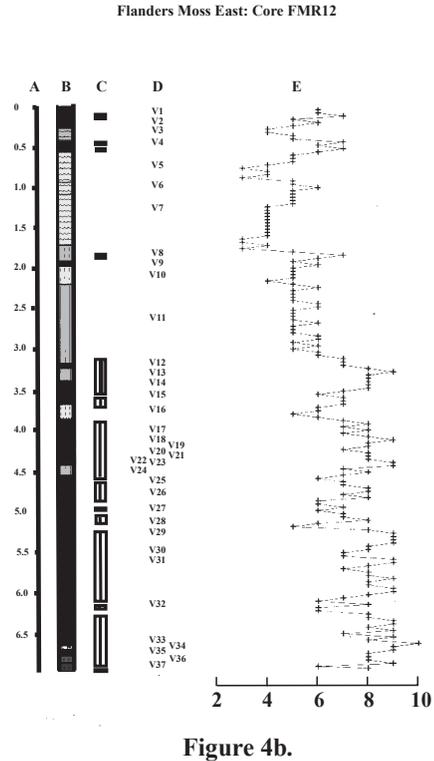
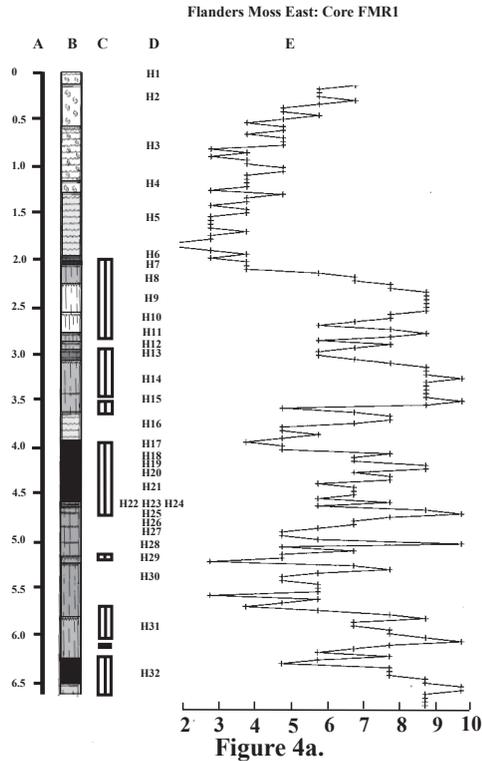


Figure 4a and 4b. A denotes depth in metres; B simplified stratigraphic profile; C well humified peat; D Unit identifier; and E degree of humification.

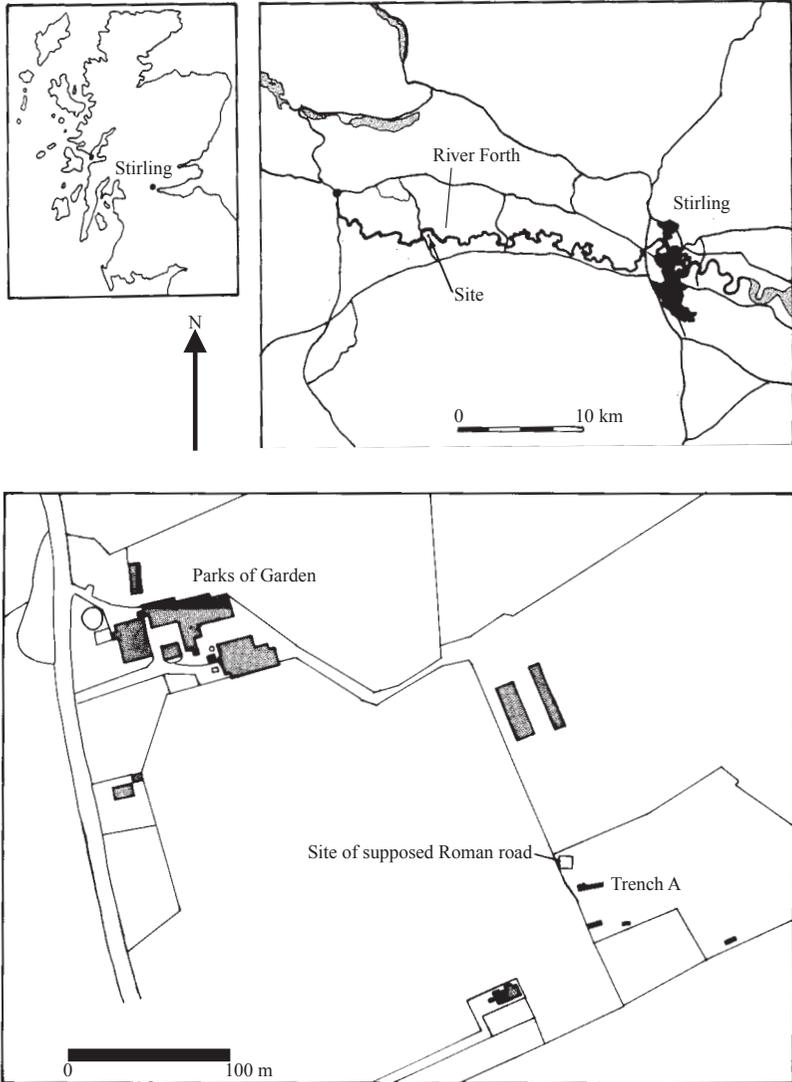


Figure 5  
Site location, Parks of Garden. The wooden structure was rediscovered in Trench A.

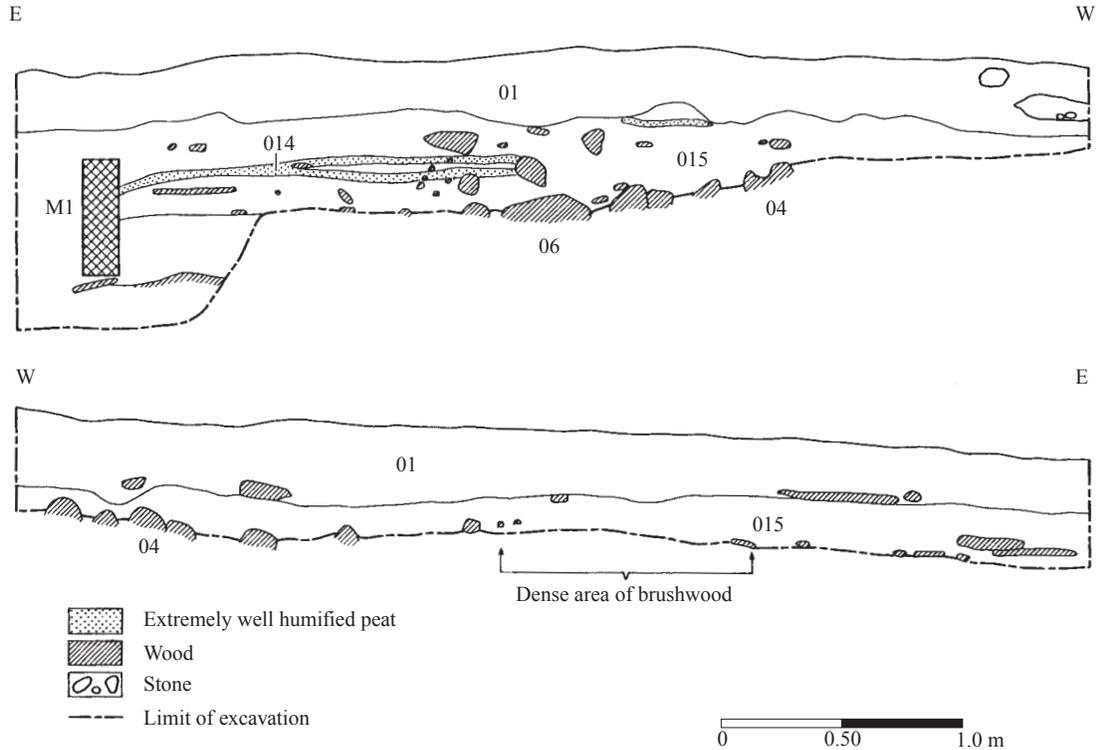


Figure 6 The upper most drawing is the north facing section of Trench A. The wood located on the limit of the excavation line is the wooden structure. The lower most drawing is the south facing section of Trench A. The wood located on the line of excavation line is the wooden structure and an area of dense brushwood is highlight.

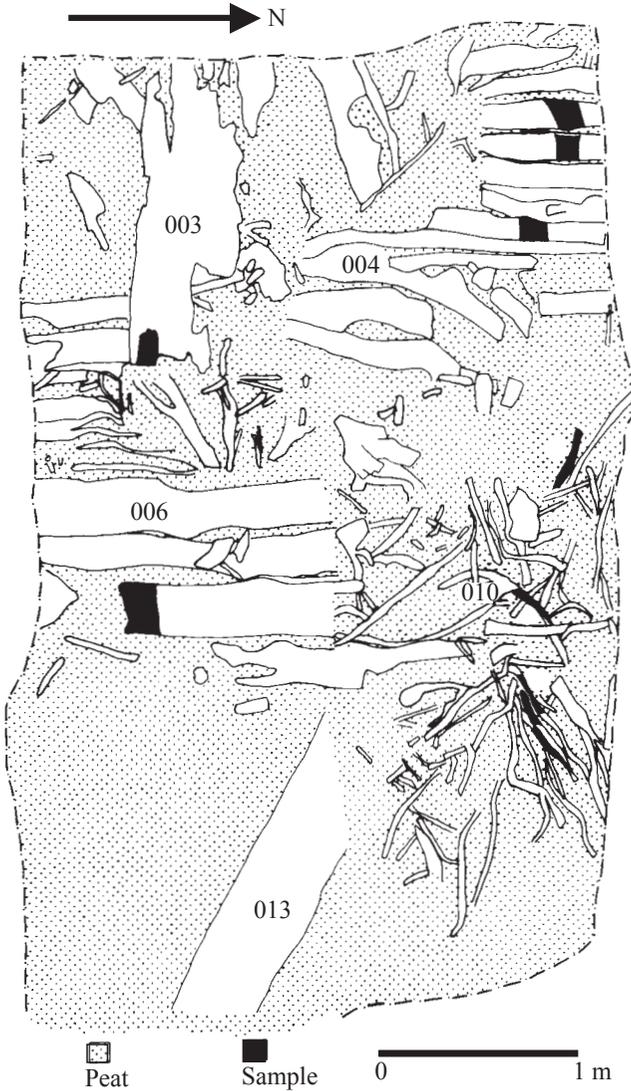


Figure 7

Trench A. Plan of wooden structure. Shown are the identified contexts discussed in the text, Context 003 split roundwood oak laths, Context 004 roundwood oak and alder timbers; Context 006 split oak planks; Context 010 birch brushwood and Context 013 a bog oak.

## THE WEATHER OF 1999

S.J. Harrison

### Annual Summary

The year was characterised by strong winds, heavy rain and extensive snow over northern Scotland. This collage of colourful weather was pasted onto a background of above average temperature in ten out of the twelve months, and could be said to be typical of the 'globally warmed' Scottish climate of the future. Globally, 1999 was the 21st consecutive year with an above average temperature. The exceptions in Scotland were June, which was a breezy and showery month for the most part, and December, which was exceptionally cold at times with heavy frosts and some snow.

### Monthly Summaries

*Temperature and rainfall values in the following refer to Parkhead II climatological station although reference is also made to the records from Bridge of Allan and Flanders Moss.*

#### January Mild and wet with a few cold spells

The weather was unsettled for the first eight days with rain in strong winds, and there was widespread storm damage on the 4th in a south-westerly gale. The wind had slackened by the 6th, but the weather became rather damp and dull, with fog on the morning of the 7th. This was followed by a spell of clear and calm weather for a few days, with heavy frosts at night. The minimum temperature fell to  $-5.5^{\circ}\text{C}$  ( $-5.9^{\circ}\text{C}$  Bridge of Allan) by the morning of the 10th. Unsettled weather arrived late on the 11th and heavy overnight snow was lying down to an altitude of 200 m by the morning of the 12th. This heralded the start of a protracted spell of cold and wet weather until the 16th. Heavy rain, with occasional sleet, fell on the 13th, 14th and 15th and the Allan overtopped its banks. By the 16th, heavy snow had closed many roads in the Highlands. The wind began to back to south-westerly on the 16th and the following three days were mild, but grey and miserable, days. The Allan was in flood again on the 18th. There was slightly sunnier weather in the southern half of Scotland on the 21st and 22nd, but unsettled wet and windy weather with occasional sleet returned on the 23rd. The end of the month was calm but very dull.

#### February Mostly mild and slightly drier than average

The first two days were calm and warm, but rather dull, but by the 3rd the wind had become fresh to strong north-westerly, reaching storm force in northern Scotland on the 4th. The visibility was excellent between blustery showers in the clear polar air which dominated the weather until the 10th.

Days were bright and sunny, but night-time temperatures fell sharply, reaching  $-3.6^{\circ}\text{C}$  by the morning of the 8th ( $-4.9^{\circ}\text{C}$  Bridge of Allan). There was a sharp rise in temperature as tropical air arrived late on the 11th, and the 12th was dull with occasional light drizzle. However, cold polar air had returned by the 16th and blustery showers fell as sleet on the 16th and 17th. Very cold Arctic air affected Scotland on the 21st and 22nd. Heavy snow showers fell and there was a 3 cm depth of snow lying at Stirling University by the morning of the 22nd. The weather remained changeable until the 27th when very heavy rain fell in a fresh to strong south-westerly wind and the river Allan was in flood by mid-day on the 28th.

### **March** Warm and very dry

After a brief spell of warm and sunny weather on the 1st, there was intermittent rain between the 2nd and 4th. Scotland was then brought into a fresh northerly airstream and the weather was very cold, but sunny and dry, until the 6th when the temperature increased quite sharply with the arrival of warmer air from the south. Where snow was still lying on high ground, there were snow-melt floods. Amounts of rainfall were very small in central Scotland. The weather was warm and sunny on the 13th and 14th. The 16th and 17th were particularly warm for the time of year (maximum  $13.8^{\circ}\text{C}$  Bridge of Allan). The weather became less settled from the 17th with some longer sunny spells from the 21st. Very heavy rain fell during the 28th which gave a 24 h total of 24.2 mm (26.1 mm Bridge of Allan) and which represented 40 % of the total rainfall for the month. The Allan was in flood by the 29th.

### **April** Very warm and quite wet

The British Isles experienced very warm tropical air at the beginning of the month and the daytime temperature reached  $18.2^{\circ}\text{C}$  on the 1st. There was a little light rain in muggy humid air between the 2nd and 4th followed by a warm and quite sunny spell until the 9th, when the weather became unsettled. Cold Arctic air arrived in the British Isles after the 12th. Snow showers fell on the 13th, 14th and 15th and the temperature had fallen to  $-1.9^{\circ}\text{C}$  by the morning of the 14th. A very deep depression affected the weather from the 19th, and by noon on the 20th this lay off the west coast of Scotland, where it had a central pressure of 968 mb. The weather on the 20th, the wettest day of the month (11.8 mm, 13.1 mm Bridge of Allan), was wild and very wet, followed by blustery showers on the 21st. Very mild air entered Scotland on the 23rd and daytime temperatures improved as the weather became settled for the remainder of the month. The first warm spell of the year came under clearing skies and by the 28th the maximum temperature had reached  $20.1^{\circ}\text{C}$  ( $25.1^{\circ}\text{C}$  Bridge of Allan).

### **May** Warm but cloudy and rather wet

The first four days were warm and sunny with just a little light drizzle early on the 3rd, which was followed by a spell of very dull and wet weather from

the 6th to the 9th. Visibility was very poor and the hills were shrouded in a heavy cloud cover. On the 9th the visibility improved in a freshening south-westerly wind and heavy rain began to fall during the evening. Heavy showers, some very heavy and prolonged, fell on the 10th, 11th and 12th. 17.0 mm of rain was registered in Bridge of Allan on the 12th. Although the weather became more settled from the 14th, there was cloud and light rain at first before the skies cleared on the 17th. After a very warm day on the 20th, the temperature fell quickly on the 21st at the start of a protracted spell of windy weather with a fresh to strong south-westerly wind which persisted until the 26th. Conditions became very warm and muggy on the 27th when the daytime temperature reached 20.5°C (23.7°C Bridge of Allan). However, by the 28th continuous rain was fallen from a leaden sky and the 28th and 29th were dull wet days with maximum temperatures only just managing to top 12°C. By contrast, the last two days of the month were bright and sunny.

**June** Some warm spells but generally a rather cool and wet month

Settled weather lingered for the first two days, which were sunny and warm, but the weather became generally unsettled between the 3rd and 6th, with occasional sunny spells and intermittent rain. After the 6th, conditions became warmer and brighter until the 11th. The maximum temperature reached 25.1°C in Bridge of Allan on the 10th. Rain began to fall during the afternoon of the 12th, some of which was quite heavy, and the 13th and 14th were dull with occasional rain. The weather became more settled briefly on the 15th before rain returned on the 16th and there was yet more rain on the 19th, which was the wettest day of the month (16.1 mm). The weather was fresh, with excellent visibility in the polar air on the 20th which heralded the start of a more settled spell, and by the 24th it appeared that summer had, at long last, arrived. The 24th and 25th were hot and sunny days but conditions became very muggy by the afternoon of the 25th under a heavy cloud cover. On the 26th, the weather became unpleasantly hot (22.9°C, 26.7°C Bridge of Allan) and humid, and there were thundery outbreaks over the British Isles. A heavy rainstorm occurred just before midnight on the 26th which produced 9 mm of rain in an hour. The weather remained unsettled for the rest of the month with occasional rain in a fresh south-westerly breeze.

**July** Very warm at times and mainly dry

Although the 1st was sunny and warm, the following days were dull with low cloud and drizzle. From the 5th there was a protracted spell of calm and, at times, very warm weather but there were some cloudy and rather humid spells. There were localised showers, and during the early afternoon of the 5th, a remarkable 19.4 mm of rain fell between 13.00 and 14.00 GMT at Flanders Moss, while no rain was registered in either Bridge of Allan or Stirling University. By the 8th, the weather had become very hot and humid and on the 9th the maximum temperature reached 27.2°C (26.5°C Flanders Moss, 31.0°C Bridge of Allan). There was an abrupt end to the warm weather on the 13th as occasional rain fell in a freshening south-westerly breeze, which dominated the

weather for the following eight days. Rainfall amounts were relatively slight but there were three very wet days between the 18th and 20th which generated a 72 h total rainfall of 27.9 mm. The rain had become showery by the 21st, and by the 22nd the weather became settled and dry for the remainder of the month. There were occasional spells of dull cloudy weather but these were relatively brief in an otherwise uninterrupted spell of hot sunny weather. The weather pattern had begun to break by the 31st, which was miserably hot and very humid as thundery conditions threatened from continental Europe.

**August** Very dry with some warm spells

A thundery weather pattern lay to the west of the British Isles over the first nine days, which brought a long spell of dull and, at times, very muggy weather. There were afternoon thunder-storms in the Stirling area on the 1st and 2nd, the former resulting in 12.0 mm of rain, a third of the total fall for the month. Although unpleasantly warm and humid, no further rain fell over the following days. Conditions improved on the 7th as a freshening easterly breeze developed. The daytime temperature fell sharply, the maximum of 22.1°C on the 6th contrasting with 15.9°C on the 7th. There were three days of settled weather from the 10th and the solar eclipse on the 11th could be watched through a thin veil of stratus cloud. Conditions were rather changeable between the 12th and 19th but there were long spells of warm sunny weather with occasionally heavy showers. There was another spell of warm settled weather from the 20th to the 24th, but under clear night skies the ground temperature fell very close to freezing, reaching 1.5°C in Bridge of Allan by the morning of the 21st. Thundery weather moved northwards in the British Isles on the 25th, which was a dull and wet day. Further cloud and rain dominated the weather at the end of the month.

**September** Very warm but rather wet

Low cloud and rain persisted for much of the first six days and there was heavy rain on the 5th and 6th. The air was, however, exceptionally mild and the grass minimum temperatures on the mornings of the 5th and 6th in Bridge of Allan were 17.1°C and 15.1°C respectively. Unsettled and generally wet weather continued until the 13th although there were some protracted drier spells. There was a brief interlude of more settled weather on the 14th and 15th, which were warm sunny days but the respite was short-lived as rain fell all day on the 16th, followed by more rain and heavy showers on the 17th. The 48 h rainfall total came to 29.3 mm. Although there were a few brighter spells from the 18th, notably on the 21st, the weather was very mild and exceptionally damp with heavy rain on the 19th and 20th (25.5 mm). Conditions remained unsettled for the remainder of the month, although there were occasional glimpses of the sun. The 28th was the dullest and wettest day of this period, contributing another 15.3 mm to the substantial monthly rainfall total of 136 mm (more than 150 % of the long-term average).

**October** Mild and quite dry

A fresh, but showery, westerly breeze blew for the first three days which

was replaced on the 4th by a brief spell of calmer weather. The temperature fell under clear night skies and by the morning of the 5th had fallen to  $-1.9^{\circ}\text{C}$  ( $-2.3^{\circ}\text{C}$  Bridge of Allan,  $-3.8^{\circ}\text{C}$  Flanders Moss), the first autumn air frost. Rain returned on the 6th and Scotland experienced a run of westerly winds which became fresh to strong briefly on the 11th. From the 12th there were six days of settled weather with variable amounts of cloud, and there was dense fog in the Forth Valley on the morning of the 14th. By the 17th, a freshening easterly airflow had developed which brought warm air from the Mediterranean to Scotland. However, unsettled weather soon returned and there were spells of continuous rain, which became heavy overnight between the 21st and 22nd (14.8 mm, 17.1 mm Bridge of Allan). Air temperatures were exceptionally high and the night-time minimum temperature had fallen to only  $10.5^{\circ}\text{C}$  by the morning of the 23rd,  $5^{\circ}\text{C}$  higher than the seasonal average. Westerly winds brought a return to unsettled and cooler weather from the 27th onwards and there was a very windy and quite wet end to the month.

**November** Another very mild month: dry mid-month, otherwise very wet at times

Scotland experienced a run of mild south-westerly winds over the first four days. Heavy continuous rain began to fall during the afternoon of the 4th, which continued into the 5th. The 48 h rainfall amounted to 29.8 mm (30.9 mm Bridge of Allan). The clouds cleared away briefly on the 6th but dull weather returned on the 7th. Although the weather became very settled for the next seven days, bright sunshine was a rare visitor. When the cloud cover did clear, notably overnight between the 9th and 10th, the air temperature fell and had reached  $-1.7^{\circ}\text{C}$  ( $-2.4^{\circ}\text{C}$  Bridge of Allan) by the morning. A cool and fresh north-westerly breeze cleared the air on the 15th but the daytime temperature reached only  $6.2^{\circ}\text{C}$  on the 17th, and night minimum temperatures hovered around freezing. Unsettled weather with fresh to strong south-westerly winds returned on the 22nd and remained in charge for the rest of the month. The wind was frequently quite strong, gusting to gale force 8 at times, and there was a protracted spell of remarkably wet weather from the 26th to the 29th. The 4-day rainfall total came to 56.6 mm (73.6 mm Bridge of Allan, 74.6 mm Flanders Moss) and the Allan was in flood by the 28th. The last day of the month saw the strongest winds, with the south-westerly gusting in excess of 45 mph (Force 9).

**December** Cold and very windy at times

Cold Arctic air affected Scotland for the first four days and showers began to fall as snow at low levels by the 2nd. Continuous snow was falling by the evening of the 3rd, and there was a thin cover on low ground by the morning of the 4th. The air temperature between the 2nd and the 4th never rose above  $4.6^{\circ}\text{C}$  in Bridge of Allan. Snow was still lying on the morning of the 5th, but there was a very rapid rise in temperature and heavy rain during the evening. By the morning of the 6th the temperature had risen to  $12.0^{\circ}\text{C}$ . The mild spell was, however, brief and by mid-day on the 7th polar air had returned and the

weather remained cool and unsettled until the 13th. There were spells of bright sunny weather but the night-time temperatures fell sharply when the cloud cover cleared. By contrast, the 11th was very dull and wet day. The air became calm and clear and by the morning of the 13th there was a blanket of freezing fog which lingered all day. The daytime temperature on the 13th stayed below freezing, the maximum at Bridge of Allan and Flanders Moss stations reaching only  $-1.5^{\circ}\text{C}$ . By the morning of the 14th the temperature for the previous 24 hours had struggled to  $1.1^{\circ}\text{C}$  in Bridge of Allan. The wind remained in a cold northerly direction and the 15th was a raw day. There was brief milder interlude on a wet and windy 16th, but the cold spell lasted until the 21st. On the 20th the minimum temperature fell to  $-9.8^{\circ}\text{C}$  at the Flanders Moss station. By mid-day the temperature at this location had reached only  $-5.0^{\circ}\text{C}$ . Heavy snow was falling in the Stirling area by midnight on the 20th and by dawn this lay to a depth of 7 cm. However, in the evening the air temperature rose by  $5^{\circ}\text{C}$  and the snow began to melt very rapidly. Over the next few days the wind was fresh to strong south-westerly, which gusted to gale force. Heavy rain resulted in widespread floods by Christmas Day. The Allan was in flood on the 24th and 25th. The total rainfall between the 21st and the 25th amounted to 74.6 mm (78.6 mm Bridge of Allan, 82.6 mm Flanders Moss). The weather remained unsettled for the remainder of the month and the 20th Century bowed out on a dull and damp note.

### **Noteworthy weather events during 1999**

The following notes have been compiled from personal diaries, the Royal Meteorological Society's 'Weather Log', and the monthly bulletin of the Climatological Observers' Link

#### *Scotland*

- January 4th: Storm damage and floods across the western UK. Coastal flooding occurred at Largs
- January 16th: Heavy snow and strong winds brought blizzard conditions to parts of northern Scotland. Gusts exceeded  $30\text{ ms}^{-1}$  and there was 30 cm of snow in Aviemore
- February 4th: Gales across northern Scotland. Winds gusted in excess of  $40\text{ ms}^{-1}$  across the Northern Isles. Over northern and north-western Scotland 8000 homes were without electricity and air and sea-ferry travel was disrupted.
- February 8-11th: Arctic air brought very heavy snow in strong winds. Snow was 27 cm deep at Aberdeen airport on the 10th and on Fair Isle snow drifted to a depth of 2 m in places. All schools in Aberdeenshire were closed on the 9th. The A9 was also closed.
- February 22nd/23rd: Heavy snow caused road closures in the north of Scotland
- July 5th: Low pressure sitting over the UK set off isolated storms over the country with some exceptionally heavy, and very localised, rain. Between 13.00 and 14.00 BST the Flanders Moss weather station registered a

remarkable 19.4 mm, 12.0 mm of which fell between 13.30 and 14.00 h. At the same time, neither Bridge of Allan or Stirling University registered any rainfall.

- November 25th/26th: Gales began to blow over Scotland on the evening of the 25th, with gusts exceeding  $35 \text{ ms}^{-1}$  to the west and north of Scotland. Gusts reached  $54 \text{ ms}^{-1}$  on Cairngorm on the 26th. Such was the strength of the wind that the Glasgow to Benbecula air service could not land and was forced to return to Glasgow.
- 28th November: Heavy rain fell across Scotland which caused extensive flooding. In Port Glasgow floods reached window-sill level in some homes. The Edinburgh to Stirling railway line was blocked by a landslide and the West Coast Main Line was closed for a while during the afternoon. The Dollar to Dunfermline road was closed by flood water. In Falkirk eight greenhouses 'disappeared' as floods undermined the river bank. Allanvale Road in Bridge of Allan became impassible for a while.
- December 3rd/4th: Heavy snow and strong winds blocked roads and overturned several lorries on Scotland's roads. A snowplough was required to keep the M74 open and the Christmas tree in George Square in Glasgow was badly damaged by the wind. In Northern England gusts exceeded  $40$  to  $45 \text{ ms}^{-1}$  and there was widespread structural damage which extended across northern Europe.

### **Bridge of Allan Flood Diary 1999**

The Allan overtopped its banks on the following dates: 4th January, 15th January, 18th January, 28th February, 29th March, 28th November, 24th December, 25th December

### **Scottish Temperature Indices**

Funded by SNIFFER (Scotland and Northern Ireland Fund for Environmental Research), this project set out to develop indices of air and sea temperatures to parallel Manley's Central England Temperature (CET), which has been used for many years as the standard reference for research into environmental change. CET has obvious limitations when it comes to investigating changes in the Scottish environment. It relates not only to a notional location in the English Midlands, but also to a lowland and inland location. There has been a need, therefore, to develop an index which relates to Scotland's more northerly latitude and to the powerful influences of topography and coastline. The climatological record for Scotland is very restricted, so it has not been possible to generate a reliable temperature index for the period before the end of the 19thC. A number of key climatological stations in Scotland have been used to provide a basis for two Scottish indices, these being for the mainland and for the islands. There are also temperature indices for Northern Ireland and for coastal waters. The indices are currently available on CD-ROM and will soon be available on the Internet for general use. The indices show very clearly how the climate of Scotland has become very much warmer over the course of the 20thC.

### **Scottish Snowfall Changes Project**

The snow cover over Scotland has been changing quite markedly over the last few decades of the 20thC and climatic models suggest that projected future warming of the earth's surface will impact on the frequency and distribution of snowfall over the course of the 21stC. The Scottish Executive has awarded a research contract to a team based at Stirling University, the objectives of which are to develop predictions of how snowfall in Scotland may change, and to establish what impact this may have on environmental and socio-economic systems. Two key problems at the outset are the fundamental shortage of data on snow cover, especially for the uplands, and the relatively poor spatial resolution offered by existing climatic models. The prediction of future changes will be based on a climatic analogue technique which uses representative samples from within the current climatological record. Snow cover data will be analysed for representative winters, and maps of snow cover produced using a Geographic Information System. The assessment of the impact of changes in snow cover is currently being based on a questionnaire which has been sent to key interest groups throughout Scotland, such as the skiing industry and skiers, winter road maintenance departments, water resource managers, and hydro-electric power producers.

### **Forth Weather Network**

The number of climatological stations providing summaries for the University of Stirling's Annual Climatological Bulletin continues to grow. During 1999, data were received from the following locations:

**Parkhead:** *University of Stirling campus; Mr Lewis Taylor, Standard Climatological Station submitting returns of observations to the Meteorological Office.*

**Bridge of Allan:** *Westerlea Drive; Dr John Harrison; Observations submitted to the Climatological Observers Link.*

**Dunblane:** *Ochiltree; Mr Neil Bielby.*

**Craigmill:** *Near to Causewayhead and beneath the Wallace Monument; Mr Jack Bairner*

**Flanders Moss (West Moss-Side):** *Open land to the east of the Moss; Dr John Harrison and Mr Stuart Bradley, Fully automatic station*

**Balquhiddier (Auchtoo):** *Open valley site; Ms Edna Haydock.*

Weather observations from other locations are always welcome.

*Material in this article has been extracted from the Annual Climatological Bulletin No. 21 of the University of Stirling, copies of which may be purchased from Dr S.J. Harrison, Department of Environmental Science, University of Stirling, Stirling FK9 4LA*

## FORTH AREA BIRD REPORT 1999

C.J. Henty and W.R. Brackenridge

Almost one hundred contributors appear this year, some sending individual notes either direct to the Editor or via the RSPB local group, others have assisted in the wildfowl counts and the breeding birds survey. The extensive use of record cards has greatly helped the compilation of notes by species. Red Kites are now seen more extensively in the area and four pairs nested successfully this year; Ospreys continue to do fairly well and Goldeneye bred successfully whilst Eider ducklings were seen close to our border with West Lothian. The White-tailed Eagle reintroduction project gave us the first recent record, a tagged juvenile that may have lingered longer than the definite records suggest. Other first records are a Nuthatch at a bird table in August and an autumn Spotted Crake – in the *Vertebrate Fauna of Forth* there are no records definitely from our area. Migrants not seen for many years include Avocet, Sabine's Gull and Little Tern. Scarce but regular migrants include a spring Great Grey Shrike and Dotterel, and autumn Marsh Harriers; the drake Smew at L.Dochart seems to have become a regular winter feature. Several moderate flocks of Curlew Sandpipers occurred but passage of the other scarcer waders was weak. Some massive flocks of Chaffinches were noted early in the year, whilst at Lecropt there continue to be large numbers of Tree Sparrows, and also Greenfinches in December

This report is compiled from a larger archive of records submitted to the local recorder under the national scheme organised by the Scottish Ornithologists Club; it is worth noting that annual Bird Reports are unusual amongst natural history publications in the degree of involvement from the local birdwatching community by the regular contribution of their observations. The area covered by the report comprises the council areas of Falkirk and Clackmannan together with Stirling, excluding Loch Lomondside and other parts of the Clyde drainage basin. Please note that we do not include the Endrick water, *i.e.* Fintry and Balfron. Records from Carron Valley Reservoir are published here but it is proposed that Clyde should cover all the forest south of the reservoir. Observations are not spread evenly being concentrated on the estuary and the Carse of Stirling, although the inland part of Falkirk and the extensive and often inaccessible hill area in the north of our area have had more attention than in past years

Most months in 1999, apart from December, were warmer than average with much rain in the late spring and in the last four months. January was unsettled and windy, except for frost and snow in the second week, and there was heavy rain and flooding after the snow. In February mild spells alternated with Arctic airflows that caused snowfall on the 22nd, soon replaced by heavy rain and flooding. This pattern continued in early March, then some mild and sunny spells finished with heavy rain at the end of the month. Apart from cold winds

and snow showers in mid-month April was very mild though wet and windy on the 20th/21st. May was warm but cloudy with heavy rain in the second week. June was generally cool and wet with only brief sunny spells whereas July was hot and thundery except for unsettled weather with some rain in the third week. Warm and thundery conditions dominated August, finally turning unsettled and this persisted so that September was wet though very mild. In early October an anticyclone gave the first frost and settled weather was only interrupted briefly so the month was quite dry, a contrast to the wet and windy, though mild, weather in November. In early December Arctic air brought snow leading to calm days with freezing fog in mid-month, then followed more cold and windy weather with heavy snow on the 20th that was quickly melted by south-westerly gales and heavy rain.

The 1999 information on the breeding numbers of common species come from the British Trust for Ornithology Breeding Bird Survey (see later) and one study of mapped territories, a Waterways Birds Survey along 5 km of the R.Devon at Alva which has much damp scrub surrounded by mixed pasture and arable, referred to as "Devon WBS", or, for species that are not fully mapped, as "5 km of lower Devon". In addition the Breeding Bird Survey, based on transect counts, is now sufficiently extensive to calculate numbers of birds recorded per ten kilometres for several habitat types and these are regularly mentioned in the species paragraphs. For less common species I can sometimes mention data in terms of the numbers of pairs or apparently occupied territories for particular locations. Several observers send in a list largely or entirely for their home locality, much of this information is not appropriate for these annual reports but it is valuable to have on record and I am keeping them in a special file. At the moment there are fourteen such lists referring to the whole district from Falkirk to Killin.

For many species the records sent in are very unrepresentative of their general distribution, this applies particularly to very common species or to those that are secretive or breed in inaccessible places. Readers can consult the Check List published in the *Forth Naturalist and Historian* vol 15, but in addition I have in this report put, after the species name, a coded summary of general distribution – which often apparently contradicts the detailed records that are published for the year.

- B* - Breeding status, widespread (in more than five 10 km squares)
- b* " " , local, scarce (in fewer than five 10 km squares)
- W* - Winter status, widespread or often in groups of more than ten.
- w* - " " , local, scarce (local and usually fewer than ten in a group)
- P* - Passage (used when species is usually absent in winter, *P* or *p* used for widespread or local as in winter status)
- S* or *s* - a few species are present in summer but do not normally breed.

Thus *BW* would be appropriate for Robin, *B* for Swallow, *p* for Ruff and *SW* for Cormorant. No status letter is used if a species occurs less than every other year.

An asterisk (\*) in front of the species name means that all records received have been quoted.

The SOC has pressed for a more systematic vetting of records of species that are unusual locally, this area now has an informal panel of five – C. Henty (Recorder), W. Brackenridge (Dep. Recorder), D. Orr-Ewing, A. Blair and D. Thorogood. The judging of national UK or Scottish rarities continues as before, but we have produced for the upper Forth a list of species that are scarce locally and where the records need to be supported by either a full description or sufficient evidence to remove any reasonable doubt. This list and a background explanation have been circulated to a hard core of observers and can be got from the recorder at SOC meetings or by post. Any species which is a vagrant to the area, and most of those which are asterisked in this report, will come into this category.

The organisers for both the estuary and the inland waters parts of the national wildfowl counts (WEBS) have made available the results for this report. These often contribute to the species accounts and there is also a separate summary for inland waters which concentrates on localities.

There is an ever-increasing amount of information coming in: records on the standard species cards need only to be sorted and I would urge observers to use these wherever possible (putting several records for one species on a single card); records on sheets, whether written, hand-typed or computer-typed, need to be either retyped onto a computer database or cut and pasted onto species sheets. This is time consuming and the recorder can no longer do this systematically without extensive help from contributors; otherwise these records will be scanned on arrival and only those items seeming to be salient will be transferred to the database, all the original sheets will be kept on file but that information is very difficult to unearth and inevitably some uncopied records will in fact be important but remain hidden. Appeals for assistance will continue !

The following abbreviations have been used : AoT - apparently occupied territory, BoA - Bridge of Allan, c/n - clutch of n eggs, BBS - Breeding Bird Survey, CBC - Common Bird Census, CP - Country Park, F - Female, G - Glen, GP - gravel pit, J - juvenile, L. - Loch, NR - Nature Reserve, M - Male, ON - on nest, Res - Reservoir, SP - summer plumage, WBS - Waterways Bird Survey, WG - Wildlife Garden, Y - young.

This report has been compiled from records submitted by:

A. Ayre, B.D. Allan, M. Anderson, P.&M. Ashworth, M.V. Bell, A. Blair, N. Bielby, Birdline Scotland, W.R. Brackenridge, R.A. Broad, G.J. Brock, D.M. Bryant, R. Bullman, D.J. Cameron, R. Chapman, D.A. Christie, J. Corcoran, R.&A. Daly, P. Dearing, A. Downie, K. Duffy, D.S. Fotheringham, J. Fotheringham, C.J. Henty, D. Jamieson, D. Jones, R. Jones, J. Knowler, G.&E. Leisk, C.J. Mallett, A.K McNeil, J. Nimmo, D. Orr-Ewing, J. McOwat, G. Owens, R.K. Pollock, D. Rees, H. Robb, P.W. Sandeman, J. Sankie, S. Sankey, R. Shand,

A. Smith, P. Stirling-Aird, D. Thorogood, A. Thiel, M. Trubridge, J. Wheeler, K. Wilkinson, T. Young, R. Youngman.

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## RESULTS OF THE BBS SURVEYS FOR CENTRAL REGION

*(Based on a comprehensive summary by NB).*

This year the bird report continues to make extensive use in the species accounts of results from the Breeding Birds Survey, these are in terms of the frequency of occurrence of a species along linear transects in several habitat types. In 1999 30 1x1 kilometre squares were surveyed, 1 more than 1998. Each square is visited twice in spring/summer, a total of two kilometres on a set route is walked per visit and all birds noted in 200 metre sections; a standardised habitat survey is done on another visit. In the main report I have presented selected results, calculated as birds per ten kilometres of habitat, for the major habitats where it is likely that the birds are breeding locally. For species that are scarce – say, 5 or less per 10 km – results may vary erratically from year to year. Each 200m section and the birds noted in it have been attributed to one of four major habitats – Mountain and moorland (=moor), Conifers (woodland + wood/moorland edge), Farmland, Urban/suburban. Broadleaved woodland occurs mainly as copses in farmland whilst conifer woodland includes both young plantations and mature woods, thus “Conifers” figures may include species of scrub and moorland edge which are not found in mature plantations. Also, some urban squares may include bushy areas on the fringe of towns.

An average of 22 species were recorded per square, but with great variation from four on high moorland to 44 on mixed farmland, numbers of individuals varied similarly from 32 to 847, average 246.

1999 contributors were: MA, M. Blunt, WRB, RB, DJC, P. Carter, RC., RD, S. Davies, D. Egerton, S. Easthaugh, J. Grainger, A. Hibbert, CJH, J. Nimmo, D. Jones, S. Mitchell, R. Osborn, LO'T, D. Redwood, P. Rodway, SS, JW, J. Walker, KW, TY.

## WILDFOWL REPORT 1999-2000

This report concerns the inland waters part of this area's Wetland Bird Survey (WeBS) organised by NB and is a condensed version of a fuller report by him.

WEBS is a monthly waterfowl census under the auspices of the British Trust for Ornithology (BTO) and the Wildfowl & Wetlands Trust (WWT), it runs from September to March inclusive. For this report 'wildfowl' includes divers,

grebes, cormorants, herons, swans, geese (excluding Pink-footed and Greylag for which the WWT organises separate counts), ducks and rails

This report covers the area occupied by the new local government councils of Stirling, Falkirk and Clackmannanshire (the 'region'). In total, 112 still water sites, 92 km of river and 13.7 km of canal were counted by 42 counters.

### Still Water Sites

Standing water in Central Region amounts to 7693 hectares or 2.9 % of the area.

The following table consists of matched monthly data for total wildfowl on 14 sites in the top 25. Those sites holding fed Mallard have been excluded.

Month	1996/7	1997/8	1998/9	1999/0
September	1583	1756	1494	1605
October	2039	2454	2082	2812
November	3235	3037	2633	3257
December	3955	3396	2710	3386
January	4477	3332	2599	3045
February	2771	2940	2133	2244
March	1646	1930	1338	1334
Total	19706	18845	14989	17683

This season's numbers are up 17 % on the previous largely due to high figures for the autumn and a return of Gartmorn Dam to its preeminent position.

Turning to individual sites, the top ten along with monthly averages are listed below:- (previous season's figures in brackets)

	Site	Average
1. (2)	Gartmorn Dam	530 (350)
2. (1)	Gart complex	479 (433)
3. (3)	Lake of Menteith	288 (319)
4. (4)	Airthrey Loch	283 (295)
5. (6)	Blairdrummond Park	274 (189)
6. (22)	Loch Venachar	249 (73)
7. (9)	L.Dochart-Iubhair	240 (150)
8. (5)	Loch Earn	231 (265)
9. (7)	Vale of Coustry	224 (182)
10.(8)	Doune Ponds	153 (158)

The above table excludes sites where Mallard are reared and released for shooting. Most sites show the increase in total numbers this season, of the larger waters only Carron Valley Reservoir declined, down to a monthly average of 116, only one third of the long term average.

In general the number of species recorded at a site increases with the

average number of birds, four of the six sites with more than 15 species are in the top ten for numbers; however, there are exceptions: the most diverse, with 18 species, is L.Watson (11th for numbers) whilst L.Ard scores 15 but is 13th in the number ranking.

### Linear Water Features: Rivers & Canals

This season coverage of the canals in the region decreased but the river length increased slightly. The most favoured river was the Teith with 22 birds km<sup>-1</sup>, closely followed by the Forth; canals scored at 18 km<sup>-1</sup>.

The proportion of birds that use linear waters can be checked by taking the species total for the season and comparing with the total for all inland waters. Mallard (27 %), Goldeneye (31 %), and Wigeon (31 %) are all very similar, Teal (46 %) and Goosander (48 %) are more river specialists. The difference between Moorhen (45 %) and Coot (0.3 %) is consistent with general field experience. These figures come from two periods without prolonged frost, ice cover would certainly displace some species to the rivers such as the Forth around Stirling.

WEBS contributors to these data, additional to report list were: B. Barker, M. Blunt, P. Dearing, G. Diack, S. Easthaugh, D. Egerton, M. Ferguson, P. Glennie, A. Hannah, M. Hardy, I. Henderson, M. Kobs, A. Moody, R. Osborn, D. Series, D. Shenton, A. Wallace, J. Watson, H. Weir, M. White.

### SYSTEMATIC LIST

Codes – S, F and C indicate records from Stirling, Falkirk and Clackmannanshire “Districts”.

#### \*RED-THROATED DIVER *Gavia stellata* (b,w)

F 3 Blackness 4 Mar, 1 on 25 Apr & 26 Dec. 1 Bo’ness 20 Feb & 25 Dec (DMB MA). 1 Kinneil 10 Mar (DT).

S Trossachs: 2 on 14 Mar to 23 Aug (+Juv), at other sites 1 on 2 Jul & 20 Aug (DJC DAC). 5 Carron Valley Res 9 Oct, calling in flight, left S (DAC).

#### \*BLACK-THROATED DIVER *Gavia arctica* (b,w)

S Trossachs: 2 on 30 Mar, 1 on 2 Jul & 2 on 8th, no young seen (NB DAC DT).

#### LITTLE GREBE *Tachybaptus ruficollis* (B,w)

F At Skinflats 16 to 30 Jan & from 23 Sep, max 7 on 27 Dec. Kinneil: max in Jan, 4 on 9th; from 22 Sep with max 5 on 17 Dec (AA AB MA GO JF DT). Pr with 2Y Falkirk (MA). 5 Drumbowie Res 6 Oct (NB).

C 1 Cambus Pools 20 Mar & 3J on 12 Sep (WRB CJH). 6 Kersiepow 29 Oct & 29 Nov (NB).

S At 6 sites in breeding season (WRB AD DJC CJH). In Sep, 9 Cocksburn Res on 12th, L.Dochart on 26th & Gart on 21st. 7 L.Voil/Doine 12 Nov (NB).

#### GREAT CRESTED GREBE *Podiceps cristatus* (b,W)

F 86 Blackness 4 Mar, 24 on 18 Jul & 22 on 18 Aug (MA AB). Few in autumn Kinneil, max 24 on 5 Sep (DT).

C Gartmorn: 1 on 10 Jan, 2 on 21 Mar; 17 on 22 Oct, 14 on 30 Nov, 7 on 27 Dec (EH AT). 3 Black Loch 16 Mar & 1 Little Denny Res (NB).

S 5 Ad & 3Y Carron Valley Res 10/11 Aug (DT AKM). Pr + 3Y Cambusmore 25 Jun (PWS). 12 Lake of Menteith 31 Mar (NB). At 6 other sites in breeding season (DJC NB).

\*SLAVONIAN GREBE *Podiceps auritus*

- C 1 Gartmorn 27 & 28 Dec (AT).  
 S Carron Valley Res: 1 on 12 Apr, 28 Jun, 10 Aug (Ad in primary moult) & 1 on 25 & 30 Sep (RKP DT GJB).

\*FULMAR *Fulmarus glacialis* (p)

- F 12 -> E Blackness 25 Apr & 1 -> W on 23 Jun (MA GO). Kinneil: 1 on 27 May, 25 Jun, 8 Aug & 17 Sep, 2 on 5 Sep (DT AB).  
 S 1 flew E at Airthrey 20 Apr (DMB).

\*GANNET *Sula bassana* (p)

- F Blackness: 1 -> W on 23 Jun & 1 Juv on 11 Sep. 9 Juv -> W Kinneil 19 Sep. (GO DT AB).

1998 11 Juv -> W, Carron Valley Res 6 Oct (GJB WB RKP).

CORMORANT *Phalacrocorax carbo* (S,W)

WEBS max: 73 Forth Estuary in Jan & 115 in Dec (DMB). 77 inland in Oct & Dec (NB).

- F 27 Higgins Neuk 10 Jan (DF).  
 C 80 Tullibody Inch 8 Feb (CJH).  
 S 29 (max) Lake of Menteith 13 Oct. 19 L.Earn 7 Dec (NB). 18 Carron Valley Res 26 Nov (DAC).

GREY HERON *Ardea cinerea* (B,W)

WEBS max: 53 inland in Sep (NB).

- F 9 Skinflats (max) 6 Aug (GO).  
 C 21 on lower Devon in Feb (GEL PD DE).  
 S 15 Blairdrummond 8 Mar (AD). 12 Gart 25 Jun & 21 Sep (PWS NB). 10 Carron Valley Res 26 Nov (DAC).

MUTE SWAN *Cygnus olor* (B,W)

WEBS max: 154 inland in Nov (NB).

Colour ring sightings: Ad Airthrey 20 Nov, ringed Kirkliston 11.8.96, seen Hogganfield Loch on 2.5.99 & L.Gelly on 30.5.99. 1 Alva 28 Oct ringed Edinburgh 8.9.94, seen Hogganfield 16.3.97. 1 Blairdrummond 22 Oct ringed Edinburgh 16.8.98.

- F 12 Prs around Falkirk, 3 failed, rest reared 39 Juv. 15 Skinflats 26 Dec (MA). 49 Forth/Clyde Canal 21 Feb, 29 Union Canal 12 Sep (AA JN).  
 C 2 nests fledged 10 at Cambus. 2 nest + 2 AoT on R.Devon, Pr with 4 Juv Tullibody (CJH AT). 46 on Devon in Jan & 31 in Dec (GEL PD KW).  
 S 8 sites, 6 Prs reared 22 Juv (AT DJC WRB PWS). Max Lake of Menteith 31 on Jan & 32 on 10 Dec (NB). At Lecropt 17 Feb to 27 April, max 46 on 21 Mar (DK AD DT AT DAC CJH).

\*BEWICK'S SWAN *Cygnus columbianus*

- S 1 Ad, with Whoopers, Lecropt 12 Nov (DT).

WHOOPER SWAN *Cygnus cygnus* (W)

WeBS max: 80 inland in Nov (NB).

- F 15 by M9 at Kinnaird on 13 Nov, 16 Bonnybridge on 23rd - from NE, could be same herd (AS MA).  
 C Menstrie: 3l on 28 Jan, in Nov 18 on 25th & 26th, 33 Alva on 29th (AT N B).  
 S L.Dochart: max 22 on 24 Feb, 25 Cromlix 17 Mar. Lecropt/Drip Carse: 23 on 20 Feb, max 45 on 3 Apr, 7 on 10 Apr but 2 Blairdrummond on 30th. (AS DK DOE DT NB); 1st of autumn 21 on 2 Oct, 54 on 8 Nov; 37 Thornhill carse 27 Dec probably this herd. 15 Carron Valley Res 16 Nov (DAC AD SE DR AKM).  
 Counts of juvs in distinct herds gave: Spring 20 % Juv. Autumn 13 % Juv. Rather similar to 1998.

PINK-FOOTED GOOSE *Anser brachyrhynchus* (W)

Considerable flocks reported throughout the lowland areas, in the absence of regular coordinated counts these are difficult to interpret. However, 3000 Blairdrummond Carse 22 Feb may have included the 2060 Lecropt on 21st and 1600 Thornhill Carse on 27th where there were still 2000 on 18 Apr (RD AD DAC DOE).

550 Skinflats 14 Feb, 2030 on 10 Oct & 300 on 24th; other max in the east of the area were 140 Airth on 24 Jan, 400 L.Ellrig 7 Feb & 205 Menstrie 23 Dec (MVB DMB DAC JN KW).

The main arrival started with 2 Kinneil on 26 Sep, 64 Skinflats on 28th, 130 Buchlyvie on 27th & 880 on 30th. Max were 4000 Thornhill on 6 Nov & 3100 Lecropt on 13th (DT GO DAC MVB).

BEAN GOOSE *Anser fabalis* (W)

F 132 L.Ellrig 10 Jan (JN). 27 west of Slamannan 3 Dec (DK).

\*WHITE-FRONTED GOOSE *Anser albifrons* (w)

S 2 Lecropt 9 Nov (AD). 1 Drip Carse 5 Dec – unusually, European race (MVB).

GREYLAG GOOSE *Anser anser* (b,W)

Substantial flocks were noted mainly on Drip/Blairdrummond carse with 530 on 16 Jan, 400 on 6 Mar & 300 on 9 Apr (MVB DK DOE). The max further north was 164 G.Dochart 24 Feb (NB). 160 Menstrie on 13 Mar & 50 -> W Tullibody Inch 8 Feb (PMA CJH), but few lower down estuary. 344 Slamannan 20 Jan (NB). 50->N Killin 4 Apr (PWS).

The 1st of autumn were 106 Drip Carse on 8 Oct, max here was 660 on 6 Nov, 800 Lecropt on 13 Nov probably the same birds (NB DT MVB). In the north, 800 Gart 22 Nov & 109 G.Dochart on the 18th, in the east 105 Alva 29 Nov & 182 Slamannan 5 Dec (PWS NB).

CANADA GOOSE *Branta canadensis* (b,W)

WEBS max: 97 inland in Sep & Dec (NB).

F 24 Bonnybridge 30 Jan (MA). 21 -> E Higgins Neuk 4 Sep (DF).

S Max early in year was 40 Cambusmore on 19 Feb (PWS). 75 -> NE Ashfield 21 Aug presaged large autumn numbers in the west of Carse of Stirling with 70 on 2 Oct & 85 on 8 Nov, fewer in December but further north 50 Gart 12 Dec, 53 L.Venachar on 23rd & 39 G.Finglas on 28th. Spring pairs at G.Finglas (16Y), Killin, Lochearnhead, Lake of Menteith, Thornhill, Hutchinson Dam (WRB NB DAC DJC PWS DOE).

BARNACLE GOOSE *Branta leucopsis* (w)

F 3 Skinflats 10 Oct (DMB).

S 1 Drip Carse 6 Mar (SE). Lecropt 9-13 Nov, max 6 on 13th (AD MVB DT). 1 Lake of Menteith 16 Nov (NB).

SHELDUCK *Tadorna tadorna* (b,W)

WEBS max: 1066 Forth Estuary in Feb & 3052 in Sep (DMB).

F Moulting flock at Kinneil totalled 2360 on 25 Jul & 4714 on 7 Aug. Skinflats: 479 on 14 Feb, 354 on 7 Aug & 690 on 12 Sep (MVB DMB CJH).

C 252 Tullibody Inch 21 Feb (DMB). 2 pairs Blackdevonmouth Apr-May. Pair on Devon WBS 17 Apr to 18 May (CJH).

S 4 Cambuskenneth in Mar were highest up Forth (AT). Pair Howietoun 18 May & 4 Jun (DT). 2 Killin 28 Jun (1st, PWS).

WIGEON *Anas penelope* (b,W)

WEBS max: 1192 Forth Estuary in Jan & 468 in Dec (DMB), 922 inland in Nov (NB).

F 138 Blackness 23 Jan & 212 on 24 Oct (AB). Kinneil: max 470 on 1 Jan, 310 on 4 Mar to 6 on 17 Apr; Pair on 25 Jul, 35 on 13 Sep, 134 on 7 Oct & 298 on 28 Dec

- (MVB MA GO CJH AB DT). Skinflats: 47 on 14 Feb, last 4 on 21 Apr; 3 on 31 Aug, 100 on 12 Sep (MVB GO AB). 65 Lathallan 21 Feb & 20 on upper Avon 8 Nov (JW NB).
- C 640 Tullibody Inch 8 Feb, 20 on 14 Sep (CJH). 170 Kersiepow (Alva) 28 Oct & 227 Gartmorn 30 Nov (NB AT).
- S Gart Lochs (Cambusmore): 418 on 18 Jan, pair on 11 Apr & 10 on 25 Jun; 79 on 21 Sep to 407 on 9 Dec. 109 L.Dochart 18 Nov, 205 L.Venachar 20 Dec (NB CJH PWS DJC). Max on the upper Forth between the Teith and Gargunock 319 on 27 Dec (RC DR).
- \*AMERICAN WIGEON *Anas americana*  
1998 1 Kinneil 25-26 Apr (GO).
- GADWALL *Anas strepera*  
C 5 (4M) Cambus Pools 7 Mar, 7 on 14 Apr & pair on 20th (WRB AT). 3 Gartmorn 12 Nov (AB DT).
- TEAL *Anas crecca* (B,W)  
WEBS max: 992 Forth Estuary in Jan & 1212 in Dec (DMB). 467 inland in Nov (NB).
- F Kinneil: 131 on 26 Jan, 121 on 5 Apr; 100 on 13 Sep & 365 on 5 Dec. Skinflats: 256 on 17 Jan, 4 on 26 Jun, 14 on 20 Aug, 233 on 5 Dec. Inland max 45 Carronshore 10 Oct (CKM DT AB MVB GO).
- C Max Gartmorn Dam 39 on 10 Jan, 30 on 27 Dec (EH AT). 61 on Devon, Alva-Dollar, 8/11 Jan (GEL DE). F+8Y Blackdevonmouth Marshes 10 Jul, 77 on 15 Oct (CJH).
- S 164 on upper Forth 12 Feb & 240 on 27 Dec (RC). 100 Gart 21 Feb & 132 on 12 Dec (DOE DJC). 150 Blackwater Marshes 6 Sep (DJC). Pairs Ashfield & Hutchison ponds to late May (WRB). F+6Y Thornhill 4 Jul (SS).
- MALLARD *Anas platyrhynchos* (B,W)  
WEBS max: 426 Forth Estuary in Jan & Dec (DMB), 4725 inland in Oct (NB). 10 Broods had 71Y (MA DT).
- F 202 Skinflats 17 Jan, 198 on 5 Dec (MVB).
- C 23 AoT on Devon WBS, 18 in 1998 (CJH). 192 Gartmorn 10 Jan & 276 on 27 Dec (AT EH).  
290 Airthrey 10 Jan & 242 on 29 Nov (MK). 234 L.Watson 11 Oct (CJH). 573 on upper Forth between the Teith and Gargunock 13 Sep (RC). 442 Blairdrummond Safari Pond 22 Oct (NB). 310 N.Third Res 4 Nov (BO).
- PINTAIL *Anas acuta* (W)  
F Skinflats: max 84 on 17 Jan, 66 on 14 Feb, last 4 on 10 Mar; 2 on 5 Sep, 88 on 23 Dec. Few at Kinneil, last 1 on 10 Apr; 1st autumn on 13 Sep, max 11 on 26th (GO AB MVB CKM DT).
- C Pr Cambus 28 Mar to 20 Apr (WRB AT).
- S 2 L.Watston 14 Oct (CJH).
- \*GARGANEY *Anas querquedula*  
F M Skinflats 1 May (DAC).
- SHOVELER *Anas clypeata* (p)  
F 1 Bonnybridge 30 Jan. Kinneil: 4M on 3 Apr & 3 to 5th, Pr on May 27; 1 on 14 Aug & 2 on Sept 5 & 26. (MA GO DT).
- C 4(3M) Cambus Pools 20 Apr, Pr to 17 Jun, F on 1 Jul; 8 on 27 Jul & 2 on 14 Nov (AT WRB CJH).
- S M Callander 17 Mar, M L.Watston 2 May & 2 Gart 14 Aug (DJC DMB DOE).
- POCHARD *Aythya ferina* (W)  
WEBS max: 180 inland in Dec (NB).
- F 17 Black Loch 6 Oct (NB).

- C 71 Gartmorn 24 Sep, 98 on 22 Oct (AT).  
28 L.Achray 18 Feb, 21 Cambusmore 18 Oct, 38 L.Walton 8 Nov, 46 L.Ard & 21 L.Venachar 20 Dec (NB PWS MF).
- TUFTED DUCK *Aythya fuligula* (B,W)  
WEBS max: 595 inland in Oct (NB).
- F 103 Black Loch 12 Sep, F+2Y on 18 Jul (MA). Max 7 around Grangemouth Jul-Dec (CJH DT GO AB).
- C 6 AoT on Devon WBS (CJH). 200 Gartmorn 24 Sep & 278 on 22 Oct (AT).
- S F+3Y Ashfield in Jul (WRB). Winter counts low, max 50 Coustry 23 Mar & 51 on 22 Sep. 32 L.Coulter 9 Sep, 40 L.Watston 18 Oct, 35 Lake of Menteith 16 Nov (NB CJH).
- SCAUP *Aythya marila* (w)  
F Kinneil: 1 on 1 Jan, 2 through Feb, M on 1 Jul-29 Aug, 1 on 3 Oct. 1 Skinflats 18 Nov (MVB DMB DT GO RS).  
M Carron Valley Res 26 Mar (AKM). 1 Cromlix 23 Nov (NB).
- EIDER *Somateria mollissima* (w)  
F Blackness: 13 on 23 Jan & 25 Apr (9 on 18 Apr, also 9 off Bo'ness); 5(3F) on 6 Jun, 2F+3Y on 26th & 4F+3Y on 18 Jul, 18 on 13 Aug (MA) (This is first proof of nesting locally, however nest site could well be on Lothian side of bay, Ed).  
Kinneil: 6 (max) on 18 Apr to 27 May. 2 Skinflats Jan & Dec & 4 on 18 Apr; 1 on 7 Aug & 27 Nov to 26 Dec (GO AB DT DMB MVB).
- \*LONGTAILED DUCK *Clangula hyemalis*  
F 1 F/Imm Little Denny Res 20 Jan to 16 Mar (NB). F Blackness 7 Nov (MA). F Skinflats 12 Nov to 18 Dec (GO AS AB DAC).
- C F Cambus Pools 24 Oct to 8 Nov (CJH DAC). F Gartmorn 12 Nov (DT).
- \*BLACK SCOTER *Melanitta nigra*  
F M Kinneil 17 Apr (GO).
- GOLDENEYE *Bucephala clangula* (W)  
WEBS max: 92 Forth Estuary in Feb & 33 in Dec (DMB). 467 inland in Dec (NB).
- F 28 Higgins Neuk 10 Jan (DF). 25 R.Carron (Camelon) 3 Jan & 19 Dec; M Bonnybridge 27 Jun. 38 Skinflats 23 Jan & 27 on 17 Dec, F summered. M Kinneil 27 May, 5 on 3 Aug, max only 10 on 26 Jan (MA AB GO DT CKM). 44 Black Loch 16 Mar & 21 on 8 Nov (NB).
- C 51 R.Forth, Cambus, 22 Feb & 1 M 18 Jun to 18 Jul. 60 Gartmorn 22 Oct & 45 on 27 Dec (CJH AT). 87 on lower Devon 4 Feb & 37 in Dec (KW PD).
- S F in nestbox L.Tay 11 May, with 2Y on 9 Jun (PWS). 70 Cambuskenneth 10 Jan (AT). 71 Lake of Menteith on 23 Feb. 22 L.Venachar & 22 L.Ard on 20 Dec. 40 L.Dochart/Iubhair 11 Mar; 41 on 13 Dec (NB DJC). 34 Carron Valley Res 27 Dec (DAC).  
24% M (n=278) in Feb/March.
- \*SMEW *Mergus albellus* (w)  
S L.Dochart/Iubhair: M on 21 Jan to 11 Mar. M on 13 & 18 Dec (NB DOE NB PWS AS DK IW RY).
- RED-BREASTED MERGANSER *Mergus serrator* (B,W)  
34 Forth Estuary in Jan & 25 in Oct (DMB).
- F 14 Skinflats 14 Feb & 11 on 7 Nov. 13 Kinneil 18 Apr & 25 on 23 Oct (MVB GO AB DT). Pr R.Carron (Camelon) 21 Mar (MA).
- C M on Tullibody Pond 21 Feb & 24 Dec (NB).
- S No reports from breeding areas.
- GOOSANDER *Mergus merganser* (B,W)  
WEBS max: 183 inland in Jan & Dec (NB).

- F 20 Skinflats 23 Sep & 14 Oct. 11 Kinneil 26 Sep & 12 on 3 Oct (GO AB DT). 21 St Helens Loch 1 Jan & 10 on 18 Nov. 10 R.Carron (Larbert) 21 Feb (MA AA).
- C 11 on Devon at Dollar 11 Jan (DE). 12 (6M) Cambus 8 May (DAC).
- S 11 Airthrey 1 Jan to 28 on 1 Mar, 10 on 6 Dec (CJH DMB MVB). 22 on Forth-Teith, Stirling to Doune in Feb (D&B ZC); 13 on Allan Water 14 Dec (AW). 22 L.Venachar 7 Sep. In spring/summer noted L.Voil & at 7 sites in Trossachs Doune-L.Chon (DT DAC PWS DOE DJC).
- \*RUDDY DUCK *Oxyura jamaicensis* (w)  
 C Gartmorn: 2 M on 16 Jan; 12 Nov (5, max) to 27 Dec (DAC AB DT AT).
- RED KITE *Milvus milvus*  
 The RSPB/Scottish Natural Heritage re-establishment scheme continues with a max at winter roost of 31 on 19 Jan. Five broods attempted, 4 pairs raised 6Y, all wingtagged (DOE). Please try to note wing tag colours on any bird you may see, Ed).  
 Many records from Doune to Callendar, also 1 Thornhill 18 Jul & 1 BoA/Lecropt/Blairdrummond 20 Nov to 14 Dec (JS JC NB GJ CJH DMB).
- \*WHITE-TAILED EAGLE *Haliaetus albicilla*  
 S An immature (with 1998 wingtag) flying NW over the Braes of Doune 8 Mar, later seen Lochearnhead (LO). First record for the area (Ed).
- \*MARSH HARRIER *Circus aeruginosus*  
 F Imm Kinneil 17 Aug – in from NW, left S (GO).  
 C Imm M Tullibody Inch 8 Aug (DMB).  
 S F/imm at Hutchison Dam 30 May (WRB), Thornhill 7 July (JS). M Braes of Doune 31 Jul (AD).
- HEN HARRIER *Circus cyaneus* (b, w)  
 No coastal records. 6 males and 16 Ringtails noted, omitting repeated records.  
 S Singles on Carse of Stirling 31 Jan to 27 Feb and 8 Aug to 4 Nov. Also on surrounding hill ground but only 2 records Apr-Jul, Pr Gargunlocks 4 Apr & F on 18 May (SS WRB DJC DAC DOE KD AT AD RD MVB DT).
- GOSHAWK *Accipiter gentilis*  
 Pair bred in area (per DOE).  
 S 1 Airthrey 13/18 Oct (DMB). On 12 Jul a soaring bird was repeatedly dived at by a Sparrowhawk (CJH).
- SPARROWHAWK *Accipiter nisus* (B,W)  
 BBS reports 1 per 10 km in conifers and farmland. Many records throughout area, including gardens; killed Chaffinch at Doune, Collared Dove at Dunblane (& saw off cat), Woodpigeon at Stirling, feral Pigeon at Kinneil (robbed by Peregrine); chased Starlings going to roost Polmont (RD AD RJ JK JW). Few noted in midsummer when it is presumably secretive. Raised 2Y Skinflats (GO AB MA et al).
- BUZZARD *Buteo buteo* (B,W)  
 As breeding bird: widespread & increasing S, widespread C, scarce F  
 F Pr with Juv Howierigg in August – 1st proved breeding (MA). 3 Wallacebank Feb-Jul & 3 Torwood 29 May (AS AB). Pr all year at Lathallan, else around Falkirk mainly Jan-Mar & Sep-Dec, max 4 Camelon on 4 Sep (JW MA).  
 C 6 Menstrie 19 Apr. 2 AoT Devon WBS. At Tillicoultry Feb & Jul to Dec (juv heard Aug). 2 Gartmorn 12 Sep & 26 Dec. Report of nest Yetts of Muckhart (CJH AT DAC).  
 S In main breeding range to W & N, largest groups were 22 Braes of Doune 12 Sep & 17 Lecropt 2 Oct; 10 Airthrey 1 Mar, 8 BoA 4 Sep, 6 Callander 17 Mar & 6 Hutchison pond 17 Oct. 1 Balquhiderock wood 13 Jul (DOE DT DMB AT DJC WRB).

GOLDEN EAGLE *Aquila chrysaetos* (b,w)

- S 7 territories checked, 7 occupied by pairs. 5 successful reared 6Y (PSA). No records outwith highlands.

OSPREY *Pandion haliaetus*

- S 1st seen 4 Apr, last 23 Sep. Six pairs & a single F held territories of which 3 reared 7 young (DOE NB). Many records Aberfoyle-Doune; 1 Killin 18 Aug (PWS). 1 Carron Valley Res from 10 Jul to 30 Sep, 2 on 18 Sep ( DT DAC DJ RKP GJB AKM).

1998 1 at Carron Valley Res 26 May to 24 Aug (AKM RKP).

KESTREL *Falco tinnunculus* (B,W)

Difficult to make significant observations, hence greatly underrecorded. BBS shows overall as frequent as Sparrowhawk, at 1 per 10 km in farmland and urban.

- F Through year at Skinflats (GO). Pr raised 4Y Camelon (MA).  
 C 2 AoT Devon WBS (CJH). Pair with 3 juvs Dollar 11 Jul (AT).  
 S Courtship display seen Trossachs from 6 Mar (DJC). Pr+5 Juv G.Dochart 12 Jul (PWS).

MERLIN *Falco columbarius* (b?,w)

- F 1 Skinflats 7 Aug & 12 Sep (DMB MVB). 1 Kinneil 10 Oct (DT). 1 Camelon 6 Feb & 25 Oct (chased Fieldfare, MA).  
 S Several pairs in north of area, breeding suspected (DOE DT). 4 Trossachs Apr & Sep/Oct (DJC). 5 Carse of Stirling Jan/Feb & Sep-Dec (DR SS JS). 1 Airthrey 13 Apr (DMB). 1 Cromlix 24 Jan & 10 Oct (MVB).

PEREGRINE *Falco peregrinus* (B,W)

- F 12 coastal records Feb, Apr, Aug to Dec (JMO DT AB GO AS). 4 over Falkirk Jul, Oct (MA).  
 S 18 territories checked, 13 pairs & 1 single. 9 successful pairs reared 20 Y (PSA). 15 on low ground Jan-Apr & Aug-Dec. 1 over Stirling 31 May. (DOE DAC DJC DT KD SS JC RJ).

RED GROUSE *Lagopus lagopus* (B,W)

Generally under-recorded. BBS shows 6 per 10km on moorland.

- S 5 sites in Trossachs (DJC). 10 Glen Lochay 23 May. 13 Touch Hills-Earlsburn in Mar, F+8Y Jun (AT DT). Heard Thornhill, edge of Flanders Moss 8 Jul. (SS).

\*PTARMIGAN *Lagopus mutus* (b,w)

- S 8 Meall nan Tarmachan 5 Sep; 5 Ben Oighreag 21 Nov; 4 Ben Vorlich 14 Sep; droppings noted Stobinian 31 May (RAB JK).

1998 9 Ben Lomond 27 August (A.Eckershall).

BLACK GROUSE *Tetrao tetrix* (B,W)

- F 4 (3M) Carron Bridge 4 Apr (WRB).  
 S Nine lek sites totalling 53 Ms, in Trossachs except 6M Earls Hill 4 Apr; one lek disrupted by hybrid M Black Grouse/Capercaillie. Also 5 Killin 15 May, 2 North Third 5 Feb (DJC DK RJ DOE).

\*CAPERCAILLIE *Tetrao urogallus*

- S F L.Ard Forest in Jan, M Duke's Pass 28 Apr & F Invertrossachs in Jan (DOE DJC).

GREY PARTRIDGE *Perdix perdix* (B,W)

- F 23 Kinneil 16 Jan. 8 Skinflats 23 Oct & 5 Nov & 6 on 18 Dec ( GO DAC).  
 C 1 AoT on Devon WBS (CJH).  
 S 7 sites mainly on carse, max 9 Arnprior 10 Jan (DAC AD NB AT DOE)

\*QUAIL *Coturnix coturnix* (b)

- S Calling birds Thornhill (W.Moss-side) 30 May & Drip Carse 5 Jul (SS WRB).

PHEASANT *Phasianus colchicus* (B,W)

Abundant (usually by releases) on fields next to kept estates.

F Bred Skinflats –rare event (GO).

C Probably only 2 AoT on Devon WBS (approx. 1 km sq) (CJH).

WATER RAIL *Rallus aquaticus* (w)

F 1 Kinneil 16 Jan & 12 Dec. Skinflats: 1 on 23 Apr, from 3 Jul to 12 Sep, 2 ad + 3 Juv on 4 Sep, 1 on 7 Nov & 2 on 21 Dec. 1 Larbert 20 Jan & 6 Oct. 1 Falkirk (W.Mains Pond) 16 Oct & 18 Dec (GO DK AB JK DT NB MA).

C Cambus Pools: 2 on 7 Mar, from 27 Jul to 14 Nov (WRB CJH). 2 Tullibody Inch 8/21 Aug (DMB). 2 Gartmorn 12 Nov (DT AB).

S 2 Hutchison Dam 31 Jan & 28 Sep (WRB). 2 L.Watson 11 Nov (CJH).

\*SPOTTED CRAKE *Porzana porzana*

F 1 Skinflats 3 Sept (GO). Seen at the reed pools together with Water Rails and Moorhens, salient points from a full description were: size slightly smaller than Water Rail, legs greenish, bill short & stumpy, yellowish in colour; underparts finely spotted whitish from throat to upper belly.

MOORHEN *Gallinula chloropus* (B,W)

WeBS max: 277 inland in Oct (NB).

F 23 Skinflats 21 Dec (GO). 3 Prs reared 13Y around Falkirk (MA). Max on Union Canal 54 in Jan & 98 in Nov (JW JN). 29 Callendar Park 27 Dec (AA).

C Max 18 Cambus Pools 12 Sep. 1 AoT on Devon WBS (CJH); 12 Alva-Dollar in Nov (GEL DE).

S Airthrey: 16 on 20 Nov & 15 on 27 Dec (AT MK). At Killin marshes from 25 Mar (PWS).

COOT *Fulica atra* (B,W)

WeBS max: 726 inland in Nov (NB).

F 28 Callendar Park 27 Dec (AA). 32 Little Denny Res 8 Nov (NB). 3 Prs reared 5Y (MA).

C 3 Prs Cambus Pools 7 Mar (WRB). 331 Gartmorn Dam 22 Oct, only 50 on 27 Dec (AT).

S Airthrey: 51 on 10 Jan, 59 on 27 Dec (MK). 14 L.Watson 19 Jan & 13 Dec (CJH). 233 Lake of Menteith 26 Jan, 218 on 10 Dec. 74 Gart 9 Dec (NB). 8 ad + 15Y Callander 26 Jun (DJC).

OYSTERCATCHER *Haematopus ostralegus* (B,W)

238 on Forth Estuary in Feb & 121 in Dec (DMB).

Apart from 2 Gart 27 Jan, spring return inland in February: Airthrey 1st, Craigforth 13th, Kippen Muir & L.Tubhair 20th, Stirling 28th (DJC DMB CJH DAC DT).

F 110 Blackness 31 Jan; 100 Kinneil 22 Jul, bird with badly crossed bill 5 Apr. 100 Skinflats 9 Aug, 1 complete albino (MA DT GO AB).

C 10 AoT Devon WBS, 7 in 1998 (CJH). 121 Tullibody Inch 21 Feb (DMB).

S 370 Craigforth 27 Feb, 341 Blairdrummond 23 Mar & 200 Gart on 31st (MVB PWS NB).

\*AVOCET *Recurvirostra avosetta*

F 1 Skinflats 27 May, disturbed by gunner (GO).

RINGED PLOVER *Charadrius hiaticula* (b,W)

20 Forth Estuary in Feb & 45 in Dec (DMB).

F 27 Kinneil 7 Jan; 15 on 12 Sep & 35 on 18 Dec. Spring passage at Skinflats from 27 May, max 20 on 4 Jun (MA DMB GO).

S 4 Cambusmore 21 Feb (DOE). In March at Lower Earlsburn Res, Touch Res, Buckieburn Res, Barbush GP (AT NB WRB). 4 Breachlach Quarry 7 Jun (PWS).

\*DOTTEREL *Charadrius morinellus*

1998 1 Ben Lomond 9 May (per A Eckershall)

GOLDEN PLOVER *Pluvialis apricaria* (B,W)

The small number of likely breeding records may indicate a reduction in range compared with twenty years ago. Inland passage noted in spring. Numbers high by estuary in late autumn.

F 123 Kinneil 23 Jan. Blackness: 418 on 31 Jan; 67 on 25 Jul, 860 on 15 Nov (MA AS). Skinflats: 1st of autumn 18 on 1 Aug, 510 on 24 Oct, 270 on 21 Nov (GO MVB). 190 Larbert 21 Mar (MA).

S 150 Thornhill Carse 20 Feb (DAC). 5 prs in 1 sq km Dochart hills 12 Jul (AT). 1 L.Katrine 16 Jun (DOE).

GREY PLOVER *Pluvialis squatarola* (W)

F Skinflats: 1st of autumn 1 on 14 Aug, max 49 on 24 Oct (GO MVB).

LAPWING *Vanellus vanellus* (B,W)

659 on Forth Estuary in Feb & 2820 in Oct (DMB).

F 233 Bo'ness 4 Sep (AS). Skinflats: 55 on 3 Jul to 200 on 2 Aug, 560 on 24 Oct & 5 Dec. Kinneil: 2390 on 1 Jan & 3100 on 26th; 100 on 8 Aug, 500 on 26 Sep, 494 on 24 Oct. 454 Higgins Neuk 15 Sep. (GO AB MVB CKM DT MA DSF).

C 21 AoT Devon WBS; 6 AoT Blackdevonmouth. 256 Alva 5 Oct. 200 Tullibody Inch 16 Jul, 500 on 19 Aug, 320 on 6 Nov (AT CJH WRB).

S Spring return 280 L.Watson 18 Feb & 250 Blairdrummond carse on 22nd; 250 Cambusmore 19 Aug (PWS). 220 Lecropt 13 Nov & 310 on 12 Dec (NB RD DT AD). Nests at Ashfield and Banknock ploughed in (WRB).

KNOT *Calidris canutus* (W)

4000 Forth Estuary in Jan & 2111 in Dec (DMB).

F 600 Bo'ness 21 Feb (MA). Kinneil: 4300 on 1 Jan; 1 on 18 Jul, 65 on 5 Sep, 150 on 3 Oct & 4000 on 21 Nov (MVB DT). 7 Skinflats 1 Aug & 10 on 9th, 43 on 13 Sep (GO AB).

\*SANDERLING *Calidris alba* (p)

F 4 Skinflats on 28 May & 1 on 29th (GO).

\*LITTLE STINT *Calidris minuta* (p)

F 1 Skinflats 1 Aug. 1 Kinneil 25 Jul, 3 on 25 Sep & 1 on 23 Oct (GO CJH). 1 Kinneil 23/34 Jan, 8 & 12/13 Feb; seen with Dunlin (MA GO RS JK) – *presumably the bird seen in Dec 98, Ed.*

CURLEW SANDPIPER *Calidris ferruginea* (p)

F 1st Kinneil 1 (adult) on 14 Aug, then Juvs from 22 Aug to 24 Oct, max 18 Skinflats on 28 Aug & 17 Kinneil on 11 Sep (GO DT AB DMB MVB DF AD DAC). Area Summary (half monthly)

Aug	Sep	Oct
1 19	28 13	4 1

DUNLIN *Calidris alpina* (b?,W)

8150 Forth Estuary in Jan & 6808 in Dec (DMB).

F Kinneil: 4000 on 6 Feb, 200 on 10 Apr; 35 on 11 Jul, 250 on 26 Sep, 1000 on 10 Oct, 2000 on 20 Nov & 5000 on 5 Dec. Skinflats: 2450 on 14 Feb, 126 on 25 May: 1st of autumn 103 on 17 Jul, 1620 on 24 Oct & 2115 on 5 Dec (CJH DT CKM MVB GO).

S Pr Ben Gullipen 9 May (DK) - ? possibly nesting, Ed.

RUFF *Philomachus pugnax* (p)

F Skinflats: M, partial BP 8 May (MA). 1st of autumn 7 Aug, 3 on 11 Sep, singles to 25th. Kinneil: 1 on 7 Aug, max 10 on 26 Sep, last 1 on 7 Oct (GO DMB AB DT AB JF DK).

Area Summary (half monthly)

Aug	Sep	Oct
2 1	4 11	1 0

JACK SNIFE *Limnocyptes minimus* (w)

- F 1 at two sites by Falkirk 2 & 3 Jan. 2 Kinneil 16 Jan & 1 on 7 Feb; 2 on 23 Oct, 4 on 8 Nov & 5 on 21st. 2 Grangemouth 24 Oct & 3 on 5 Dec 1 Skinflats 21 Nov. (MA GO DT DMB).
- C 1 by Devon at Alva 8 Jan & 5 Feb, 3 on 9 Oct (GEL). 1 Blackdevonmouth Marshes 9 & 24 Feb (CJH).

SNIPE *Gallinago gallinago* (B,W)

Probably under-recorded in breeding season but may have decreased (Ed).

- F Kinneil 14 on 16 Jan; from 7 Aug, max 54 on 8 Nov. 35 Grangemouth 5 Dec (GO DT DMB). 26 West Mains Pond 2 Mar, 22 on 27 Nov. 27 Bonnybridge 4 Dec (MA).
- C 16 Alloa Inch 24 Oct (MVB). 14 Gartmorn Dam 13 Nov (DAC).
- S 18 on upper Forth in Jan & Mar (TY SE RC). 15 Cambuskenneth 26 Mar (AT). In Apr-Jun at Inverlochlarig, Balquhidder, Thornhill, Cromlix Moor, Cringate Muir (DT SS WRB). 18 Thornhill 25 Nov (NB).

WOODCOCK *Scolopax rusticola* (B,W)

Under-recorded (Ed).

- S/F Breeding season records from: L.Chon, Glen Finglas, Lendrick, Invertrossachs, Drumore, Dunblane (DOE DT SS DJC MVB).

BLACK-TAILED GODWIT *Limosa limosa* (W)

- F The max site count was 129 Kinneil 1 Jan, however the whole estuary WEBS count on 14 Feb found 224. Numbers decreased in early May and there were very few until late August, the autumn plateau was reached by early October with a max of 98 Kinneil 8 Nov. It seems that this year the birds were more likely to be in several groups and often moved between Skinflats and Kinneil, thus no reliable area total can be calculated. No records from other sites. (GO AB DT DMB et al)

Site Summary (half monthly)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Knnl	129 71	65 46	72 52	90 66	10 0	0 0	6 10	16 38	37 0	45 60	98 51	80 78
Skn	65 40	71 68	70 36	0 52	24 5	0 0	3 5	1 4	31 20	35 21	6 20	0 0

BAR-TAILED GODWIT *Limosa lapponica* (W)

282 Forth Estuary in Feb & 92 in Dec (DMB).

- F Kinneil: 200 on 7 Feb, last 17 on 23 Apr; 1 on 1 Jul, 135 on 21 Nov (DT GO). 1st of autumn 5 Skinflats 12 Sep, 20 on 23rd (MVB).
- C 1 Cambus 6 Nov (WRB).

WHIMBREL *Numenius phaeopus* (p)

- F In spring from 6 May (when max 8 Skinflats) to 8 Jun. 1st of autumn, 1 on 17 Jul, last 25 Sep (MA GO DT AB et al).
- C 1 Tullibody Inch 21 Aug (DMB).

Area Summary (half monthly)

May	Jun	Jul	Aug	Sep
8 1	1 0	0 5	2 5	4 1

CURLEW *Numenius arquata* (B,W)

The March return is clear in inland records, and early return to estuary (Ed).

876 on Forth estuary in Feb & 713 in Dec (DMB).

- F 484 Skinflats 18 Feb, still 57 on 18 Apr; 442 on 5 Dec. Kinneil: 385 on 1 Jul & 650 on 25th. 85 Higgins Neuk 15 Sep. (MVB GO DT DF). Inland in winter: 88 Polmont 21 Feb (JW).

- C 3 AoT Devon WBS. 120 Kennetpans 10 Jan; 300 Tullibody Inch 21 Feb (CJH DF DMB).
- S 200 Forthbank 27 Feb (AT). 31 Gart on 28 Feb, 38 Kippen Muir 10 Mar, also in Mar at Touch Res, G.Finglas (DAC DJC). Still 60 Lecropt 4/10 Apr (MVB DT). 3 prs in BBS square at Cromlix (WRB).
- SPOTTED REDSHANK *Tringa erythropus* (p)
- F 1 Skinflats 23 Mar, 1 on 28 Aug & 12/13 Sep. Kinneil: 1 from 7 Jan to May; from 19 Sep to 20 Nov, max 3 on 3 Oct (MA GO MVB AB DMB DT WRB).
- C 2 Tullibody Inch 12 Sep & 1 on 14th & 19th. 1 Kennetpans 24 Oct (RB DMB CJH).  
Area Total (half monthly)
- | Jan | Feb | Mar | Apr | May | - | Aug | Sep | Oct | Nov |
|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|
| 1 1 | 1 1 | 1 2 | 1 1 | 1 0 |   | 0 1 | 3 2 | 3 3 | 0 1 |
- REDSHANK *Tringa totanus* (B,W)
- 2161 Forth Estuary in Feb & 2002 on Oct (DMB).  
Spring return in March– Gart on 14th, Kippen Muir on 19th, Ashfield on 20th, R.Devon & upper Forth on 21st, L.Venachar on 30th (DAC WRB GEL RC DOE).
- F 100 Blackness 11 Sep, 174 Bo'ness 20 Oct (AS). Skinflats: 625 on 14 Feb; 150 on 9 Aug, 250 on 8 Aug, 530 on 12 Sep & 605 on 24 Oct. Kinneil: 600 on 27 Mar & 440 on 3 Apr; 200 on 11 Jul, 850 on 8 Aug & 1160 on 22nd (DT AB CJH JMO CKM DMB).
- C 2 AoT Devon WBS (CJH).
- GREENSHANK *Tringa nebularia* (p)
- F 1 Skinflats 26 Jun, from 6 Aug to 10 Oct (max 3); 1 from 5 Nov to 18 Dec (2 on 21 Nov). Kinneil: from 22 Jul to 8 Nov (max 5 in Sep) (AB GO JF AS DAC DT).
- C 1 Blackdevonmouth Marshes 14 & 27 Aug. 1 Tullibody Inch on 8 Aug, 2 on 19/21st (CJH DMB).
- S 1 L.nan Geadas 15 May (DOE).  
Area Summary (half monthly)
- | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|
| 0 2 | 5 9 | 8 7 | 2 2 | 2 2 | 0 1 |
- GREEN SANDPIPER *Tringa ochropus* (p)
- F 1 Camelon 5 & 25 Feb. 1 Grangemouth (R.Avon) 3 to 24 Apr. Skinflats: 1 on 16 Apr; from 14 Aug to 26 Sep, max 3 on 4 Sep. 1 on Carron (Larbert) 6 Sep. 1 Lathallan 10 Oct (MA JW GO DT AB JK).
- C 1 Blackdevonmouth Marshes 22 Jul (CJH).
- COMMON SANDPIPER *Tringa hypoleucos* (B)
- Spring return in April: Grangemouth 15th, Inverlochlarig 17th, L.Tay on 19th, Kinneil on 24th, Blackness & R.Devon 25th, L.Venachar & G.Finglas 27th (JW DOE PWS GO MA CJH DJC).
- F Kinneil & Skinflats: mainly 10 Jul to 8 Aug, max 17 on 18 Jul & late birds on 10 Sep (2), 3 Oct (DT GO MA).
- C 5 AoT on Devon WBS (3 in 1998). At Blackdevonmouth from 10 Jul, 8 Cambus 31 Jul (CJH).  
Summer AoTs at L.Venachar, G.Finglas (DJC). Late bird Touch Res 18 Sep (AT).  
Estuary autumn totals :
- | Jul   | Aug  | Sep | Oct |
|-------|------|-----|-----|
| 10 28 | 10 5 | 4 0 | 1 0 |
- TURNSTONE *Arenaria interpres* (W)
- F Blackness: Jan to 11 Apr (20); 2 on 8 Aug & from 7 Nov (max 23) to 25 Dec (MA). 11 Carriden 17 Jan (DMB). 7 singles at Skinflats through year (GO MVB).
- \*ARCTIC SKUA *Stercorarius parasiticus* (p)
- F Kinneil: 3 on 5 & 17 Sep, 8 on 19th (DT AB).

\*GREAT SKUA *Stercorarius skua* (p)

F Kinneil: 1 on 17 Aug, attacking injured Herring Gull, 1 on 17 Sep & 2 on 19th (AB DT).

\*LITTLE GULL *Larus minutus* (p).

F 1 (1st summer) Skinflats 17 Jun (MA). 3 imm Kinneil 5 Sep (DT).

\*SABINE'S GULL *Larus sabini*

F An adult in summer plumage flew E off Blackness on 23 Jun, then close to Fife shore. Record submitted to & accepted by Fife Recorder (GO RS). 2nd record for area (Ed).

BLACK-HEADED GULL *Larus ridibundus* (B,W)

F 1st juv Skinflats 26 Jun (GO).

300 at Ashfield colony 28 Mar, 120 Y reared (WRB). 30 prs L.nan Geadas 15 May (DOE). 40 juv on Carron Valley Res island 10 Jul (DT). 434 Blairdrummond 19 Feb (NB). 80 flycatching BoA 28 Aug (CJH).

COMMON GULL *Larus canus* (B,W)

S 500 Cambusmore GP 31 Mar & 300 on 21 Sep (PWS NB). 50 Prs Breachlaich Dam 7 Jun (PWS). 250 L.Venachar roost 26 Sep (DJC).

LESSER BLACK-BACKED GULL *Larus fuscus* (b,S)

Few mid-winter records, as usual; increasing nest attempts on roofs; more stayed late into autumn.

F 1 Cambuskenneth on 10 Jan, 1 Skinflats on 6th & 30th, 1 Bonnybridge on 30th (AT AA GO MA). 1 Fallin 12 Dec (DJ). Nested on roofs: Camelon pr + 2Y on 17 Jun; Carron works, 15 prs + 32 Y on 25 Jun (MA). 100 (90 Juv) Skinflats 20 Aug (AB).

C 69 AoT on Menstrie bond roofs 19 Apr (CJH).

S 1 Lecropt 13 Feb (DT). 1 Killin 10 Jan. 2 Pr Cambusmore GP 25 Jun (PWS). 2 Carron Valley Res on 27 Dec (DAC).

HERRING GULL *Larus argentatus* (b,S,W)

F 3000 Kinneil 25 Jan (CJH).

C 30 AoT Menstrie bond roofs 19 Apr. 6400 Cambus roost flight on 16 Jan & 1040 on 19 Aug (CJH).

\*ICELAND GULL *Larus glaucooides*

F 1 2nd winter Kinneil 27 Dec (GO).

C 1 1st winter Alloa tip 1 Jul (DOE).

\*GLAUCOUS GULL *Larus hyperboreus*

F 1 imm Kinneil 6 Feb (CJH).

GREAT BLACK-BACKED GULL *Larus marinus* (S,W)

Highly under-reported (Ed).

F 25 Skinflats 5 May (MA).

KITTIWAKE *Rissa tridactyla* (P,w)

F Kinneil: 1700 in 4 hr -> W on 4 Mar, 335 in 1 hr on 21st - birds spiralled high over Grangemouth (MA); 50 -> W 27 May & 150 on 19 Sep (DT).

SANDWICH TERN *Sterna sandoicensis* (P)

F 12 Blackness 25 Apr; then from 26 Jun, max 121 on 15 Aug (MA AS AB). 62 Skinflats on 4 Sep (GO). 184 Kincardine bridge 4 Sep & 220 on 12th (DF MVB). 1998 5 Carron Valley Res 31 Aug (RKP).

COMMON TERN *Sterna hirundo* (B)

F 1st, 25 Kinneil 29 Apr, still 20 on 19 Sep (DT). 3 Skinflats 1 May, 34 on 22nd (GO AB). 109 pairs Grangemouth Docks 6 Jun (DMB).

S 2 Carron Valley Res 4 Jun (DT).

\*ARCTIC TERN *Sterna parasidaea*

F 1 Skinflats 22 May & 3 Jul, 2 Kinneil 10 Jun & 1 on 27 Jun & 21 Jul (GO MA JF CKM).

\*LITTLE TERN *Sterna albifrons*

F 1 Skinflats 2 Sep (GO).

\*GUILLEMOT *Uria aalge* (W)

F 23 Blackness 4 Mar (MA).

FERAL PIGEON *Columba livia* (B,W)

F Large numbers at Kinneil, 500 on 1 and 25 Jan, 350 on 10th, 300 on 3 Apr (CJH MVB JMO).

S Pr nesting under bypass bridge, Barbush (WRB).

STOCK DOVE *Columba oenas* (B,W)

Widespread in small numbers, surely much overlooked. BBS records only in farmland, 1 per 10 km (as 6 year mean).

F Maximum of 19 Skinflats 26 Jun, 17 on 3 Jul (GO AB). 32 Kinneil 14 Feb, 51 on 21 Mar (MA, GO). 40 Larbert 5 Feb, 8 Lathallan 6 Mar, 52 Denny 12 Dec (MA JW).

C Probably 1 AoT on Devon WBS (CJH).

S 52 Lecropt 3 Feb (DOE)

WOODPIGEON *Columba palumbus* (B,W)

Greatly underreported. BBS shows 81 per 10 km on farmland, 4x more than urban or conifer habitats; no general trend over last 6 years (NB).

S 2000 Lecropt 13 Nov (DT)

COLLARED DOVE *Streptopelia decaocto* (B,W)

Greatly under-reported, but scarce away from suburbs and large farms (Ed)

S 1-2 Killin 8 Jan to 16 Jun, 37 Blairdrummond 29 Jul, 40 Arnprior 13 Sep (PWS DJC DOE).

CUCKOO *Cuculus canorus* (B)

First records in April at Achray Forest 27th, Kippen 29th, Monachyle Glen 30th (DJC DAC AD).

F 1m High Bonnybridge 16 May, grey-phase juv. Camelon 4 Sep (MA).

C 2M Devon WBS 9 May – 1st in 5 years (CJH). 1 calling Harviestoun 10 May (AT).

S Possibly bred W. Moss-side (SS). Up to 4 calling Achray Forest–Glen Casaig 27-29 Apr, 2 Loch Doine & 1 W.Flanders Moss on 30th; 1 Killin 3 May, 1 Kippen Muir 9 May, 2 Cromlix 30 May, 1 Cocksburn 10 Jun (DA DJC WRB PWS DT).

BARN OWL *Tyto alba* (b,w)

Possibly bred north of Doune, apparent increase west of Stirling.

F 1 on M9 near Larbert 7 Mar (JW).

S Singles Balfroon, Blairdrummond, 2 sites Braes of Doune, Doune, Keir, Lecropt, Drip, Cambusbarron-Touch, Thornhill (WRB DAC DJC RD SD DOE RY KD SS). 1 drowned Braes of Doune 8 Sep, 1 dead on M9 W of Stirling 13 Dec (KD DK).

TAWNY OWL *Strix aluco* (B,W)

Moderate success only (1-2Y per pr) in nestbox areas (HR).

F 3 Torwood 3 May (AB).

C Bred (2Y) at Harviestoun (AT).

S Reported Arnprior-Buchlyvie, Callander-L.Venachar, BoA, Braes of Doune (3 sites), South Flanders, Broomridge- only once (DAC DJC KD AT DT TY).

LONG-EARED OWL *Asio otus* (b,w)

F Skinflats from 6 Mar to 15 May (MA GO).

SHORT-EARED OWL *Asio flammeus* (b,W)

Similar pattern to 1998, remains very local, mainly on Gargunnoch Hills.

- F 1 Skinflats 20 Aug-7 Sep, now rare there (GO AB).  
 S 1 Buckieburn Res 2 Feb & 14 Mar, 3 Flanders Moss 3 Mar, 1Earl's Hill 13 Mar, 2 Braeleny 22 Apr, 2-3 Touchadam Muir 18 May, 3 Lossburn Res 20 Feb, 8 Apr, 2 on 4 Dec. 1 North Third Res 4 Nov, 1 L.Coulter 4 Dec (BU WRB DJC DOE AT DT BO).
- SWIFT *Apus apus* (B)  
 Numbers appear to be low, largest count only 40 BoA 31 Jul. First records in May: 3 Airthrey on 7th, 1 Doune & 8 Hill of Row on 8th, 7 Callander on 10th, 3 Falkirk 11th, Killin 13th; Last 1 BoA 18 Aug, 1 Skinflats 1 Sep (DMB DOE DT DJC PWS CJH).  
 S Present over Stirling 10 May -13 Aug, 16 Dunblane 30 Jul (NB DT).
- \*NIGHTJAR *Caprimulgus caprimulgus* (b?)  
 S 1 churring Dukes Pass 25 Jun (KG).
- KINGFISHER *Alcedo atthis* (b,w)  
 Appears to be maintaining good numbers throughout.  
 F Pr nested on Avon, Grangemouth. Reported Carron, Bonny Water, Blackness, Whitecross (MA JW). 1 Skinflats 7 Mar, 10 Nov, singles Kinneil 9 Jan, 7 Oct, 5-30 Dec (GO DT DK DMB).  
 C Reported R Devon (Cambus to E.of Tillicoultry), Gartmorn Dam (AT GEL PD DE).  
 S R Forth (E Frew, Allan mouth), Airthrey, L Doine, Cromlix (DR DMB NB DT), 1 West Moss-side 27 Oct. 1 fished 'Riverhouse Pond' (Craigforth) 22-28 Feb (SS TY).
- GREEN WOODPECKER *Picus viridis* (B,W)  
 Increase in reports, may give fuller picture of range, apparently absent Falkirk.  
 C Singles Harviestoun Wood, Dollar Glen, Ochils Woodland Park (AET).  
 S 1 Logie 27 Mar, 1 Plean CP 4 Apr, one feeding on ants BoA 1 Aug, also Achray Forest, L.Drunkie, Invertrossachs, Cambusmore, Gartur, Glenny, Kilbryde (WRB AB DOE SD DJC).
- GREAT SPOTTED WOODPECKER *Dendrocopus major* (B,W)  
 Wide spread of records, giving clearer picture of distribution, especially in Stirling.  
 F F with Y Dorrator 20 Jun (MA). 1 in open country Skinflats 18 Dec, also at Camelon, Carron Dams, Larbert, Hills of Dunipace (DAC AB NB MA).  
 C M Harviestoun 31 May (AT).  
 S Juv at feeder in Dunblane garden 6 Sep (DSK). Large number of Trossachs reports (8 sites), also Plean CP, Carron Valley Res, Cambusmore, Doune Ponds, Thornhill, Arnprior, Killin (NB AB AD DAC DJC JS PWS).
- SKYLARK *Alauda arvensis* (B,W)  
 BBS shows 36 on moorland, 13 in conifers, 5 on farmland and none in 'Urban'. Singing Kippen Muir 11 Feb & Alva on 21st, Skinflats from 3 Mar (NB AB).  
 C 11 AoT on Devon WBS, as 1998. 4 prs Blackdevonmouth 2 Apr (CJH).  
 S 160 Lecropt 27 Feb, 360 on 4 Dec. 380 Drip Carse 5 Dec (MVB). 300 Thornhill Carse 4 Dec (DAC).
- SAND MARTIN *Riparia riparia* (B)  
 1st records in March: 10 Doune on 27th, 2 Cambus & 3 Ashfield on 28th, 2 Camelon on 30th, 8 Dunblane & 3 Lake of Menteith on 31st; in April: 75 Cambusmore on 5th & 30 Lake of Menteith on 6th. Last 6 Kinneil 10 Oct (DT WRB MA DOE).  
 S 500 Killin 14/17 Apr (PWS). 415 nests Cambusmore & 13 nests G.Finglas 7 Jun (DJC).

SWALLOW *Hirundo rustica* (B)

1st records in April: 1 Kinneil 3rd, 8 Lake of Menteith on 6th, 1 Carron Bridge on 7th, widespread arrival 10-14th. (JMO DOE MA et al). Last, 2 Buchlyvie 28 Sep, 2 Kinbuck 2 Oct & 6 Touch 9 Oct (DAC AT).

F 100 Kinneil 13 Sep (AB).

C 450 Tullibody Inch 19 Aug & 160 on 14 Sep, 150 Clackmannan 12 Sep (CJH).

HOUSE MARTIN *Delichon urbica* (B)

1st records: Doune on 10 Apr, Gart on 11th, Airthrey on 20th, widespread from 25th. Early departure, last 4 Ward Toll 25 Oct (DT DJC DMB). BBS usually shows Swallow is four times as common, but this year House Martins were only 15% less, at 17 per 10 km.

S 80 Ashfield (12 nests) 30 Jul (WRB). 75 Airthrey 28 Aug, 76 L.Venachar 7 Sep (DMB DJC).

TREE PIPIT *Anthus trivialis* (B)

BBS shows 13 per 10 km in conifers, 1 on farmland. Otherwise greatly underreported.

1st records: Loch Ard 17 Apr & Lanrick on 18th (DOE DT).

MEADOW PIPIT *Anthus pratensis* (B,W) BBS shows 31 per 10 km in moor/conifer edge, 117 on moorland, & 3 on farmland.

Relatively scarce midwinter: 15 Higgins Neuk 10 Jan, 13 Lendrick on 30th, 7 Blackdevonmouth on 31st; however, still 40 Kinneil 5 Dec & 25 Blairlogie on 19th. Spring passage: 60 -> W Venachar 24 Feb, 109 Blackdevonmouth 26 Mar, arrival Killin 25 Mar, none on lower Devon after 7 Apr. (DF DJC CJH DT DJC PWS)

F Singing Kinneil 18 Apr (AB).

S 130 G.Casaig 6 Sep & 70 G.Buckie on 12th (DJC DT).

\*ROCK PIPIT *Anthus petrosus*

F 1 Airth shore 3 Jan (CJH).

GREY WAGTAIL *Motacilla cinerea* (B,w)

11 January records from 7 sites (5 on the Devon, Tillicoultry-Menstrie) and scarcer after mid November (except for 7 on upper Forth on 29th), 12 in Dec from 9 sites. Widespread records from early Feb to early Mar suggest spring return, 1st Killin 9 Mar.

Many traditional sites reoccupied W.Stirling (HR). Summer records at 7 sites Trossachs (DJC et al). Family parties on R.Avon at Grangemouth, Union & Forth-Clyde canals (JW MA). Juvs on lower Devon from 18 May (CJH).

PIED WAGTAIL *Motacilla alba* (B, w)

Noted at 4 sites Jan (DAC). BBS shows 7 in Farmland & 6 in "urban".

F 30 Kinneil 9 Aug (AB). White Wagtails M.a.alba : 14 Skinflats 29 Apr (GO). 2 Kinneil 25 Apr & 1 on 8 May (MA).

C 19 Blackdevonmouth 26 Mar. 2 AoT on Devon WBS, 1 in 1998 (CJH).

S 17 Stirling 27 Feb (AT). 10 Lecropt 17 Dec (CJH).

DIPPER *Cinclus cinclus* (B,W).

F 1 on Avon at Grangemouth 11 April (JW) – seems late for wintering bird, Ed.

C 12 on Devon, Tillicoultry-Dollar, 11 Jan & 10 Feb, 21 on 22 Nov (DE). 4 (wintering) on Devon below Menstrie 23 Dec (KW).

S Very good year W.Stirling, several nests had two successful clutches (HR). Nest building in Gargunnocks 28 Mar (DAC).

WREN *Troglodytes troglodytes* (B,W)

Under-recorded (Ed). BBS shows 38 per 10 Km in conifers, 23 on farmland, 23 in 'Urban' & 2 on moorland.

C 20 AoT on 5 Km of lower Devon, 16 in 1998 (CJH).

HEDGE SPARROW *Accentor modularis* (B,W)

Under-recorded (Ed). BBS shows 17 per 10 Km in 'Urban', 5 in conifers & 4 in farmland.

C 5 AoT on 5 Km of lower Devon, 7 in 1998 (CJH).

ROBIN *Erithacus rubecula* (B,W)

Under-recorded (Ed). BBS shows 27 per 10 km in conifers, 17 on farmland & 15 in 'Urban'.

C 4 AoT on 5 Km of lower Devon, 6 in 1998 (CJH). Fledglings from 11 Jun (AT).

REDSTART *Phoenicurus phoenicurus* (B)

1st of spring in April: Balquhiddy on 17th, Lake of Menteith on 24th & Aberfoyle on 30th (DAC RAB DOE).

S 23% fewer at Trossachs colony, 36 broods produced 158 Y (HR).

WHINCHAT *Saxicola rubetra* (B)

BBS shows 3 per 10 Km on moorland & no other records.

F F+Juv Drum 11 Jul (MA). Autumn migrants at Skinflats 22 Aug to 5 Sep (AB).

S 1 Inverlochlarig 30 Apr. Summer records from 5 sites (DT WRB). 1Touch 9 Oct (AT)

STONECHAT *Saxicola torquata* (b,w)

BBS shows 1 per 10 Km on moorland & no other records

F 4 Skinflats 30 Sep (AB). 1 Kinneil 11 Jul & 12 Dec (DT GO).

C 1 Cambus 10 Dec (CJH).

S 3 (1M) Cocksburn Res 11 Jan. In breeding season noted at 11 sites in Gargunnocks, Balquhiddy & L.Arklet to BoA. In autumn at 6 sites, 2 extra to summer. Wintered Thornhill, G Finglas, Callander (DT DAC AD DJC AT DJC WRB DOE NB KD JK SS).

WHEATEAR *Oenanthe oenanthe* (B)

BBS shows 5 per 10 km, only on moorland.

3 M Gargunnocks 28 Mar, 1 Thornhill 3 Apr, Earlsburn on 4th, Buckieburn on 7th, then widespread; on estuary & Thornhill to 11 May. Autumn migrants on estuary 16 Jul to 9 Sep (DAC SS DT WRB AT DF).

RING OUSEL *Turdus torquatus* (b)

S In Gargunnocks, M Lees Hill 28 Mar, prs at Stronend & Double Crags 24 Apr (DAC JK). 1 Monachyle Glen 10 Apr & 3 on 2 Jun (DOE). 3M Rhuveag 16 May. F lower G.Lochay 23 May (DT). M singing Stobinian (at 900m) 31 May (WRB).

BLACKBIRD *Turdus merula* (B,W)

BBS shows 116 per 10 km in 'Urban' & 35 on farmland.

F 11 Skinflats 8 Feb (MA) - ? early spring passage, Ed.

C 13 AoT on 5 Km of lower Devon, 13 in 1998 (CJH).

S Fledged Juvs from 5 Jun at Tillicultry (AT).

FIELDFARE *Turdus pilaris* (W)

Spring departure meagre, 75 Camelon 30 Mar, 120 Auchenbowie 7 Apr, last 260 Ashfield 18 Apr (MA WRB MVB).

Autumn arrival started on 7 Oct at Airthrey and 10th Oct on Braes of Doune, 1st large influx was around Killin on 21 Oct, then 900 Kinbuck and 700 Lecropt on 24th. (DMB DOE PWS MVB).

F 655 Skinflats 21 Nov & 125 Camelon on 28th (AS MA).

S 2000 Thornhill Carse 6 Nov (DT), later numbers less, 500 Blairdrummond carse 5 Dec & 100 Arnprior on 4th (MVB DAC).

SONG THRUSH *Turdus philomelos* (B,W)

BBS shows 9 per 10 km in 13 'Urban', 9 in farmland & 1 in conifers.

Few in January - 1 Larbert, 1 Skinflats, 1 Stirling (MA AT). Song noted from mid

- Feb (MA AT). 10 Buchlyvie on 21 Feb represent spring arrival, but not noted Killin till 25 Mar (DAC PWS).
- C 3 AoT in 5 Km lower Devon, 3 in 1998 (CJH).
- REDWING *Turdus iliacus* (W)  
1st of autumn 1 Camelon 2 Oct, 5 Airthrey on 3rd, 15 Carronshore on 10th. Widespread from 16 Oct but sole large party was 200 Kinbuck on 24th. Max in November, 50 Skinflats on 21st. (MA DMB AB PWS MVB AS).
- C 50 Cambus 7 Mar (WRB).
- S 35 BoA 23 Jan (AD).
- MISTLE THRUSH *Turdus viscivorus* (B,W)  
BBS shows 2 per 10 km in conifers & 1 on farmland.
- F 4 Skinflats 14 Oct with Redwings (AB).
- C 9 Blairlogie 19 Dec (CJH).
- S 1 AoT Plean CP 4 Apr (AB). Around Bridge of Allan 15 on 8 Aug, 25 on 10 Sep, 11 on 2 Oct (AT). 10 Ashfield 16 Oct with Fieldfares (WRB).
- GRASSHOPPER WARBLER *Locustella naevia* (b)  
F Singing at Skinflats from 24 Apr to 2 Aug, max 3 on 5/6 May (GO AB MA). Singing birds at Castlecary 9 May & Forth-Clyde Canal on 15th (MA).
- C 1 Devon WBS 27 May & 1 Jun (CJH)
- S 1 Flanders Moss 18 Apr & 1 Thornhill on 30th. 1 Lanrick 11 May. 1 Carron Valley Res 27 Jul (DOE SS DT DAC).
- SEDGE WARBLER *Acrocephalus schoenobaenus* (B)  
1st records May: on 1st at Skinflats & Ashfield, 4th at Lake of Menteith (DAC WRB DOE). BBS shows drop of 18% compared with 1998.
- C 44 AoT on Devon WBS, 50 in 1998; 70% of birds arrived by 9 May (CJH).
- S 6M Blairdrummond 20 May, 2 prs W.Moss-side (DOE SS).
- WHITETHROAT *Sylvia communis* (B)  
BBS shows drop of 53% compared with 1998.  
1st records in April: 24th Skinflats & 30th Doune; May 1st at Lanrick & Invertrossachs (GO DOE DT RAB).
- C 3 AoT on Devon WBS (9 in 1998) (CJH).
- SWP 4 AoT Dunblane 23 May (WRB). 5 AoT Doune (Inverardoch) 7 Jun (DOE).
- GARDEN WARBLER *Sylvia borin* (B)  
1st records in May: Lanrick on 3rd, Camelon, Polmont & R.Devon on 9th (DT MA JW CJH).
- C 6 AoT Devon WBS, 8 in 1998; all arrived by 18 May (CJH).
- S 4 AoT Ashfield-Dunblane in May (WRB).
- BLACKCAP *Sylvia atricapilla* (B)  
BBS shows drop of 36% compared with 1998.  
Winter records: In Jan: M BoA on 1st, Denny on 16th, F Callander 9th to 29th then through Feb & Mar probably to 8 Apr; M Doune 25 Feb. F Dunblane from 25 Dec 98 to 2 Mar, F Polmont on 2 Dec. Often at bird tables, ate apple, nuts, bread & fat. 1st of spring, Ms Polmont 11 Apr & Cambus on 13th, Skinflats & BoA on 1 May. Last Stirling 20 Sep. (many obs).
- WOOD WARBLER *Phylloscopus sibilatrix* (B)  
Underrecorded  
1st records Aberfoyle & G.Finglas 29 Apr, BoA on 1 May (DAC DOE DJC WRB).
- CHIFFCHAFF *Phylloscopus collybita* (B)  
1st records in March: Blairlogie & Tillicoultry on 20th, Plean on 28th; in April: Bonnybridge on 2nd, Grangemouth on 3rd. (DAC DT GO MA).
- F 1 Kinneil 16 Jan & 1 Skinflats on 31st (GO MA). 5 AoT Polmont Woods 11 Apr (JW).

WILLOW WARBLER *Phylloscopus trochilus* (B)

BBS shows 32 per 10 km in conifers, 20 in farmland, 39 in 'Urban'; 20% down on 1998 (NB).

1st records in April: Skinflats on 3rd, R.Devon on 7th, Doune & Plean CP on 8th, Blairlogie on 10th, Doune on 11th, widespread by 17th (GO CJH DOE DT DAC).

C 15 AoT on 5Km of lower Devon, 17 in 1997. 67% in by 25 Apr (CJH).

GOLDCREST *Regulus regulus* (B,W)

BBS shows 8 per 10 km in conifers, 2 on farmland (NB).

Widespread in small numbers, max 14 Wallacebank Wood (Falkirk) 27 Feb (AS).

F Bred Skinflats, max 8 on 16 Jan (AB).

SPOTTED FLYCATCHER *Muscicapa striata* (B)

Under-recorded (Ed). Scarce in BBS, 1 per 10 km, only in farmland; slight increase this year, back to 1997 level (NB).

1st records: Pr Lendrick 17 May, 2 Ashfield on 25th, 1 Killin on 30th (DJC WRB PWS). Migrants Stirling 17 Aug, Skinflats 5 Sep, Gartmorn on 12th & Tullibody Inch on 19th (DT DAC AB DMB).

S In summer at BoA, 2 Prs Invertrossachs, 4 L.Voil. Family parties at Carron Valley Res, Buchlyvie & Lendrick (DMB DOE WRB DAC DJC).

PIED FLYCATCHER *Ficedula hypoleuca* (b)

1st records in May: G.Finglas 1st, L.Ard Forest 7th, Balquhiddier (Rhuveag) on 16th (DJC DOE DT).

S Numbers at Trossachs colony 20% down, 51 prs reared 121 Y – poor success, starvation & predation (HR). 9 prs at G.Finglas boxes reared 37 Y (DJC).

LONG-TAILED TIT *Aegithalos caudatus* (B,W)

Always the scarcest of the four tits, BBS suggests big decrease from 1998.

F 18 Wallacebank Wood 27 Feb, 23 Grangemouth 12 Sep, 14 Skinflats 7 Oct & 15 Carronshore on 10th (AS AB GO).

S 29 Lendrick 6 Sep (DJC). 18 Killin 17 Dec (PWS).

COAL TIT *Parus ater* (B,W)

Greatly under-recorded (Ed). BBS shows steady decrease since 1995, 17 records per 10 km in conifers, 3 on farmland (NB).

F/C In gardens at Bo'ness, Tillicoultry (AS AT).

BLUE TIT *Parus caeruleus* (B,W)

Under-recorded (Ed). BBS shows 33 per 10 Km in 'urban' squares, 26 on farmland & 6 in conifers; the commonest tit over 6 years (NB).

C 5 AoT on 5 Km of lower Devon, 7 in 1998 (CJH).

S Low fledging success in Trossachs (HR). 8 prs at G.Finglas boxes reared 44 Y (DJC).

GREAT TIT *Parus major* (B,W)

Under-recorded (Ed). BBS shows 16 per 10 km in 'Urban' squares, 8 on farmland and 2 in conifers – big drop in conifers and overall 45% drop since 1998.

C 3 AoT on 5Km of lower Devon, 4 in 1998 (CJH).

S Low occupancy in Trossachs & low success (HR). 6 prs at G.Finglas boxes reared 33 Y (DJC).

\*NUTHATCH *Sitta europaea*

C 1 at Alva 21 to 27 Aug, very close views at bird feeder, full description supplied (P & M Ashworth).

*This is the first documented record for the area, a mapped point on L.Lubnais in R Murray's survey of Scottish records is untraceable and is probably a misplotting of a 1948 occurrence on L.Lomond (Ed).*

TREECREEPER *Certhia familiaris* (B,W)

Under-recorded (Ed). BBS shows 2 per 10 km on farmland, possibly small increase over 1998.

S Bred Buchlyvie (DAC). 1 Stirling 20 Dec climbed stone wall of office (DT).

\*GREAT GREY SHRIKE *Lanius excubitor*

S 1 Queen Elizabeth Forest Park 27 Mar (JK).

JAY *Garrulus glandarius* (B,W)

BBS records largely from conifers, 2 per 10km.

F All year at Torwood – Wallacebank Wood (AB AS) - continuous with range around Stirling (Ed). 1 Bo'ness 27 Nov (AS).

S Recorded from some 15 sites from Buchlyvie to L.Ard, G.Dochart to BoA; one record from north edge of Gargunnocks – 4 Touch Mollar 28 Mar (AT). 1 Lendrick 5 Aug killed by Sparrowhawk (DJC).

MAGPIE *Pica pica* (B,W)

Its abundance around Stirling is not necessarily noted in the west and east of the area (Ed). BBS shows 31 per 10 km in 'urban' squares & 5 in farmland. Numbers stable since 1997, were higher in previous 3 years.

F 22 Bo'ness 21 Feb (MA).

C 5 AoT on 5 Km of lower Devon, 3 in 1998 (CJH).

S 18 Stirling 3 Mar (DT). Prs Braes of Doune (Drumloist) 19 Jan & Callander 30 Dec (DJC). Pr Buchlyvie 14 Apr (DAC).

JACKDAW *Corvus monedula* (B,W)

An overlooked species, about 2 reports (Ed). BBS shows highest frequency (9 per Km) in urban areas, numbers stable over last 5 years.

C 250 Menstrie 30 Jan (CJH).

S 50 Cambusmore 15 Sep (PWS).

ROOK *Corvus frugilegus* (B,W)

BBS suggest numbers up 50% on 1998 (similar and erratic fluctuations in previous years). Rookery counts: BoA(N) 165 in pines; BoA(S) 180; Myretoun 46; 65 Menstrie nursery (new in 1996). Total 456 (378 in 1998). 126 Gartmorn (CJH).

S 650 Blairdrummond Carse 28 Jan (CJH).

CARRION CROW *Corvus corone* (B,W)

Possibly the most widespread species of all: BBS shows 61 per 10 km in 'Urban' squares, 30 in farmland, 27 in conifer & 16 on moorland.

F 120 Kinneil 10 Jan, 210 (80 on musselbeds) on 9 May (CJH MA). 1 Hoodie Kinneil 30 Jan (GO).

C 5 AoT on Devon WBS (CJH).

S 1 Aithrey 8 Jan twice chased by Grey Squirrel (AT). Hoodies: 6 records (max 4, often with Carrions) L.Venachar-Monachyle Glen - the usual breeding range (DJC).

RAVEN *Corvus corax* (B,W)

S 18 territories checked, 15 pairs. 11 successful pairs of which 5 raised 17 Y (PSA). Successful tree nest Brig o' Turk (DJC). 8 G.Buckie 27 Mar (DT). Outwith of main breeding areas: 2 Airthrey 1 Mar, 2 Buchlyvie 22 Mar & 1 on 8 Aug, 1 Carron Valley Res 18 Sep (DMB DAC).

STARLING *Sturnus vulgaris* (B,W)

Greatly underreported (Ed). BBS shows most frequent in 'Urban' squares.

F 450 Darnrig Moss 5 Dec (MA).

HOUSE SPARROW *Passer domesticus* (B,W)

Under-recorded (Ed). BBS shows 83 per 10 km in 'Urban' areas, 11 on farmland, lowest for 6 years.

- C 17 Blairlogie 19 Dec (CJH).  
 S 67 in garden Stirling 8 Aug (R Ruffell). Through year at Ashfield, max 32 (WRB).
- TREE SPARROW *Passer montanus* (B,W)  
 Scarce on BBS transects and 1999 well below 6 year average.  
 F 6 by R.Carron at Larbert 16 Apr (MA). 26 Skinflats 27 Nov & 16 on 4 Dec. 6 Kinneil 30 Dec (GO).
- C 4 Cambus 7 Mar & 12 in Oct (WRB).  
 S 140 Lecropt 31 Jan, 55 on 28 Mar; 120 on 27 Nov. 21 Blairdrummond Carse 24 Apr & 50 on 5 Dec. 54 Thornhill Carse 6 Jan (MVB WRB DT NB). Small numbers west to Buchlyvie (DAC).
- CHAFFINCH *Fringilla coelebs* (B,W)  
 BBS shows 65 per 10 km in conifers, 66 on farmland & 39 in 'Urban' squares, overall close to 6 year mean.  
 F 120 S.Alloa 7 Jan. 500 Drumbowie 16 Feb (CJH NB).  
 C 9 AoT on lower Devon in May, 11 in 1998 (CJH).  
 S 2700 Kinbuck 9 Jan & 1700 on 20 Feb; 600 on 26 Sep (MVB). 300 Callendar 31 Jan. In November: 500 L.Venachar (turnips) & 300 Doune (stubble) on 11th, 300 Thornhill on 6th, 400 Lecropt on 27th & 800 on 19 Dec (DJC DT MVB).
- BRAMBLING *Fringilla montifringilla* (W)  
 Generally scarce, one large spring flock.  
 F M Larbert 21 Mar & 20 on 29 Dec (MA).  
 S 700 W.Cambushinnie 3 Apr, last 5 on 17th. 20 on 19 Dec (MVB).
- GREENFINCH *Carduelis chloris* (B,W)  
 Underrecorded. BBS shows 39 per 10 km in 'Urban' squares & 11 in farmland.  
 S 150 Lecropt 24 Oct, 300 on 13/19 Nov, 800 on 19 Dec – on uncut linseed (MVB DT).
- GOLDFINCH *Carduelis carduelis* (B,W)  
 BBS shows 3 per 10 km in farmland and 3 in 'Urban' squares, close to 6 year mean.  
 F 22 Skinflats 8 Feb & 30 on 5 Dec (MA).  
 C 4 AoT on Devon WBS, as 1998. 25 Blackdevonmouth 27 Aug. 24 Cambus 12 Sep (CJH).  
 S 28 W.Cambushinnie 6 Feb, 80 on 16 Dec (MVB NB). 18 Touch Res 9 Oct (AT). Nested Thornhill in 8 year plantation (SS).
- SISKIN *Carduelis spinus* (B,W)  
 BBS shows 13 per 10 km in conifers, 2 on farmland. Numbers low, shows huge yearly variation.  
 In gardens at Bo'ness, Grangemouth & Stirling until late Apr (AS GO RJ).  
 C 37 R.Devon at Tillicoultry 19/27 Dec (AT).  
 S 30 L.Venachar 18 Feb; 60 Balquhidder 31 Mar. 90 L.Lubnaig (alders) 12 Nov; 70 G.Finglas 29 Oct, 100 on 19 Nov & 75 on 28 Dec (NB DJC DAC). M displaying Airthrey 9 May (CJH).
- LINNET *Carduelis cannabina* (B,W)  
 BBS shows 4 per 10 km on moorland, 3 on farmland, 4 in 'Urban' & 2 in conifers. Stable over last 4 years.  
 F 900 Kinneil 1 Jan & 400 on 25th (MVB CJH). 225 Larbert 5 Feb (MA). 100 Skinflats 17 Dec (AB).  
 S 150 Lanrick 3 Feb. 150 Flanders Moss 18 Apr (DOE). 200 Kinbuck 18 Apr & 26 Sep (MVB). 100 W.Cambushinnie 16 Dec (NB). 382 Lecropt 17 Dec (CJH).
- TWITE *Carduelis flavirostris* (b,W)  
 F 80 Skinflats 5 Dec (MA). 14 Kinneil 24 Dec (GO).  
 S Spring/summer reports from G.Ogle, Glen Finglas (3 sites), Braeleny (DOE DJC

- DAC). 18 Thornhill 17 Jan (SS). 40 G.Buckie 12 Sep (DT). 250 W.Cambushinnie 9 Jan, 230 on 27 Nov & 200 on 16 Dec (MVB NB).
- REDPOLL *Carduelis flammica* (b,W)  
    BBS shows 1 per 10 Km in conifers, overall only one sixth of 6 year mean.
- F 12 Falkirk 20 Feb (MA).
- S 3 sites (?6 AoT) Cromlix 30 May (WRB). 22 Lendrick 14 Feb, 14 Monachyle 20 Apr (DJC). 35 Dunblane 7 Nov & 30 L.Voil 7 Dec (MVB NB).
- COMMON CROSSBILL *Loxia curvirostra* (b,W)  
    BBS shows 8 per 10 km in conifers, close to 6 year mean.
- F Family of 8 Skinflats 2 Jul & 7 on 3rd. 2 in garden Grangemouth 14 Dec (GO).
- S 5 L.Mahaick 19 Feb, 47 Carron Valley Forest 4 Apr (NB DT). Widespread (9 sites) Buchlyvie, L.Ard Forest to Braes of Doune, May to Aug, max 8 on 25 Jul (DOE DAC WRB). 5 Airthrey in Aug, 9 Dunblane 11 Sep (DMB MVB). Regular Braes of Doune Oct/Nov (KD).
- BULLFINCH *Pyrrhula pyrrhula* (B,W)  
    BBS shows 2 per 10 km in conifers, 1 on farmland, overall lowest figure for 6 years & only one-fifth of mean.  
    Widespread in groups less than ten.
- S 16 L.Venachar 19 Feb & 17 on 24th (DJC). Fed on heather seeds in Feb, in gardens fed on buds of Amelanchier, Greengage, Plum (RJ AD).
- SNOW BUNTING *Plectrophenax nivalis* (W)  
    S 12 Sheriffmuir 28 Feb & 25 Stronend 6 Mar (AT JK). 33 Ben Lomond 14 Nov (J Gordon), singles elsewhere in hills.
- YELLOWHAMMER *Emberiza citrinella* (B,W)  
    BBS shows 5 per 10 km on farmland & 3 'Urban', overall half the 6 year mean, last 3 years all poor.
- F 25 Skinflats 16 Jan (GO). 14 Bo'ness 21 Feb (AS).
- C 11 AoT in 5 km on lower Devon, 10 in 1998 (CJH). 35 Alloa 10 Jan (DMB).
- S 15 Cambuskenneth 27 Feb (AT). 35 Thornhill 17 Jan & 60 on 2/4 Feb (SS). 40 Lecropt 27 Feb & 14 Mar; 25 on 24 Nov (MVB NB).
- REED BUNTING *Emberiza schoeniclus* (B,W)  
    BBS shows 1 per 10 km in farmland & 3 on Moorland, overall at 6 year mean and no trend.
- F 14 Skinflats 12 Nov & 25 on 17 Dec (GO AB).
- C 13 AoT on Devon WBS, 10 in 1997. 11 Cambus 10 Dec (CJH).
- S 22 Lecropt 19 Dec (MVB).
- CORN BUNTING *Emberiza calandra*  
    No records.

### ESCAPED SPECIES

- MANDARIN DUCK *Aix galericulata*  
    S M Airthrey 6 Sep (R Ruffell).
- RED-LEGGED PARTRIDGE *Alectoris rufa*  
    S 100+ released Cromlix/Cambushinnie (MVB NB). Also noted Callander, Blairdrummond/Row, Stronend (DJC AD JK).

## WINTERING AND BREEDING BIRDS OF LONG-TERM SET-ASIDE IN THE FORTH VALLEY

C.J. Henty

The birds of 50 ha of long-term (five year old) set-aside were studied by making eight transects from December 1995 to February 1996 and five visits to map territories in April and May 1996. In winter Meadow Pipits and vole-eating raptors used the open fields whilst Yellowhammers concentrated in the hedges near to pheasant feeders, Chaffinches and Linnets mainly occurred in a patch of game cover. Amongst breeding birds, Skylarks were the most abundant whilst seven other passerine species were markedly scarcer; Curlews were the main breeding wader. The numbers of species in both seasons depended largely on management of features apart from the open fields.

### Introduction

Set-aside refers to an aspect of farm management where a proportion of arable fields, previously under continuous cropping, are left fallow for one or more years. In the UK this became subsidised under the Common Agricultural Policy in 1988 with the rules being revised and finalised in 1992. Because up to 15 % of lowland farms could be involved, there were major implications for wildlife conservation (Andrews, 1992). As far as birds are concerned, interest has been concentrated on the one year rotational option since weedy stubbles are known to be of greater value than either bare ploughland or winter cereals (Wilson *et al.*, 1995). The alternative non-rotational option, where a field is out of arable production for at least five years and a typical end result is rough grassland, has been little investigated although it did form part of a before-and-after study by Watson and Rae (1998). At the present time the future of set-aside is under debate, so its conservation impact could easily be short-lived. However, the present study has an additional interest, with regard to the bird populations of extensive areas of dry, lowland rough grassland, a habitat not often studied.

This is an investigation that was carried out on set-aside fields on the Carse of Stirling. The area has been in set-aside regime since 1991, apart from a small area which remained a hayfield but in winter resembled the rest of the area in vegetation structure. The fields were mainly tussocky grassland, having originally been pasture or arable then sown with grass seed. The set-aside system requires that the ground be given a green cover which must be maintained largely free from weeds, usually by mowing once or more times a year with the mowings being left to rot. The study fields were typically covered with grass 8 to 15 cm high, with taller dead stems; there were many areas (about 25 % of the total) of much shorter grass or dead mowings, often in lines following the wheeltracks of machinery or places where Brown Hares *Lepus europaeus* have grazed or made runs. Vole *Microtus* spp. burrows were abundant. Herbaceous plants were scarce, a few Dock *Rumex* spp. or Thistles

*Cirsium* spp., which have usually been cut before seeding, and a Buttercup *Ranunculus* spp. was abundant in wet places. This vegetation is typical of longterm set-aside. Sotherton (1998) considers that succession to this state will occur after three years in an ex-arable field even without addition of grass seed. A patch of kale about 80 by 30m, sown as game cover, occupied a corner of one field. Field boundaries were usually hedges, predominantly thorns 1.5 to 2 m high and varying in thickness and solidity, hedgerow trees were only conspicuous in one section. The heights and widths of hedges were assessed by eye and the length of each hedge type measured on a 1:10,000 map. There were 900 m of 1x0.5 m hedge, 750 m of 1x1 m, 2,700 m of 1.5 x 1 m, 160 m of 1.5x1.5 m, 450 m of 2x1 m, and 470 m of 2x1.5 m hedge. Barbed wire fences totalled 1,050 m.

### Wintering Birds

The census technique followed the recommendations of the RSPB (Evans 1993). The fields were walked in as systematic a manner as possible, so that no parts of a field were more than 30 to 40 m distant from the transect. In some fields their shape and the position of access points meant that a strict rectangular route could not be followed. The position that birds were first seen, as perched or on the ground, was categorised as being in the middle of a field, field margin (within 10 m of a boundary), or hedge; also whether the birds were in the kale patch or within 20 m of one of the six hedgeline pheasant feeders which provided grain. Birds simply overflying the area (except for lower flying raptors) were ignored. Birds that had been flushed were watched as far as possible to determine their landing point and avoid double counting. Eight morning transects were walked between 14 December 1995 and 19 February 1996, averaging 10 days apart and only on days that gave reasonable observations conditions, *ie* avoiding strong winds and persistent rain. There was severe frost and periods of deep snow in late December and at times in January and early February.

### Results

The commonest species was Yellowhammer *Emberiza citrinella*. Of the 483 records (bird-days), 95 % were associated with hedges and 62 % of these were at or close to a pheasant feeder. Linnet *Carduelis cannabina* records totalled 466 bird-days but almost half of these occurred on 20 December and there were few from 28 January on: almost all birds came from the kale patch. Many of the 211 Chaffinches *Fringilla coelebs* were also flushed from the kale but a number certainly fed at the nearest feeder. Most of the 24 Goldfinches *Carduelis carduelis* were noted in field margins, as were three Tree Sparrows *Passer montanus*. The 24 Reed Buntings *Emberiza schoeniclus* were mainly found in hedges or margins, but 6 were out in the open field on 19 February, following a small influx on the 11th. Some other species were noted in small numbers (5 or less) in the hedges: Wren *Troglodytes troglodytes*, Dunnock *Accentor modularis*, Robin *Erithacus rubecula*, Blackbird *Turdus merula*, Song Thrush *T.philomelos*, Blue Tit *Parus caeruleus*, and Pheasant *Phasianus colchicus*. Twenty-one Grey Partridges *Perdix perdix* (mainly in one covey of 16) were seen on field margins.

Few species were characteristic of the open fields. The most numerous was the Meadow Pipit *Anthus pratensis* (165) but were only frequent before the hard weather. Only 12 Skylarks *Alauda arvensis* were recorded and the odd Starling *Sturnus vulgaris* and Mistle Thrush *Turdus viscivorus*. Corvids were surprisingly scarce: only 3 Rooks *Corvus frugilegus* (1 at a feeder), 1 Carrion Crow *C. corone* and no Jackdaws *C. monedula*. Other open field species were all non-passerines: 3 Snipe *Gallinago gallinago*, 7 Short-eared Owls *Asio flammeus* (2 on 17 January), single Buzzard *Buteo buteo* and Kestrel *Falco tinnunculus* were noted regularly. A few Sparrowhawks *Accipiter nisus* and Peregrines *Falco peregrinus* and a single Hen Harrier hunted over the fields, the last species was also seen on 1 April.

### Breeding birds

Five visits to the area were made between 1 April and 24 May, 1996. The positions of birds on the area were marked on outline maps (scale 1:6,667 for photocopying convenience). Birds flying high overhead (eg gulls *Laridae*) were ignored. Species maps were compiled and analysed by grouping the records into non-overlapping clusters considered to be the minimum number of apparently occupied territories (AoTs) that were sufficient to account for the data. Field mapping of records and analyses were performed using the methods of the BTO Common Birds Census (IBCC 1969).

### Results

The observations of presumed breeding birds (Table 1) focus on species seen regularly (for each 'cluster' of records usually at least three dates for UK residents and two for summer migrants) and with reason to infer a breeding attempt. Table 1 also gives AoTs that were only marginal to the set-aside and contains comments on species outwith the study area.

Skylarks were the most abundant passerine at six pairs per 10 ha and Curlew the most abundant wader at 1 pair per 10 ha. Other passerines were all closely associated with hedges, Chaffinch was the commonest with at least five pairs (0.9 pairs per km of hedge) followed by Yellowhammer, Dunnock, Reed Bunting, Whinchat *Saxicola rubetra*, Grasshopper Warbler *Locustella naevia*, and Whitethroat *Sylvia communis*.

Lapwings *Vanellus vanellus* were frequent on the surrounding arable and pasture, their remarkably late arrival on the set-aside is presumably due to birds moving in as a result of disturbance by farming operations on the arable (small parties were flying about on 13 May). Oystercatchers *Haematopus ostralegus* were equally frequent in surrounding fields but never alighted on the set-aside. Meadow Pipits were regular as late as 13 May (max 43 on 27 April) but never showed any song and must have been migrants, probably *en route* for Iceland since birds are fully established on local moors by the end of March (Henty 1990).

The following species were seen only occasionally or peripheral to the set-aside: Buzzard, Pheasant, Grey Partridge, Redshank *Tringa totanus*, Wood

Pigeon *Columba palumba*, Stock Dove *C.oenas*, Pied Wagtail *Motacilla alba*, Wren, Robin, Sedge Warbler *Acrocephalus schoenobaenus*, Blue Tit, Jackdaw, Carrion Crow, Linnet.

Other species around the farmyard were Collared Dove *Streptopelia decaocto*, Swallow *Hirundo rustica*, Blackbird, Song Thrush, Starling, and House Sparrow *Passer domesticus*, whilst Goosanders *Mergus merganser* occurred on the river and there were at least five pairs of Sand Martins *Riparia riparia* there.

## Discussion

During the winter Corvids, Starlings and geese (Pinkfooted *Anser brachyrhynchus* and Greylag *A.anser*) were all frequent on surrounding pasture but were rarely seen on the set-aside fields though some goose droppings were noted. Species which used the open set-aside were Meadow Pipits and vole eating raptors – Shorteared Owl and Kestrel, and possibly Buzzard. Yellowhammers were notably frequent but did not use the open fields, indeed it is possible that the majority were only present due to the grain provided by the pheasant feeders. The Chaffinches and Linnets similarly made little or no use of the open fields being primarily associated with the kale patch. Finches and buntings are characteristic of the Carse arable and pasture (Henty, 1995). The bird population in winter differed greatly from spring since Skylarks and Curlews were absent and many Meadow Pipits, Yellowhammers, Chaffinches and Linnets were present at least for the early part of the season. In this study, the value of long-term set-aside to birds in winter is as much due to optional measures that attract several species as to the main set-aside regime, very much as Sotherton (1998) suggested with especial reference to game birds.

The tussocky grass set-aside was clearly favourable habitat for nesting Skylarks and Curlew but was largely avoided by Lapwings and totally by Oystercatchers. It is not obvious why Meadow Pipits do not breed, since they and Skylarks are abundant in spring on similarly structured rough grass on the nearby Ochils. The hedges in the set-aside fields hold small numbers of the commoner hedgerow passerines, at a frequency similar to that found in Lothian farmland hedges lacking trees (da Prato, 1985), but these species seem to be more abundant in the higher and broken hedges around river and ditches outwith the set-aside. Watson and Rae (1997) also found Lapwings and Oystercatchers absent from long-term set-aside, except in two fields that had bare patches; they reported that Skylarks were scarcer ( $\times 0.34$ ) compared with first summer set-aside though this species was still commoner (at a density comparable with this study) than in working arable. On the Carse of Stirling estimates from working arable (personal observations) also suggest Skylark densities increase about fourfold in long-term set-aside fields.

## Acknowledgements

I very much appreciate the interest and help given by the owner of the property whilst the local FF Wag office helped in setting up the project.

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**Table 1.** Numbers of apparently occupied territories

Species	(a) Centred on set-aside	(b) Peripheral
Kestrel	1	
Lapwing	2 (Nb absent until May 13 & 24)	
Curlew	5	2
Skylark	29	2
Dunnock	2	3 or 4
Whinchat	1	
Grasshopper Warbler	1	
Whitethroat	1	
Chaffinch	5	5
Yellowhammer	3	4
Reed Bunting	1 (doubtful)	3

## BOOK REVIEWS

**Root Causes of Biodiversity Loss.** P. Wood editor. Earthscan. ISBN 1.85383.1990. £17.95.

An enlightening survey by WWF.

**Rothiemurchus – nature and people on a Highland estate 1500-2000.** T. C. Smith and R.A. Lambert, editors. Scottish Cultural Press. 160pp. ISBN 1.84017.033.6. £9.99.

This 'gateway to the Highlands' place is famed for Elizabeth Grant's *Memoirs of a Highland Lady*. The chapters on medieval background, Gaelic heritage, lairds, birds and mammals, wild land, nature and sport, and visitors, woodlands, the Caledonian Pine and forest ecology, the Doune (house), Elizabeth Grant and editing her, – are by authoritative authors including Geoffrey Barrow, James Grant, Roy Dennis, Philip Ratcliffe. This is a valuable record of the environmental and remarkable history of an inspiring area of Scotland.

**Archaeological Requirements:** a Development Advice Note. Stirling Council. 4pp.

Includes very brief notes on sites – Boquhapple Broch, Thornhill; Tirai deserted settlement, Killin; Broad Street; Murray Place; Barbush, Dunblane; Doune Roman Fort; and on the front Castleton, Cowie – prehistoric rock art. Note that FNH published a full paper in volume 19 103-113 (1996), by M.A.M. van Hoek, on the Castleton cup and ring stones, and one on those of Menteith in volume 15 (1991) 58-75, also by van Hoek. LC

**Excavation of a timber round-house and broch at Fairy Knowe, Buchlyvie, Stirlingshire,** 1975-8. Lorna Main et al. Reprinted from the *Proceedings of the Society of Antiquaries of Scotland* 128 (1998). pp293-417.

This is the full extensive report on the project summarily described in FNH 3 (1978) 99-110.

Abstract – Stumps survive of oak posts of the round-house, its remains were overlain by a solid-based broch with an inner courtyard some 8.2 m across within walls up to 5.5 m thick. Roman artefacts included bronze coins, iron, pottery, and glass. Radiocarbon dates suggest the round-house being built sometime between 400 BC and 250 AD, and artefactual evidence puts the broch occupation/destruction in the pre Antonine period.

The project was jointly sponsored by Historic Scotland and the former Central Regional Council.

Artefacts of particular note include – examples of good-quality metal and ironworking (p369 and 394); a rare c220 cm<sup>3</sup> crucible (p371-2); iron work that greatly advances our knowledge of iron use in the Scottish late Iron Age – especially a pair of compasses (p365-..and 394); and an enamelled finger ring – "the finest surviving example from Scotland" (p344 and photo). All will be returning to the Smith Art Gallery and Museum. LC

**Clackmannanshire** – cycling, walking, street plans – a great detailed map by Harvey of Doune and Clackmannanshire Council. £2.95.

## NATIVE WOODLANDS: A FRIENDS OF THE OCHILS PROJECT

Cathy Tilbrook

Friends of the Ochils is a charitable organisation which was formed in 1993, with the aims of conserving the scenery, ecology and history of the Ochils area and promoting interest in, and responsible public access to, the Ochils. Forestry was seen as an important land use in the hills, with its potential impacts on landscape, recreation, wildlife and the local economy, and six years ago, a special sub-committee of the Friends was set up to look at forestry and woodland issues. This group initially focused their efforts on responding to consultations on forestry proposals in the Ochils. However, in addition to this reactive work, the sub-committee began to think about a more strategic approach.

The Ochils have suffered years of unrestricted grazing and have become accepted as an open and unwooded area. The sub-committee started to prepare a vision for putting native woodlands back into the landscape. They pictured a series of healthy, diverse and well-managed gorge woodlands in all the Ochils glens leading up the burnsidles into the hills. These would link to larger areas of wooded ground on the lower slopes and on some parts of the southern scarp. This would build on what remains of the native woodlands of the Ochils to create a striking landscape of open high ground rising above richly wooded lower slopes and glens – valuable for wildlife and for people.

To achieve this vision, the group decided that a Native Woodland Action Plan was needed. This would consist of two phases – a strategic plan for native woodlands over a wide area of the Ochils, and a targeted plan, based on detailed discussions with owners. Funding was obtained from Scottish Natural Heritage and the Clackmannanshire Heritage Trust, together with some of the Friends' own funds to commission the two phase project.

For the first phase, the group decided to use an innovative new technique called Ecological Site Classification (ESC) which has recently been developed by the Forestry Commission, to assess the woodland potential of selected parts of the Ochils. This involved the collation of environmental information, such as vegetation types, climate, soils and altitude, to make recommendations on planting and suitable tree species. The chosen area took in all parts of the Ochils with Clackmannanshire and Stirling, together with the western part of Perth & Kinross. Only land below 400 metres was investigated, due to the landscape and ecological constraints of planting on the higher plateau. A range of useful maps was produced, together with a detailed report which recommended four main types of native woodland for the hills<sup>(1)</sup> –

- Oak and birch woodlands – on most of the lower slopes and glens
- Wet birch and alder woodlands – in small areas where wetter soils exist

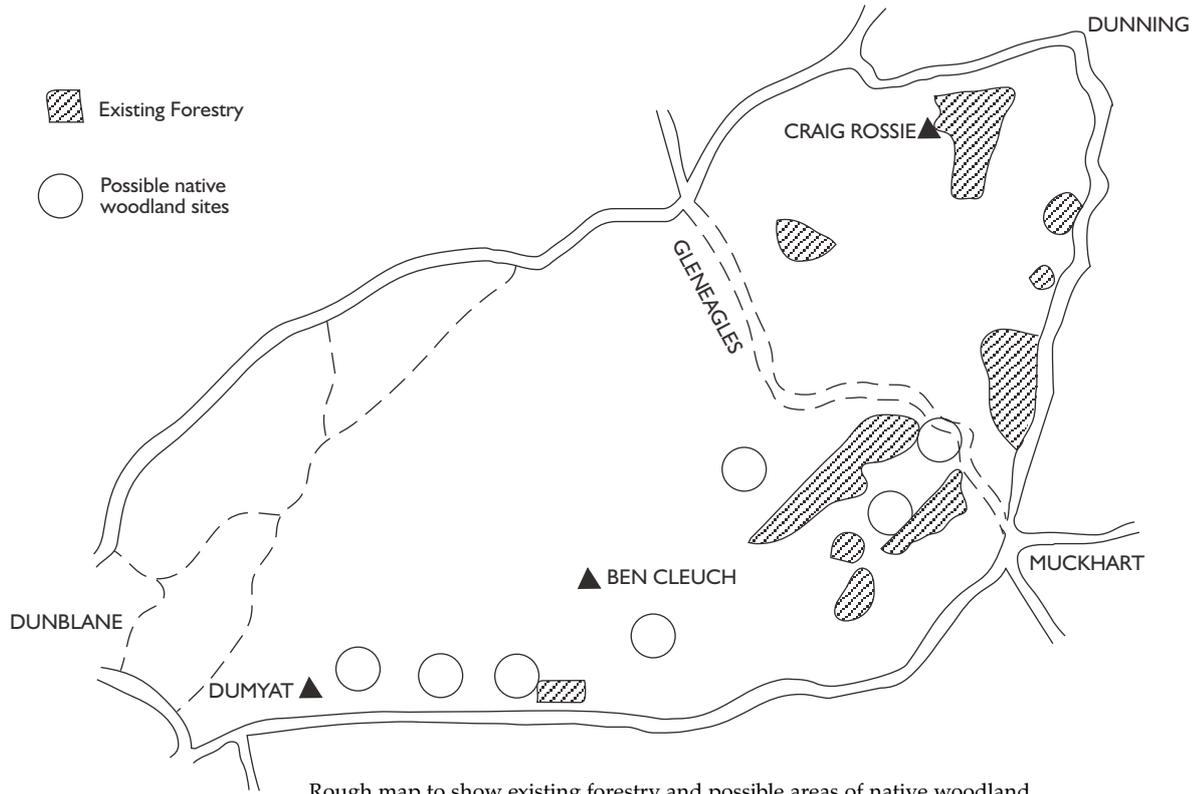
- Pine woods – on the higher areas where heather moorland exists (although not all of this habitat should be planted, as it has significant ecological value)
- Juniper – on many of the highest areas above 400 m (except where peatlands exists)

The second phase of the work involved the preparation of detailed site plans. Landowners were approached to assess their interest in woodland planting and, with their permission, detailed survey was carried out to validate the earlier ESC work. Following this survey, nine detailed plans for woodland management, regeneration or planting were prepared, including costings, using the format provided by the FC Woodland Grant Scheme. The proposals were then discussed with landowners and occupiers and their interest in different options recorded. An overview report was also prepared to prioritise the nine schemes, based on different funding levels, owner interest and ecological values<sup>(2)</sup>.

Now the work has been completed, Friends of the Ochils are pursuing possible implementation of some or all of the schemes. Funding is required to help landowners with the costs of woodland creation, as current grants do not cover the total needed. The group are also keen to collaborate with other existing woodland groups to take the projects forward. Friends of the Ochils looks forward to a future when healthy native woodlands once again clothe the glens and caress the lower slopes, making a more varied landscape and creating new habitat for local wildlife.

### **References:**

1. Ray D., Muir S., Broome A., Fletcher J., Humphrey H. & Pyatt G.: Potential for native woodland expansion in the Ochils. Unpublished report to Friends of the Ochils, April 1999.
2. Heritage Woodlands: 'Ochils Native Woodland Action Plan – Phase II'. Unpublished report to Friends of the Ochils, November 1999.



Rough map to show existing forestry and possible areas of native woodland regeneration or development. Base map scale 1:250,000.

## BOOK REVIEWS

**Loch Lomond and the Trossachs.** Rennie McOwan, David and Charles. Pevensey Guides series. £8.99.

A continuing work to Campbell's book of the same title reviewed in FNH volume 22, and greatly supplementary to our FNH *Lure of Loch Lomond*, now at half-price £2. Nine chapters of McOwan cover – faeries and artists, Redcoats and clans people, navvies and hydro workers, heroes Rob Roy and Bruce, writers Scott, Wordsworth ..., and Gaelic heritage of the area – plus photography of Roy Rainford.

**Nigel Tranter: Scotland's Storyteller.** Ray Bradfield. B & W Publishing, Edinburgh. 300pp. ISBN 1.873631.98.7. £15.99 hbk.

A definitive biography to celebrate the 90th birthday of our most popular historical writer, whose 130 works range over such epics of Scottish heroes as *The Bruce Trilogy*, *The Wallace*, events like *The Rough Wooing*, the painstakingly recorded four volume *The Fortified House of Scotland*, and the four books in the Queens Scotland guides series. As Tranter himself says in the foreword – “may give the reader some notion of the storyteller's life, whose aim has been to entertain and inform.... On his beloved land and its colourful and dramatic history”.

**Shale Voices.** Alistair Findlay. Luath Press. 270-pp. ISBN 0.946.48763.4. £10.99. £17.99 hbk.

An innovatively presented history of the West Lothian shale oil industry, particularly the society, the people, their words, stories, songs. The author with a social worker, researcher experience, and the flair of a poet, makes this work unusual – not just a straight read but a pleasure to look at and dip into. Oral social and family history are enlivened by a poetic form. The industry and people of the birthplace of the oil industry are chronicled from the times of the founder “paraffin Young” and his friend David Livingstone, the great explorer.

**Bannockburn: Scotland's greatest ever battlefield triumph.** Peter Reese. Cannongate. 230pp. ISBN 0.96241.915.8. £9.99.

There is currently much interest in the site of this historic event, and expert research is in progress to authoritatively establish and protect it from modern developments. William Scott, author of the historical novel *The Bannockburn Years* – reviewed in FNH 21 (1998) 135-6 – will no doubt be peeved that his contribution to the story is not recognised at all here by Reese, who claims “this is the first dedicated analysis of the battle in over 75 years.” From the useful introduction and acknowledgements it proceeds into main sections – The Path to Battle – Scotland under siege, leadership; The Contenders – the armies, commanders; and Bruce's Masterstroke – the battle; then through to Aftermath, Notes by chapter, Bibliography, and Index. He includes seven battle plans, a sketch map to guide the visitor to the unmarked site, and a colour map of the battle. This is a well presented contribution to a somewhat controversial subject, and comes at a perhaps significant point in time. LC

## BIODIVERSITY: CONSERVING THE VARIETY OF LIFE LOCAL ACTION PLANNING AND THE FALKIRK AREA PERSPECTIVE

Anna Perks

The word biodiversity was first coined by an American scientist called Walter G Rosen in 1985 who put together the Greek word bios meaning life and the word diversity meaning variety. It was subsequently popularised by books such as *The Diversity of Life* by Edward O'Wilson. The concept gained much wider acceptance at the Earth Summit in Rio de Janeiro in 1992 when over 150 countries signed up to the Convention on Biological Diversity which later became known as the Biodiversity Convention. Though still a relatively new word to the English language 'Biodiversity' is becoming much more frequently used and increasingly heard from the mouths of all manner of people. Business people and politicians are gradually beginning to see biodiversity, and that other strange creature 'sustainable development', as important issues that really do affect our quality of life. They are also beginning to recognise that concern for our natural environment is likely to have a growing impact on how businesses are run and government policies made. Meanwhile, the farming community is finding that the award of agri-environment grants is now in part linked to what they can do to help biodiversity. As for the humble environmentalist he or she is finding that biodiversity is rapidly becoming an everyday word ranking alongside wildlife and conservation. The concept may not have filtered down to the average man or woman in the street yet, but it is now here to stay. That makes it even more important that people are clear what biodiversity means and how the concept is affecting the use and conservation of Scotland's natural environment and our global natural heritage. This article offers an introduction to biodiversity, the national commitment to conserve it, and how Local Biodiversity Action Plans (LBAP)s are translating this into focused local action, with particular reference to Falkirk.

### *What is Biodiversity?*

There are many different definitions of biodiversity some more complex than others. One of the most widely used is that given in Article 2 of the Convention on Biological Diversity which states that biodiversity is:

*the variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*

In other words it is the variety of life that exists on earth in all its many forms, including the complex relationships and systems formed by plants and animals. Biodiversity consists of three elements: the variation between species, the genetic variation within species, and the variation between and within ecosystems. All these components make up the total variety of life on earth that is biodiversity.

Biodiversity is not just another word for nature. Nature is an abstract idea carrying implicit judgements about the value, attractiveness and significance of a species or habitat. This subjectivity makes 'nature' impossible to measure. Biodiversity on the other hand, is an objective and measurable concept. It rates all species and habitats as of equal worth. Whether we like a species or not it still has a role to play in the planet's web of life and is just as important to the totality of biodiversity as a more appealing species such as the water vole or golden eagle.

The concept of biodiversity recognises the inter-dependence of all living things on this planet, the vast variation that occurs within and between species and habitats, the value of this variety, and the need for an holistic approach to the conservation of our natural environment.

Action to protect our biodiversity tends to focus on rarer species and habitats, because if we do not take action and a species or habitat becomes extinct we have not only lost it from the total range of species and habitats but also lost the genetic and ecosystem diversity to which it contributed. However, action for biodiversity must also ensure that our common species remain common and that our ecosystems continue to be able to function properly.

#### *Why is Biodiversity important?*

Biodiversity is crucial to the well being of this planet and the people on it. It contributes to the economic, social and cultural welfare of communities and highly valued by the majority of people. Besides the ethical arguments for conserving biodiversity it is clear that its loss has serious social and economic costs.

When plants and animals interact with each other and the physical world they help to create a life support system for the planet, keeping the earth and its inhabitants healthy. If we damage or lose parts of this carefully balanced system we risk permanently damaging the planet on which we depend. Loss of the tiniest species can have a significant impact. For example, loss of a microscopic animal from coastal mud could impact on the shellfish which feed on it, affecting any birds and sea mammals which feed on the shellfish as well as the people who harvest and sell them.

Our many and varied ecosystems help us in numerous ways. For example, coastal and river floodplains help to absorb flood waters and prevent flooding in other developed areas, upland plants can help prevent soil erosion, and peat bogs and woodlands help to absorb greenhouse gases from our atmosphere. Every species and habitat plays a part in keeping our planet and us healthy.

Plants, animals and habitats are also key to a vast range of industries including agriculture, forestry, fisheries, and the production of materials and medicines. Without realising it we utilise hundreds of products every day that owe their origin to wild plants and animals. There are still many species that we have very little knowledge of and which may prove to be valuable, even life saving, resources. Thus, loss of biodiversity could result in significant economic

losses now and in the future, and in the loss of resources that could affect the quality of life of present and future generations. It has been estimated that the combined services provided by the world's ecosystems are worth about £33 trillion a year. What is more, each wild plant that provides the chemical basis for developing new drugs is projected to generate at least £180 million annually.<sup>1</sup>

As well as its direct commercial value biodiversity also helps to create an attractive environment which people enjoy and value. Our landscape and the plants and animals in it are an important part of our culture and have a significant impact on the quality of our lives. Quite simply the well being of current and future generations is inextricably linked to the continued well being of our biodiversity.

### *Is Our Biodiversity Really Threatened?*

Few would disagree that our biodiversity is under threat. On a global scale it is difficult to avoid reports of the loss of rainforests, the extinction of species, the sprawl of towns and cities into open countryside, the impacts of global climate change on our ecosystems, or the loss of semi-natural habitats to development. Closer to home, it is clear that the biodiversity of Scotland is under threat from development, pollution, over-exploitation, habitat destruction, intensive grazing and other human pressures. We are clearly not yet being sustainable in the way that we treat our natural resources. For example a quarter of Scotland's flowering plants are declining or severely restricted in range, about 30 % of the 300 or so bird species recorded in Scotland are regarded as being in need of special conservation action, and almost 90 % of Scotland's original extent of raised bogs has been lost.<sup>1</sup> It is a stark fact that in the UK alone one hundred species are thought to have become extinct over the last 100 years.<sup>2</sup> It is certain that many other species will become extinct or be seriously threatened if concerted action is not taken to protect our local, national and global biodiversity.

### *The International and National Commitment*

In 1992 over 170 world leaders met for the 'Earth Summit' in Rio de Janeiro. They met to discuss growing threats to the global environment due to our unsustainable exploitation and pollution of the earth's resources. The summit concluded that to safeguard our global quality of life future development must be sustainable. In other words future development should meet the needs of the present without compromising the ability of future generations to meet their needs. A key element of sustainable development is ensuring that the quality of our natural environment is not undermined by development activities. Thus the protection and conservation of biodiversity needs to be at the heart of our economic policy. At Rio de Janeiro 153 world leaders, including the then British prime minister, indicated their commitment to this principle by signing the *Convention on Biological Diversity*. By so doing they pledged to help stop the global loss of species, habitats and genetic resources by conserving and

enhancing the biodiversity within their own countries.

In 1994, to meet the UK's obligation under the Biodiversity Convention to produce a strategy for the conservation and sustainable use of biodiversity, the UK Biodiversity Action Plan was published. This set out 59 steps that should be taken to safeguard the nation's biodiversity. One of these steps was the establishment of a Biodiversity Steering Group to develop proposals and targets for national action to conserve the UK's most threatened species and habitats. Having identified the most rare or threatened species and habitats in the UK this group has produced an Action Plan for each one outlining conservation targets and the actions required to meet them. Nationally 47 Habitat Action Plans and about 400 Species Action Plans have been produced. The government continues to be committed to the conservation of biodiversity and both the UK and Scottish Biodiversity Groups are continuing to develop, implement and monitor the national Species and Habitat Action Plans.

#### *Local Biodiversity Action Plans*

For this ambitious programme of action to succeed it has to be interpreted and implemented at the local level. LBAPs are being developed throughout Scotland and the rest of the UK to do just that. These plans aim to translate national targets for the conservation of key species and habitats into focused, local action. However, there are many other species and habitats that contribute to the local landscape and quality of life and LBAPs must also make a commitment to safeguard and enhance these locally characteristic, distinctive or highly valued species and habitats.

The key steps in the LBAP process are broadly:

- Establish a steering group
- Produce an audit of local biodiversity and develop a database to store and up-date biodiversity information
- Identify local priority species and habitats
- Establish partnerships to develop and implement Action Plans
- Develop Species and Habitat Action Plans
- Identify mechanisms for the implementation of Action Plans
- Implement Action Plans
- Monitor plan implementation and effectiveness

There is a growing recognition in most political and environmental circles that local biodiversity planning is an invaluable tool for achieving the protection and conservation of our local and national biodiversity, and thus fulfilling the UK's commitment under the Biodiversity Convention of 1992. Throughout Scotland every local authority area has or is planning to establish a LBAP partnership. As well as local authorities, a wide range of statutory and non-governmental organisations and environmental agencies are now committed. The partnership approach is vital to the long-term success and it is crucial that a wide range of local groups and individuals get involved in the process.

At least six partnerships in Scotland have already published LBAPs, and

many more are in production. Although non-statutory these plans are beginning to have a genuine impact on the conservation of priority species and habitats and the protection of our biodiversity. By focusing the work of many different organisations and individuals through clear conservation objectives and targeted actions, the plans should ensure that resources are aimed at those species and habitats that most need them. The LBAP process also ensures that organisations are able to work together to maximise the impact of their conservation work and to take a holistic approach to biodiversity conservation. The impact of LBAPs is also now being reinforced by their consideration within the local authority planning process. A growing number of Local Plans and Structure Plans now contain references to local biodiversity and reinforce the aims and objectives of LBAPs and their development is being assisted by the appointment of dedicated LBAP project officers, in Scotland there are currently 13.

#### *The Falkirk Area Perspective*

Biodiversity within Falkirk is important as a focus for nature conservation efforts but also has implications for every area of life. It forms the character and quality of the landscape in which people live, work, play and learn. It helps shape the economic and social values of the area and is part of its heritage and culture. Biodiversity is inseparable from all these aspects of our lives.

In August 1999 a Project Officer was appointed to develop and coordinate the Falkirk LBAP. The LBAP will both take a lead in interpreting and implementing the UK biodiversity action plans and promote recognition of the social, economic and cultural value of the area's biodiversity – and consequent need to conserve and enhance it.

The Falkirk LBAP Steering Group met for the first time in November 1999 and continues to oversee the process. This group includes representatives of 15 key organisations including environmental and conservation organisations, local landowners groups, agricultural advisory groups and Falkirk Council. All these organisations recognise the importance of local action for biodiversity and are committed to the development and implementation of an LBAP for the area.

#### *Priority Biodiversity in the Falkirk Council area*

In order to effectively focus local efforts on those species and habitats which most need action to conserve them it is necessary to determine which species and habitats occur in the area, and their current conservation status. With this in mind an audit of Falkirk's biodiversity has been produced. This *Biodiversity of Falkirk: An Assessment Of Priority Habitats And Species*, has used existing data to assess the current status of over 200 species of local and/or national conservation concern and 47 different habitats. Twenty-four species are highlighted as priorities for conservation because they are seriously threatened or declining throughout the UK. Similarly 29 of the habitats are nationally or locally at risk, important for rare species, or highly valued within the local area.

This audit will be an important tool in the development of our LBAP. It has already assisted the steering group in identifying priorities for conservation action, and will be of considerable use in setting conservation objectives. The audit will be regularly reviewed and updated to ensure that it remains a useful assessment of this area's biodiversity.

A list of the priority species and habitats in the Falkirk Council area was produced by the LBAP steering group in April 2000 and finalised in September 2000. This targets around 100 species and 20 habitats that need local action to conserve them. Experts and local people were given the opportunity to comment on this list and suggest species and habitats that they felt should be included.

#### *Action Plan Development*

The partnership element of the LBAP process will really come into its own during the development of Habitat and Species Action Plans which will be developed from autumn 2000 onwards by partnerships of many different organisations and individuals who will form action groups for six broad habitats groupings woodland, estuary, inland water and wetlands, farmland and grassland, heath and bog, and urban.

The priority species and habitats will each be the subject of an Action Plan containing details of: current status and extent; factors threatening the species or habitat; conservation action already being taken; conservation objectives, and proposals and commitments. The development of action plans will depend on the resources and commitment of the partners involved. Implementation of action plans will be closely monitored and the plans reviewed on a regular basis. It is important that the process remains flexible to ensure that it continues to meet the needs of local biodiversity and local people.

#### *Participation and Partnership*

Public ownership is one of the fundamental principles of the LBAP approach which aims to give local individuals and groups a real voice in what happens to their natural environment. This principle is the essence of the Local Agenda 21 process already being applied by local councils in relation to a wide range of social, economic and environmental issues. In order to raise local awareness of biodiversity issues and encourage participation in the LBAP process an Education and Awareness Raising Group was established in March 2000. Already a Local Greenspace Survey Project has been developed to encourage local people to take a closer look at the biodiversity around them by undertaking a simple wildlife survey of a local green area. A leaflet, *Biodiversity in Falkirk*, has also been produced to raise awareness and allow people to comment on the species and habitats which they consider to be important and in need of conservation.

### *The Way Forward*

Local Biodiversity Action Plans are currently being progressed throughout Scotland with considerable success and significant levels of commitment from a broad range of national and local organisations and individuals. It is important that we now look to reinforce their role within a whole range of sectors including conservation, land management, business and industry, and land-use planning. Such links are already being established. Many local authorities are reinforcing their LBAP by incorporating its objectives into development plans and the development control process. Agri-environment grants are using biodiversity priorities as one of the criteria for assessment of applications. Scotland's politicians are beginning to recognise the importance of biodiversity conservation and are encouraging the development of biodiversity indicators to help assess the success of moves towards more sustainable development. Many sectors and organisations are even looking to develop their own sectoral biodiversity action plans. For example the Scottish Executive has developed a Trunk Roads Biodiversity Action Plan to ensure that biodiversity is adequately conserved and enhanced during the development and maintenance of the trunk road network. There is growing support for and commitment to LBAPs and the development of links between them and a whole raft of other landuse and conservation initiatives. The indications are that the LBAP process is, and will continue to deliver, long-term focused local action to conserve biodiversity throughout Scotland. The Falkirk area LBAP is no exception. Though it is still relatively early days in this area many people and organisations are already committed to the process and the future looks bright.

For more information about the LBAP process in the Falkirk Council area contact: Anna Perks, LBAP Project Officer, Abbotsford House, David's Loan, Falkirk FK2 7YZ. Tel: 01324 504863.

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5. Scottish Biodiversity Group LBAP Subgroup, 1999, *Local Biodiversity Action Plans: A Manual and Guidance Notes*, The Scottish Office.

*The Biodiversity of Falkirk: An Assessment Of Priority Habitats And Species* is available from local libraries within the Falkirk Council area and at Falkirk Council's One Stop Shops.

## BOOK REVIEWS

**Ardoch 2000.** A brief history of Ardoch Parish to the end of the second Millennium. William C. Hutchison. Ardoch Millennium Committee. 80pp. ISBN 0.95378270.0.0. £5.

Braco and Greenloaning from the Dark Ages and the Romans, with old and new photographs from Bob Bomont and Steve van der Walt – a chronicle of their development – people, places, events, well produced by Cordfall and enthusiastically written.

**Stories behind some of Burns' songs and other Scottish songs.** Normal Watters. Pentland Press. 300pp. ISBN 1.85821.705.9. £16.50.

Edited posthumously by Ann Watters, well produced and illustrated, the selection of songs is appealing, with battles, islands and rivers, nature and folk, among the chapters. The author's investigations give fresh insight into aspects of Scottish history and culture.

**SATH: History Teachers Review. Issue 23, September 2000.** Compiler/editor Andrew Hunt, Scottish Association of Teachers of History. 32pp.

This is a source of informative, well produced reviews – including in this issue our FNH 22 as *Forth Valley Naturalist and Historian*, and *The Emigrants: Historical background, documents lists, extracts, facsimiles*. Scottish Record Office. Booklets on America, Canada, Australia and New Zealand. This is a subject area of much interest these days as people seek to explore their family backgrounds.

**The Kingdom of Kippen.** Tom Begg. Donald. 270pp. ISBN 0.85976.599.3. £20.

The village of Kippen dominates the 'Fords of Frew', notable in history as the only other crossing of the Forth to the Stirling Bridge. Handsomely presented, well written and illustrated by an experienced writer and researcher, and a Kippen man, this is a crucial contribution to mid-Scottish history. The history of Scotland is embedded in that of the parish of Kippen, and here presented under seven headings: 'Oot o' the World'; the Kingdom of Kippen; John Ure of Shisgarten and the Covenanters; the First Jacobite War and the Myth of Rob Roy; Kippen in the 18th and 19th centuries; School History; and The Making of the Modern Kingdom.

**Discover Old Stirling.** Craig Mair. Stirling Libraries. 64pp. ISBN 1.87054.74.1.X. £4.95.

Presented especially to capture and hold the interest of young people, it scans and illustrates key features of the story of Stirling – historic characters, events, people.

## THE FALKIRK WHEEL

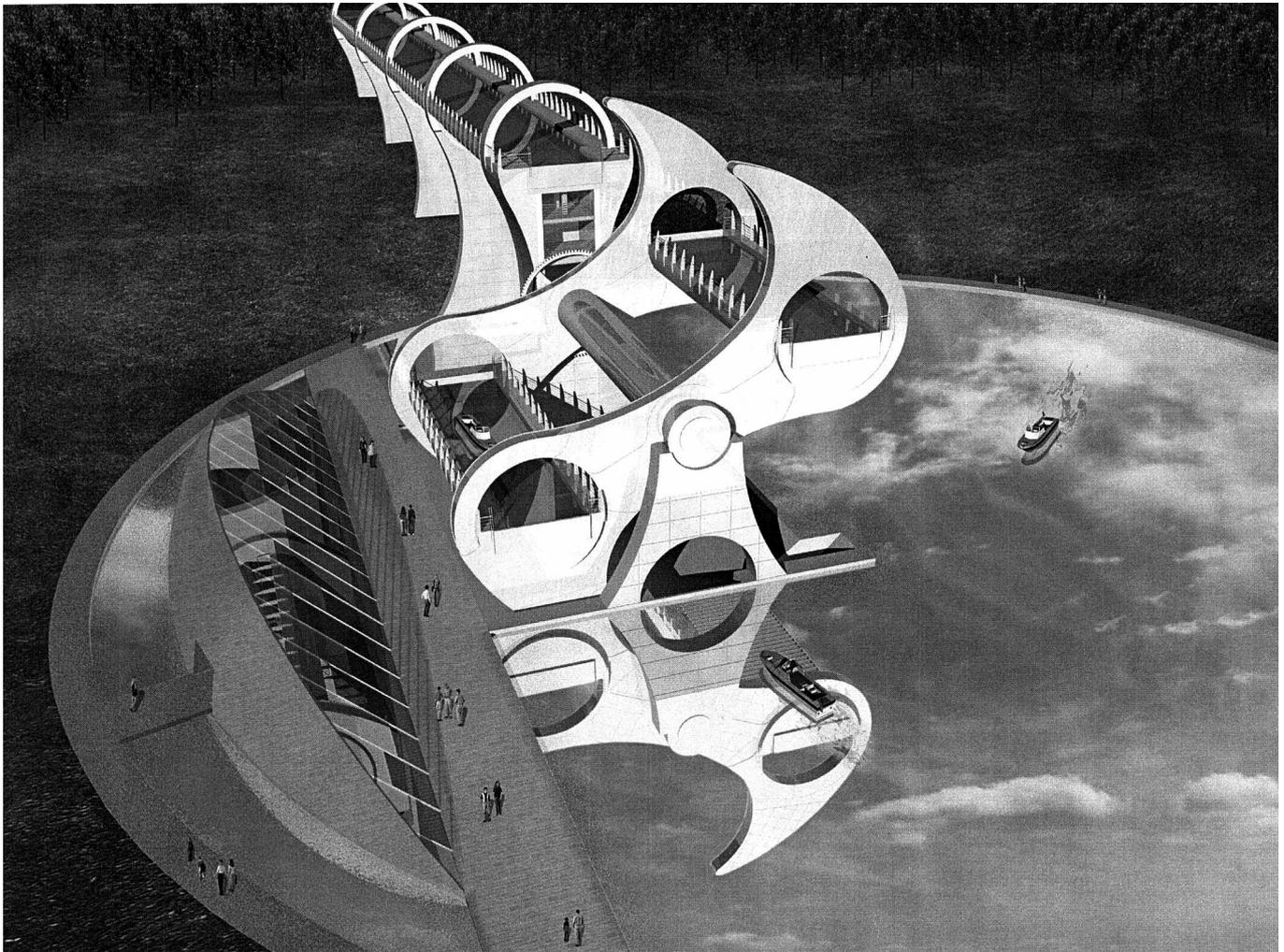
Marischal Ellis

The Falkirk Interchange is part of the Millennium Link, the joining of the two lowland canals, the Forth and Clyde (1790) and the Edinburgh Grand Union (1822). The original join, from Port Maxwell at the western end of the Union to Lock 16 close to the Union Inn (Auntie Kate's) at the old Port Downie on the Forth and Clyde, was by way of a flight of 11 locks. In the mid 1990's an investigation of this, closed in the 1930's, showed it to be difficult to re-establish due to many obstructions and physical changes over these seventy years. The new routed interchange was planned but with many physical obstacles still to be overcome. Thus an exemplar design was undertaken on behalf of British Waterways by Binnie Black and Veatch of Glasgow to consider what still needed to be done in design and financial terms.

Earlier feasibility research had been done and costs apportioned to the numerous structures, infilled sections of canal, bridges, and utility services along the whole Link. The exemplar design allowed tenderers to be instructed under European rules that ultimately led to the selection of Morrison Bachy Soletanche Joint Venture as the design and build contractor. From early feasibility to exemplar and construction designs, the underlying solution has remained remarkably true over some six years, and includes constructing an aqueduct over a road, 1.3 kilometres of new canal, bypassing a 1930's coal mine, and a Roman construction camp, and infilling a section of 1960's coal mine. The largest obstacles to be seen above ground along the route are a main railway, a B class road and the archaeologically important Antonine wall dating from circa AD142, all of which could not be disturbed in any manner. This prompted the solution to tunnel under all three obstructions. To accommodate the change in level and to pass under the railway, two locks each with a drop of 3.7 m were necessary before the tunnel, some 147 m long and 8 m diameter, could be reached.

The interchange site to the north of the tunnel, with a level difference of 24 m between the canals required many engineering and design ideas to be considered. The innovative solution by way of a wheel boatlift outshone all others. Much design, technical, safety, and cost research followed before the final design was chosen. Competitive tendering did not come up with the polished design hoped for, and as a result a partnership of contractors, designers, manufacturers and the British Waterways team, prepared the final design. From the tunnel, an earth embankment 150 m long and a concrete aqueduct 120 m long reach out to the wheel boatlift or transfer mechanism sitting high above a basin. The basin then enables boats to discharge from the mechanism via a lock down into the Forth and Clyde canal.

The Wheel is the centrepiece of the whole Millennium Link which is anticipated to effect a regeneration of Falkirk and the central lowlands from



**The Falkirk Wheel – an impression.**

Edinburgh to Glasgow, the Forth to the Clyde Estuary. The Wheel as a boatlift and design form is seen as an icon of 2000 comparable to the Forth Bridge, Eiffel Tower and other international feats of engineering. The structure is 27 m long and 35 m in diameter and manufactured in steel ranging in thickness from 6 mm to 50 mm. It is designed to turn every 15 minutes, carry a mix of boat sizes in caissons 27 m long and 6.6 m wide, and by hydraulic motors acting on a 3.6 m gear attached to its aqueduct end. While the wheel rotates the caissons are kept horizontal by a planetary gear system which includes 9.5 m diameter main gears and 2.3 m diameter idler gears. Each of the two caissons holds 260,000 litres of water (260 tonnes) and is equipped with bottom hinged flap gates at either end which can only be operated in the docked station, with the land positioned gates being chosen to house the hydraulic mechanisms. Manufactured in Ripley, Nottinghamshire, Spring 2001 will see the first sections being transported by road to Falkirk where they will be assembled, an interesting exercise using heavy lifting equipment and structural support trestles.

Much thought has gone into the setting of water seals on the gates which are both caisson and land based. During loading and unloading the caissons have to be sealed against the land docks, accomplished by the use of slide sections which effectively bring the canal out to meet the caisson thereby taking up the working clearance between the lift and the gates. The hydraulic equipment for the gates is land based for ease of maintenance and repair. The main drive motors are all fitted inboard of the wheel where associated equipment, spares and supplies, stand-by electric generator and control systems are all located. Whilst the wheel is designed with a life of 120 years, certain major mechanical equipments may need replacing. For this to be done with the least difficulty the main drive gears are formed in steel sections allowing their future replacement with a relative ease comparable with the 1880's Victorian canal engineers who planned for maintenance work to be carried out in the year 2000.

As construction work progresses thoughts are turning to other aspirations and aims of the Link. Regeneration of areas close to the canals and the creation of employment have already begun. Several building developments have started and water based business interests are formulating plans for the opening of the Link, city to city, coast to coast.

Improving environments and encouraging wild life are major commitments with the extensive dredging and return of boat traffic. Close to the Falkirk Interchange the removal of mercury contamination is progressing using new lime treatment techniques for dealing with the waste. The little known Bennett's pondweed is endemic to the Forth and Clyde. Fish are being safeguarded during construction and the counting and recording of species carried out. The Lowland canals are Scheduled Ancient Monuments and as such are protected through legislation. British Waterways and its partners are committed to effectively restoring locks, bridges and all that is associated with canals.

Prior to plans to use the wheel area as a park-like facility, the site was a deep opencast pit left by mining ending in the early 1980's. Until the early 1970's the site was the home of Scottish Tar producing various tar-related products. Little remains of that huge facility, partially destroyed by fire in the 1970's, when fire fighters lost their lives controlling the blaze. Although some tar remains on the site it is safely contained in deep encapsulated pits, and the land over these pits will be used as an area for car and bus parking. All these works have left a high water table, heavy with iron deposits, and the need for 30 m deep concrete pile foundations.

The Romans while building the Antonine Wall may have been the first to change the landscape in Scotland. Other major earth works were undertaken more recently by railway and road builders constructing viaducts and embankments. In present times we can make every effort to design and create something of beauty that is pleasing to the eye, yet functional, using newer materials in different ways. British Waterways have set out to restore navigation, build something which could not have been built in the 1900's, an achievement of its time in this new canal age. All this comes about due to the commitment and enthusiasm of many people in the voluntary sector and Local authorities, to Scottish Enterprise, the European Regional Development fund, the Millennium Commission, and British Waterways.

## THE GARDEN AT COWANE'S HOSPITAL (THE GUILDHALL), STIRLING: A BRIEF HISTORY

Carol Green

*Cowane's Hospital, once known as the 'Overhospital', now since 1724 as 'The Guildhall'*

John Cowane (1570?-1633), was a significant figure in both the commercial and public life of Stirling – a wealthy merchant who was also a Bailie, Dean of Guild, Commissioner to the Convention of Burghs and member of the Scots Parliament. The Cowane's Hospital which he endowed for 12 “decayed gild breither” was built between 1637-50 on the site of a house and 2 tenements with well and “closse”. The boundaries of the curtilage have scarcely changed up to the present. The garden within the curtilage has spectacular views, notably from a ‘high terrace’ in the south west corner. It is situated on the castle rock, abutting the Town Wall to the south, on the west Cowane's Hospital, on the north the Kirk of the Holy Rude and on the east the wall of the Old Jail. The garden is in the Dutch style, with the low terrace overlooking the Bowling Green and parterre, and this reflects the strong trade and cultural links between 17th century Stirling and the Low Countries in which John Cowane participated.

### *The 17th Century Garden*

In 1661 the Masters “caus level the yaird of the said hospitall and make a walking green thereof and plant it about with plane trees and the like, and to pavement the closse and outwalke (terrace) with hewin stones”. A gardener was appointed in 1667 and flowers and fruit trees flourished. A hedge of “300 thornes” was planted in 1670 on the north side. Beds typical of the late 17th century underly the present bowling green, visible traces of rectangular plots, may show on a 1997 aerial photograph. In 1673 a sundial was set up, in 1701 the “ballasters in the high walk” were erected, and trees and plants, including apricots and peaches and double yellow roses, were brought from Holland. In 1707, Sir Robert Sibbald testified that Cowane's Hospital had a “very fine garden adjoining to it ... from whence ... there is a very pleasant prospect to the King's Park, as also to the country east, south and west”.

### *The 18th Century*

In 1712, Thomas Harlaw<sup>(1)</sup>, Gardener to the Earl of Mar, was paid £25 for a “draught of the Hospital yairds”, and in 1713 was paid for coming to direct the levelling of the Hospital yairds for a “bouling green”. The formal layout of the garden thus dates from this time and may be compared to the Sturt & Lens<sup>(2)</sup> plans for the Earl of Mar's “Great Garden” at Alloa, which include a bowling green enclosed on three sides with “woodwork” (box hedging), and a terrace walk. The sundial was re-sited in 1712 and newly bought flowers furnished the borders in 1713. A 1746 Board of Ordnance map by Dougal Campbell<sup>(3)</sup>, shows features of the parterre garden.

In 1727, a Table of Equations by Andrew Dickie replaced the old stone face of the sundial. A gardener with a “pretty understanding” of “bottony” was appointed on the understanding that he might impart his plant lore to the local “chyrurgeons” apprentices. In 1737, the gardener asked for a “raill/revell” of timber to be set up from the east to the west end of the garden with a gate in the middle with lock and key – to protect his hedge and flowers on the north side. By 1779 stringent rules had to be drawn up to prevent all and sundry (boys and maidservants), from making a thoroughfare of the garden (see Lizar print of c. 1790). Eventually a high wall was built to protect the garden on its vulnerable side; a French traveller, taking a wrong turning on a visit in 1842, found himself “renfermé” in a cul de sac between the church and the hospital.

#### *The 19th Century – A Public Park?*

Cowane’s Hospital had been gradually transformed from an almshouse offering accommodation to elderly brethren to “The Guildhall”, providing cultural and recreational activities and where “numbers of the beauty and fashion of the town and neighbourhood are to be found promenading”. The garden reflected this change. With the terrace for viewing, it offered a quiet place for the public to enjoy a game of bowls, the military band, or the Highland Society dancing festivals. In 1842 (and 1936) the Guildry gathered on the green with clergy, magistrates and town councillors for royal visits – a fine setting for civic ceremony. Civic pride led to the installation of further garden furnishings – two Crimean cannons cast at Carron in 1858, a fountain in 1862 (dismantled 1867), and a flagpole to attract tourists in 1894. Thereafter the site featured regularly on the front cover of town guidebooks.

#### *The 20th Century – Survival? A rare old formal Scottish garden at risk*

In 1897, J.J. Joass<sup>(4)</sup> listed six old formal gardens still in existence – Barncluth, Balcaskie, Edzell, Crathes, Fordel and “the small parterre and bowling green at Cowan’s house in Stirling”, which he described as having a situation “unrivalled in Scotland”. H. Inigo Triggs<sup>(5)</sup> also includes Cowane’s formal garden and like Joass details the terrace, the Dutch garden with flower beds bordered by box and the sundial. From 1946 the parterre came under threat as the Bowling Club sought enlargement of the green. The Ministry of Works objected that any encroachment would cause the sundial to be removed and “adversely affect the historic features of the buildings and the amenity of the garden”. In 1948, the Ministry gave notice that it intended to include Cowane’s Hospital, terrace, Dutch garden and bowling green in a list of monuments to be published under Section 12 of the Ancient Monuments Consolidation and Amendment Act of 1913.

In 1956, the Town Council Parks Department took over maintenance of the garden when the last live-in gardener retired; and in 1986, after prolonged pressure from the Bowling Club, the bowling green was finally allowed to extend into the parterre. Together with the loss from the south east corner, this has eroded the parterre and border by c. 40 %, compared to that shown on the 1858 OS map (Figure 2). The parterre has also lost its topiary, and today, its

effective planting. In 1997, the bowling green itself fell into disuse.

*Conclusion: A Millennium Project*

The bowling green (Figure 1), which is the second oldest in Scotland in use until recently, is now approaching its 300th Anniversary, surely a cause for celebration? Cowane's garden forms part of the curtilage and setting of an A Listed and Scheduled building which itself is an essential component of the historic landscape of Stirling. It is the sole remaining connection with a major 18th century landscape project in Scotland – the Great Garden of the Earl of Mar at Alloa. That garden has disappeared, but Cowane's Hospital Garden survives. It thus commemorates both Thomas Harlaw, its landscape gardener, and John Cowane, one of Stirling's most famous sons. A restoration of Cowane's Hospital Garden should be a priority, given the regeneration of the historic core of Stirling. The garden forms an essential element in the Castle Rock's history – an old and rare green space, which is part of an organic whole – the designed landscape of the Rock, an unrealised asset, ripe for reevaluation. If Cowane's Hospital Garden is allowed to degenerate, it will be a substantial loss to Stirling and to Scotland.

*Further Research to include:* The Parterre; The "Vicar's Garden"; The Well; The Boundary Walls; The Green Spaces of the Landscape of the Rock.

*Note*

This brief history is by the Stirling Decorative and Fine Arts Society's Garden History Group, and based on it a recent initial assessment by the Garden History Society<sup>(6)</sup> has rated the garden "outstanding" – as a work of art for its associations with Harlaw and Earl of Mar, and for its historical, architectural and archaeological interests. The Cowane Garden will merit serious consideration for inclusion in the *Inventory of Gardens and Designed Landscapes in Scotland*, and the Society would favour the compilation of a conservation plan, a programme of maintenance perhaps coupled with partial restoration, improved access, and the introduction of interpretation.

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1. Harlaw – at appendix B – National Archives.
2. Sturt and Lens – appendix B – Scottish Record Office.
3. Campbell – appendix B – British Library.
4. Joass – appendix A – Mitchell Library.
5. Triggs – appendix A – Edinburgh Botanical Library.
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*Appendix – Garden History Group Research – Cowane's Hospital*

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- B. Primary Sources*
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map of Stirling 1740 (R.H.P. 6517/11).
- Stirling Archives Map Woods Plan 1820.  
Map OS Stirling Burgh 1858 (first edition).  
Map OS Stirling Burgh 1951.  
Combines Burgh and Cowane's Hospital Minutes (1637-1708).

Cowane's Hospital Minutes (1708-1980).  
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(Kind assistance from John Harrison.)

Aerial Photograph

Bookshop, Baker Street

1997.

Painting, Guildhall Garden (c. 1860) showing fountain.

(Kind assistance from Bob McCutcheon.)

British Sundial Society

Cowane's Hospital Sundial recorded by A. Hancock and K. Mackay.



Figure 1 James A. Girvan, artist.

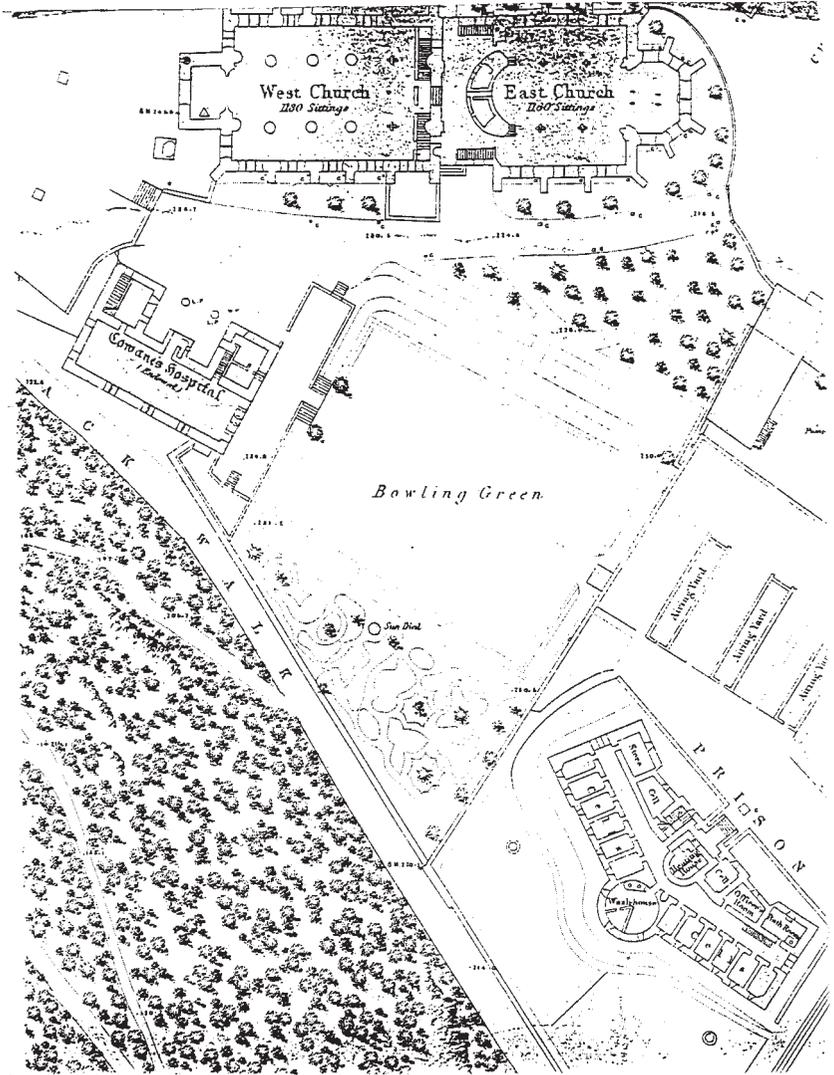


Figure 2  
Ordnance Survey Map published 1858.

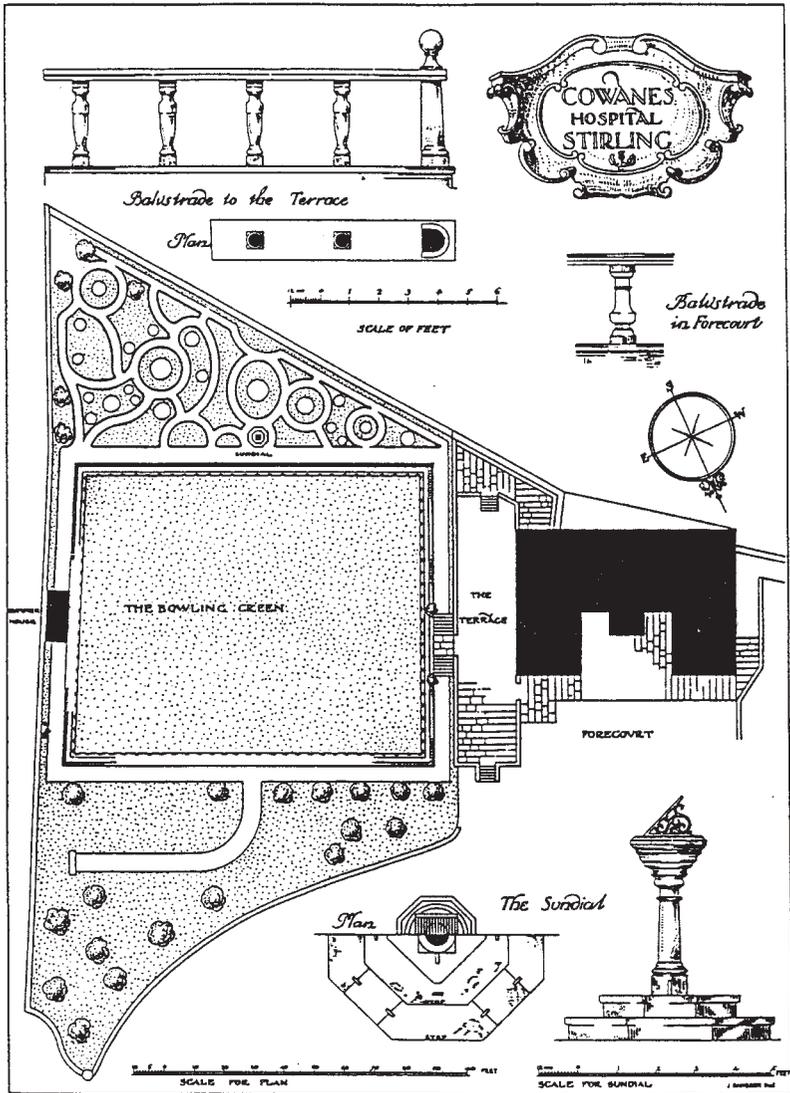


Figure 3  
Formal Gardens in England & Scotland by H. Inigo Triggs 1902.

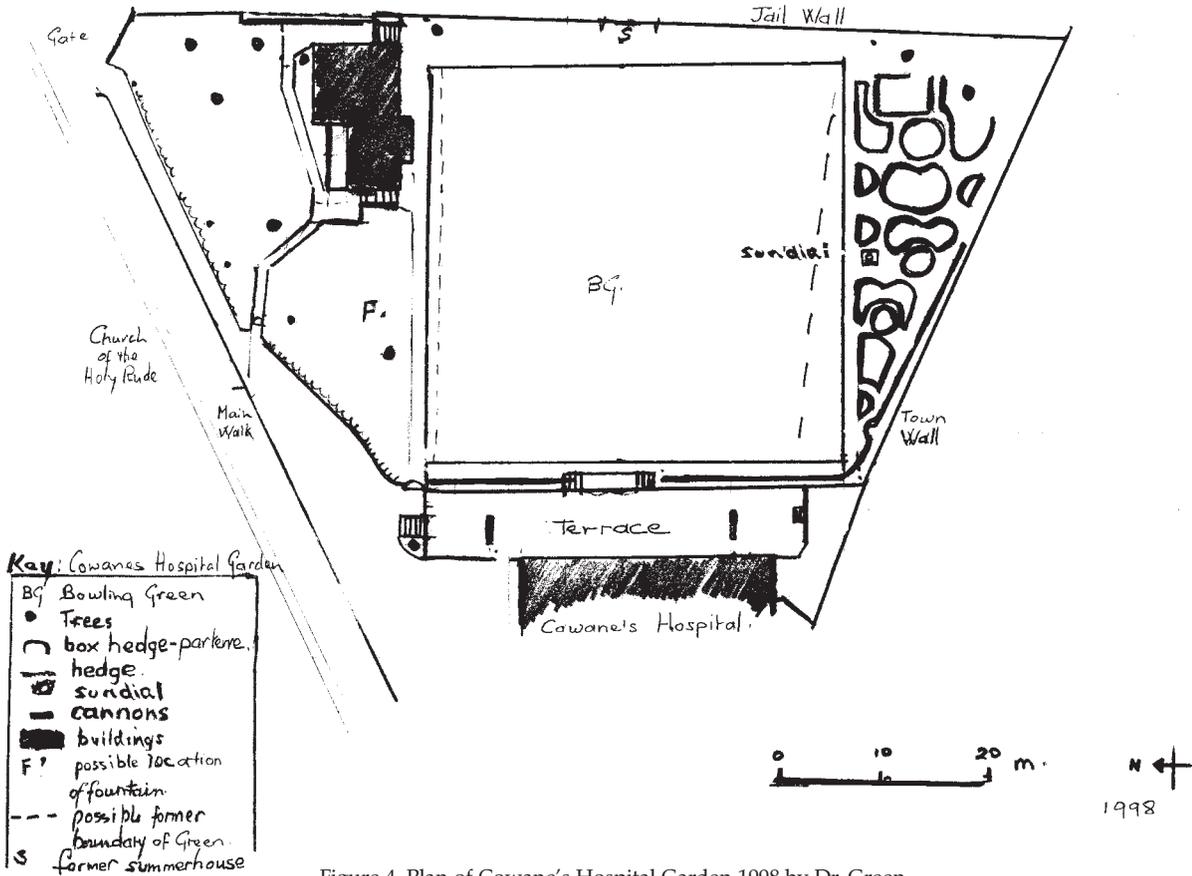


Figure 4 Plan of Cowane's Hospital Garden 1998 by Dr. Green.

## ST MARY'S CHURCH, ABERFOYLE

Peter Joynson

The name Aberfoyle is derived from the two Gaelic words *Aber* which means confluence or the uniting of two rivers and *Phuille*, a small river or burn which runs just south of the village cemetery into the Forth. Over the years the name *Phuille* has been anglicised and it is now called *The Pow* (pronounced *Pooh*).

Aberfoyle is known for many things, the principal industries now being farming, forestry and tourism. In 1765, however, a narrow bed of clay slate (which starts in the Isle of Bute and runs north-east throughout the breadth of Scotland) was discovered in Aberfoyle entering the Parish just behind Couligarten and leaving it at Brig of Turk.

The Kirk Minister of the time declared that "*slate of grand quality is wrought wherever there is a demand for it*". Whilst his knowledge of minerals may have been without fault, his command of Gaelic was non-existent with the result that the local populace complained to the General Assembly of the Church of Scotland that "*they could not have a Minister who spoke to them in an unknown tongue*" and he was duly sacked from the Parish.

However the Minister was right about the good quality of Aberfoyle slates. They were heavier than the Welsh variety, strong and durable with a range of blue, purple and green colours, the latter being the most popular as green slates were only available at the Aberfoyle and Luss quarries in Scotland and were consequently much in demand.

Over the years production increased and, by 1800, 80 tons of slate were wrought per annum employing three men. Demand continued to soar and in about 1850 families and workers were recruited from Ballachulish and the Wester Isles to work in the quarry. A quarry village was built complete with Church and School catering for approximately eighty people. Only one house remains today of the village, which was situated adjacent to what is now called the Trossachs Road.

To extract slate the rock face was bored by air compressors and blasted by gunpowder. Work was carried out in "family units" (squads of four), two at the quarry face selecting the slate and two further down dressing them. There were two sizes of slate: full size – 14" x 18" and under size 10" x 5". Initially the slates were taken from the face by horse and cart and conveyed to the Port of Menteith where they were loaded onto a boat. Thereafter they were taken down the Goodie River and then the Forth to Stirling, and put on a train. The Goodie River was then much larger than it is now.

When the Strathendrick railway was extended from Buchlyvie to Aberfoyle in 1885, the transport of slates became very much easier. To get the slates to the station yard, a form of tramway was constructed. Trucks full of slates were

drawn by horse power from the quarry to a point well above the wood behind the School from whence a double track ran down a very steep decline to the School House. Here the laden trucks were attached to an endless wire and the weight of the descending trucks drew up the empty ones on the other line. Just behind the School House another horse was waiting to draw the full trucks to the railway yard along the tramway which, after crossing the main road by the Police Station, ran alongside the main road. The tramway remained in use until 1931 when the new Trossachs Road was opened and allowed transport lorries to reach the quarry face.

In 1900 the quarry was the third largest in Scotland producing 1.4 million slates.

Curiously almost all the quarry workers who had come down from the North and West were devout Episcopalians, a much older faith than the Church of Scotland. Their ancestors must have been considered Jacobites although they were in the anomalous position of adhering to a Roman Catholic Pretender whilst refusing allegiance to a Protestant Monarch.

Although there was a Church within the quarry village it was considered to be too small and the quarrymen decided to build another one in Aberfoyle. An approach was made to the Duke of Montrose for a suitable site and he gave them a piece of land near Lime Craig just above the east end of the village.

Work on the new Church was started in 1892, the quarrymen giving their labour free of charge and working in their spare time. They could probably afford to do this as they were much better paid than other workers in the district earning, per family, an average of £2.50 per week calculated on a kind of a piece rate basis.

The building stone for the Church was acquired at very little cost due to an entrepreneurial builder named Hugh Kennedy from Ayrshire who made a bargain with the railway company to bring in stone from Ailsa Craig free of charge, in order to test the weight capacity of the company's new railway line being extended across Gartmore Moss. In addition to providing building materials for the Church the builder also erected Craighuchty Terrace, the Station Buildings and – for himself – Corrienessan.

It is likely that additional assistance came from local people, and I know that my great uncle Richard Joynson gave £500 towards the project. The family thereafter called the Church Uncle Richard's Kirk.

The work was completed in 1893 and the Church named St Mary's. The first priest in charge was the Reverend Henry Lawrence Williamson.

There does not appear to be anything in the Church to commemorate the work of the quarrymen except for a builder's trowel which hangs on the wall by the main door.

Perhaps we should do something to rectify matters?

## MUSIC IN STIRLING: KNOW THE SCORE

George McVicar

*St Cecilia's Day 1999 Lecture*  
*Stirling Stories Series, Stirling Smith Art Gallery and Museum*

It was in the interval between being appointed the first supervisor of music (the designation advisor came later) to Stirlingshire and actually taking up the appointment in January 1956 that Her Majesty's Inspector of Music in Schools said to me, "Well, I hope you know you are going to the worst musical desert in Scotland". He was of course referring to the state of music in schools and emphatically not to the provision of music within the community. By then, the mid fifties, most local education authorities had appointed an advisor to draw up a curriculum of instruction for the classroom and to create a scheme of instrumental instruction for interested pupils. When I came to Stirling, there were primary class teachers who had never taught a music lesson and there was only one violin instructor, Andrew Dick, to serve all the schools between Grangemouth, Kilsyth (then in Stirlingshire), Killearn, Balfron and Balmaha.

However, if that was the situation in the county's schools, it was not in anyway representative of music provision here in the town of Stirling or in neighbouring Bridge of Allan. In both pre- and post-reformation times, there was music making and composition at Stirling Castle court. In 1848 Chopin stayed at Keir House in Bridge of Allan, and through the 19th century there were various music associations and choral societies. By the 20th century John M. Hay, owner of the music shop in Murray Place and later in Friars' Street, had brought to Stirling a superb series of celebrity concerts, while the Public Interests Association had begun a similar series in Bridge of Allan. This series was succeeded by the Bridge of Allan and District Music Club started by Dr Welsh in 1945 – see *Music in Bridge of Allan* (1).

Mr Hay's concerts were held in the Albert Hall. There were two or three a year and prior booking was essential. Furthermore the audience was expected to wear evening dress. Mr Donald Hay kindly gave me a loan of his father's album and from it I discovered that Dame Clara Butt gave a concert in the series in 1926 (Figure 1) and that on that occasion Sir Harry Lauder came as a guest. The following year brought Elena Gerhardt, Sir Henry Wood, and Ivor Newton. In Mr Hay's album there is a signed photograph of Sir Thomas Beecham, but it does not say what Sir Thomas did at his concert. I assume he did not play the piano, because in a radio talk I once heard him describe himself as the world's worst pianist and I remember thinking – You're saying that because you have never heard me. When John Barbirolli came, he conducted what was then the Scottish Orchestra, now the RSO. David McCallum of Kirkintilloch was the soloist. Others taking part in this astonishing series included the Lener Quartet, Count John MacCormack (then

still plain Mr and described by Mr Hay as a jovial character), Solomon, Pouishnoff, Louis Kenter and Florence Austral. When the Scottish tenor, Joseph Hislop came, two rows of seats had to be put on the platform to accommodate the audience. If Joseph Hislop's name is not familiar in 1999, that of his pupil, Donald Maxwell certainly is. What must have been an event of special local interest was the appearance at these concerts of Stirling-born Muir Mathieson. I don't know the date of the concert, but presumably by then Mr Mathieson was an established and well known conductor. He came with the Reid Orchestra, the orchestra of the Music faculty of Edinburgh University. It was General John Reid who founded the Chair of Music at Edinburgh University. The Friends of the MacRobert have sponsored some concerts like recitals by the Edinburgh Quartet. The Quartet in 1998 gave a recital here in the Smith and that gave rise to the Quartet choosing Stirling as one of only three venues for its Premiers Tour which featured, over the three concerts in each town, new works by three young Scottish composers.

That has all been about listening to music and going to concerts, but music lovers have also wanted to make music. In 1951, the Stirling and District Choral Union was formed. Its predecessor was the Stirling Choral Society founded in 1866, but disbanded in 1938. Derrick Cantrell was the first conductor of the new Choral Union which, with a choir of '100 voices' and an orchestra of 18, was launched with a performance of Messiah. Roy Lennox took over from Mr Cantrell in 1954 and since has brought to Stirling such soloists as Duncan Robertson, Pat MacMahon, Neil Mackie (now head of Vocal Studies at the RCM), and Neil's wife, Kathleen Livingstone. The repertoire has ranged over the centuries from Purcell (*Dido and Aeneas*), Handel (*Messiah*, *Judas Maccabeus*), Haydn (*Creation*, *Nelson Mass*), Brahms *Requiem*, Mendelssohn's *Elijah* (Figure 2), Elgar (*Gerontius*), Kodaly and Vaughan Williams. The conductor we most associate now is George Farmer. I rang him to ask him to name three highlights of his spell as conductor. He had special praise for the artists at his first concert. There was no money for fees and Kate Lafferty, a former pupil of his own at St Modan's High School, Neil Mackie (still a student at the time) and Alan Wilkins, the organist, gave their services free. A highlight was the Dvorak *Stabat Mater* in 1991 because neither choir, orchestra, nor soloists knew it beforehand and George was introducing it to them. He has affectionate memories of his final concert (*Elijah*) when, as he said to me, the Choir "pulled out all the stops for me". The highlight was in 1993 when he had a choir augmented to 160 and an orchestra of 60 for the Verdi *Requiem*. Two of the soloists were Margaret Marshall and Frances McCafferty. (A new conductor takes over this season and I'm sure he has all our good wishes).

The Rosenethe Singers came into being as the choir required for a demonstration of choir training organised by SAMA with Arthur Oldham as the tutor. The group was intended for the training weekend only, but, at the suggestion of Arthur Oldham, stayed together. At first the singers concentrated on part songs and short choral works that did not infringe on the repertoire of the Choral Union. As time went on we got around to more extended works, the first of which was *Dido and Aeneas*, given in a concert performance in 1969

(Figure 3). Kate Lafferty sang Dido, Margaret Marshall was the Belinda and Alexander Bilsland the Aeneas. By that time we had formed an orchestra consisting of teachers and pupils and led by James Montgomery. The Rosenethe's ambitious project was Britten's *St Nicholas*, given during the 1970 Stirling Festival. Alexander Oliver sang the part of Nicholas. Ronald McIntosh and John Fraser were the piano duettists, David Frame played the organ and on this occasion, Geoffrey Lynn led the orchestra. The work requires a semi chorus (Britten calls it the Gallery Choir) and pupils of Stirling High School provided this. It is very gratifying to me that the singers keep going and flourish. Both George Farmer and George Wilson succeeded me as conductor and Matthew Beetchen of Dunblane Cathedral is the present maestro. Under Matthew they have aspired to the lofty peak of the Matthew *Passion*. They now work with the Scottish Bach Consort and I would urge you to go and hear them together.

The various churches have their choirs and the Dunblane, Bannockburn and Stirling male voice choirs combined to form the present Stirling Male Voice Choir. Under the conductorship of Sandy Sinclair they perform a repertoire of part songs. They give concerts locally and these feature guest artists (Figure 4). The choir also takes part in combined male voice choir festivals and in 1992 joined the Stirling Orchestra in one of their concerts.

There is also a Stirling Gaelic Choir. Founded in 1948, Sandy Sinclair was their conductor for 22 years. He was preceded by Archie MacLean and Kirsteen Grant, both of them Mod gold medallists and by Elaine Brown. Under the direction of Kirsteen Grant the choir won the National Mod's coveted Lovat and Tullibardine Shield and later, with Sandy as their conductor were runners up for the Lovat and Tullibardine and have taken prizes in the port a beul competitions. There is also a junior Gaelic choir. It has at present a membership of 18 singers. The applicants for a place need not necessarily be native Gaelic speakers. Like all Gaelic choirs, so far as I know, they have a Gaelic tutor. Under their conductor, Mrs Sheena MacKenzie, they take part in local and the National Mods and, Mrs MacKenzie modestly admits, took prizes under their previous conductor. The National Mod has come three times to Stirling in 1961, 1971 and 1987 and I have specially happy memories of the first of these when the adjudicators were Herbert Howells, Herbert Wiseman and Gordon Slater, with all of whom I had by that time become friendly. Together we had a number of happy social occasions. Herbert Howells was senior professor at the RCM, Herbert Wiseman was Head of Music, BBC Scotland, and Gordon Slater was the director of music at Lincoln Cathedral, a distinguished line up and an example of the standard of musicians at competitive festivals in those days.

Apart from the Youth Orchestra which had its first residential weekend at Kilsyth Academy (followed by many others, not to mention even visits abroad) (Figure 5), Stirling has had three orchestras, the Snowden Orchestra, the Rehearsal Orchestra and in 1982 the present Stirling Orchestra, a splendidly organised orchestra as I discovered from their archives kindly loaned to me by Campbell Hanna whom we must congratulate on his recent provost's award

for his services to arts in the Burgh. Their first conductor was Hugh MacDonald, now Head of Music, BBC Scotland. I first heard them under Paul MacAlinden and the present conductor is Timothy Redman. The orchestra has a distinctively Scottish leaning and I don't mean by that, that they play reels and strathspeys. They have commissioned works from a number of Scottish composers, and play in the Holy Rude. Frances McCafferty, Kathleen McKellar Ferguson, and her sister Angela in the Poulenc organ concerto, have been soloists, and Caroline Sparey Gillies in a work by her husband Robert Sparey Gillies.

The Stirling Festival began in 1958 (Figure 6) and the schools came into their own then giving a concert called Songs of Britain with six choirs and a verse speaking chair from Stirling High School. *St Nicolas* which I referred to earlier was part, in fact the first part of the opening ceremony of the 1970 festival. Another Stirling Festival presentation was Britten's opera *Noyes Fludde*. Its presentation was very much a local effort, school pupils taking part came from Bannockburn High School, Riverside, St Ninians, Bridge of Allan, Borestone, Raploch, Holy Trinity, St Mary's schools of both Bannockburn and Stirling, Stirling High, St Modan's High, and Dunblane High. The part of Noye was sung by Jolyon Dodgson, then director of the MacRobert Centre with Ian Ainsworth replacing him for one of the four performances, Mary Griffiths was Mrs Noye. Members of the teaching staff formed the chamber orchestra but the work also calls for ripieno strings, recorders, bugles, percussion and hand bells and these were all played by pupils, assisted in some cases by teachers. Still other pupils sang the parts of Mrs Noye's gossips, Sem, Ham and other smaller roles.

Just prior to the performances I had been in Ballymena adjudicating at their festival. One class was for solo boy trebles and one boy was head and shoulders above all the others. Unfortunately he sang the wrong arrangement of the set test piece and could not be awarded the prize. In my adjudication I foolishly said that I was going to be conducting performances of *Noye's Fludde* and would he like to come and sing the part of Sem for me. The next day he arrived at the adjudicating table asking if I was serious about him singing in my opera (I wonder what BB would have made of that!). I said I'd love to have him singing Sem, but the performances were in Scotland and not Ireland. "But my mother said I could come". It was then I realised the extent of my gaffe. What would Margaret Gray the producer, say?, I am pretty sure Margaret was taken aback, but gave in at once when I told her that the boy's mother had said that a child brought up in Northern Ireland at that time was a deprived child. David, now a priest in Belfast, came over and sang gloriously. I think *Noye's Fludde* was the most satisfying conducting experience of my life. When I told HM's Inspector of Music – the same one of the 'musical desert' – he said he wasn't surprised. *Noye's Fludde*, he said, had everything in it (Figure 7).

After Richard Galloway succeeded Bradley Catto as adviser, he formed a large and encouragingly enthusiastic youth choir which performed an enterprising repertoire which included such works as Bernstein's *Chichester*

*Psalms*. They combined with the youth orchestra which had grown out of all proportion to that first group that spent a weekend at Kilsyth. They even undertook overseas tours. There was even a junior choir conducted by Frances McCafferty before she left teaching to pursue her very successful career as a professional singer. One of Brad Catto's innovations was the Young Musician of Central Region competition. It was first held in the Albert Hall but Brad then decided that it should be part of the Central Region Music Competitive Festival. That festival was a flourishing affair about which Herbert Howells said to the local press, "I know no festival outside of Winnipeg with a better choral entry". In contrast to every other festival in Scotland even perhaps the whole of the UK, it has all but ceased to exist. The only class left is Brad's Young Musician competition.

But there is more. Stirling boasts an operatic society which annually fills MacRobert for a week with performances of contemporary musicals. Included in the instrumental instruction in the schools is piping and at one time there was a group playing traditional fiddle music. The school scheme covered all the instruments of the orchestra and we can boast that Stirling was the first county in Scotland to offer solo instruction in solo singing. A peak achievement was James Melville's inter-house music festivals at Stirling High School. The school's four houses competed against each other in different musical skills. There were 16 choirs all conducted by pupils, classes in solo singing – it was at one of these that I first heard Margaret Marshall, solo instrumental classes, and both vocal and instrumental ensembles. St Modan's gave us Kate Lafferty, Martin McHale, a trumpet player now in the orchestra of Welsh National Opera, John Woods now on the staff of Brisbane Conservatoire and still other musicians. Wallace High has produced some accomplished musicians that I've had the pleasure of meeting and also some blossoming composers. I must have missed out some who perhaps have not been brought to my attention and I apologise to them. Stirling High produced performers and teachers too numerous to mention.

During the course of this year, I have attended two choral concerts which well nigh filled the Holy Rude. One was a charity event in aid of Strathcarron Hospice. The other was given by the National Youth Choir of Scotland. At the latter the soprano and tenor soloists in Benjamin Britten's *Rejoice in the Lamb* were respectively Catriona Lang, a former pupil of Stirling High and Graham Boyce, ex-St Modan's. Look out for them; in both cases I predict a bright future. Only the week before last the schools' orchestra gave a concert that included a commission by the Scottish composer, Eion Hamilton. It was scored for orchestra, choir and pipes and so involved a representative section of all the county's young music makers. On Saturday last the Rosenethe combined with the Endrick Singers, the Crieff Choral Group and a choir from Morrison's Academy and made quite some progress in persuading me that after all *Carmina Burana* is perhaps not the worst work in the choral repertoire.

Earlier on I spoke of the tenor, Joseph Hislop filling the Albert Hall to such an extent that extra seats had to be put on the platform. If Ian Bostridge, by far

and away the most distinguished concert singer today were to be invited to Stirling, would he even half fill the MacRobert Centre? People do not go to concerts as they once did. Wouldn't it be wonderful if, before the next St Cecilia's Day, we were to witness a turning of the tide?

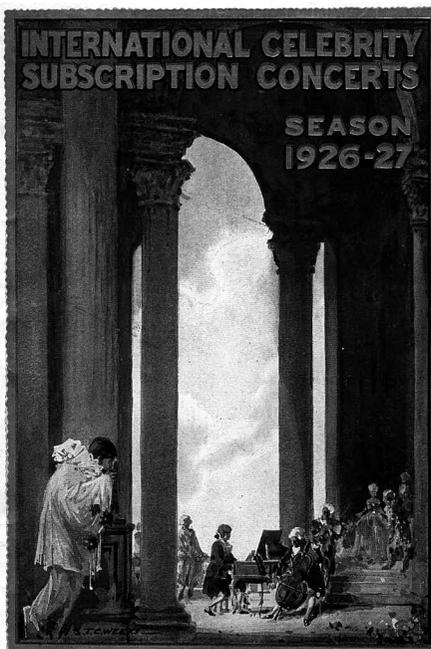
### Acknowledgements

We are grateful for assistances and illustrations to a number of people, including – Donald Hay, Margaret Gray, George Farmer, Sandy Sinclair, Peggy Roddan, Bob McCutcheon, and the Smith Art Gallery and Museum.

### Reference:

- 1 *Bridge of Allan, A Heritage of Music, and its Museum Hall*. FNH pamphlet and FNH Vol. 17, 75-88 by Gavin Miller and George McVicar.

Figure 1



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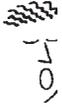
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Figure 2

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Continuo—RONALD McINTOSH, 'cello  
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Conductor—GEORGE C. McVICAR

Characters in order of singing in

"DIDO AND AENEAS" .....	Purcell
Belinda, a lady in waiting .....	MARGARET MARSHALL
Dido, Queen of Carthage .....	KATHLEEN LAFFERTY
Aeneas, a Trojan prince .....	ALEXANDER BILSLAND
Sorceress .....	MARGARET DEMPSEY
First Witch .....	MARGARET FARMER
Second Witch .....	CHRISTINE PRICE
Spirit .....	GRACE KINLOCH
A Sailor .....	GEORGE STEWART

ALBERT HALL, STIRLING

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PROGRAMME ..... ONE SHILLING

Figure 3

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Figure 4

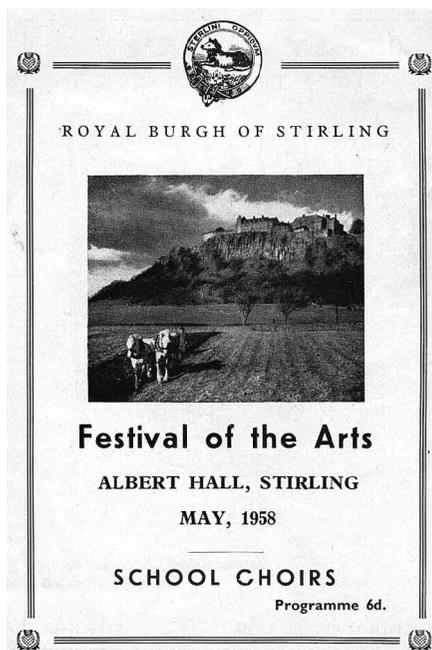


Figure 6



Figure 5 Stirlingshire Youth Orchestra.



Figure 7 Stirling Festival 1970 1-4 June. *Noyes Fludde*. Church of the Holy Rude. Above the hubbub of the storm, the hymn 'Eternal Father strong to save' is heard, sung by Noye and the others in the ark. The congregation joins in, and slowly the storm begins to abate.

## THE FORTH NATURALIST AND HISTORIAN

The Forth Naturalist and Historian (FNH) is an informal enterprise of Stirling University. It was set up in 1975 by several University and Central Regional Council staff to provide a focus for interests, activities and publications of environmental, heritage and historical studies for the Forth area comprising the local authority areas of Stirling, Falkirk and Clackmannshire.

The promotion of an annual environment symposium called *Man and the Landscape* has been a main feature, and this November 2000 is its 26th year with presentations on Biodiversity, Human modification of the Forth, Eagle Watch, Parliament and Environment, Cowane Garden, and Falkirk Wheel.

The annual *Forth Naturalist and Historian* has since 1975 published numerous papers, many being authoritative and significant in their field, including annual reports of the weather, and of birds in the locality, plus book reviews and notes. These volumes (23 as of 2000) provide a valuable successor to that basic resource *The Transactions of the Stirling Field and Archaeological Society, 1878-1939*. Five year contents/indexes are available, and selected papers are published in pamphlet form, while others eg. Ashfield Factory Village, The Weather and Bird Reports, and Flora papers, can be available as reprints.

A major publication is the 230 page *Central Scotland – Land, Wildlife, People 1994*, a natural history and heritage survey, and used in schools throughout the area, also in the form of a CD-Rom, *Heart of Scotland's Environment (HSE)*.

Other FNH and associated publications still in print include – *Mines and Minerals of the Ochils, Airthrey and Bridge of Allan* – a guided walk. *The Making of Modern Stirling, Woollen Mills of the Hillfoots, The Ochil Hills* – landscape, wildlife, heritage – an introduction with walks, *Alloa Tower and the Erskines of Mar*, and the *Lure of Loch Lomond* a journey round the shores and islands. Several of these are in association with Clackmannanshire Field Studies Society. Godfrey Maps have collaborated in producing old Ordnance Survey large scale maps of the 1890's for some 20 places in the area.

FNH publications are listed on the internet by Book Data (thebookplace.com and Bookends.co.uk), British Library (OPAC 97) and by booksellers eg Amazon and Barnes and Noble....

Offers of papers/notes for publication, and of presentations for symposia are ever welcome.

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## EARLY FOOTBALL AT CALLANDER

Neil Tranter

Ever since the third quarter of the nineteenth century, when they first emerged as separate activities, the sports of rugby and, especially soccer, have maintained an extraordinary level of popularity among Scotland's sporting pastimes. One of the most important of the no doubt numerous reasons for this was the long tradition of folk forms of football which preceded them and which provided the necessary legacy of interest and skill on which they could build.

Prior to the emergence of rugby and soccer, football was a rough, boisterous game which combined kicking and handling practices in ways that varied markedly from region to region. In some regions there was a clear distinction between players and spectators. In others the distinction was less obvious. Substantial regional differences existed both in the size of teams and in the dimensions and nature of playing arenas. Rules were few, vague, and in the apparent absence of officials to enforce them, probably rarely, if ever, applied. Little wonder that as at Bewcastle in 1599, where a game between Scottish and English borderers "degenerated into a brawl", and at Duns in 1724, where the town Baillies complained of the "tumults" caused by a match played on Eastern E'en, violence was a not infrequent corollary<sup>(1)</sup>.

Precisely when the sport of football was first played in Britain is unlikely ever to be known for certain. One possibility is that it derived from the game of harpastum introduced by invading Roman soldiers in the first century AD<sup>(2)</sup>. The subsequent popularity of ball games at various places in the Scottish borders – at Ancrum, Denholm, Duns, Galashiels, Hawick, Hobs Kirk, Jedburgh, Kelso, Lilliesleaf, Melrose, Morebattle, St. Boswells, Selkirk and Yetholm – all on or close to Dere Street, one of the two main Roman routes into Scotland, and at sites of Roman camps elsewhere in the country – at Callander and Scone for example – might be regarded as tentative support for this. The fact remains however, that the first written reference to football does not occur until 1175 when William Fitzstephen noted that the youth of London had been allocated ground on which to leap, wrestle, cast the stone and play with the ball<sup>(3)</sup>. Thereafter, references to the sport of football are sufficiently frequent to suggest that, despite periodic attempts to ban it as a distraction from archery or a source of disorder, it remained a common pastime. Acts of Parliament prohibiting the practice of football were passed at regular intervals throughout the fifteenth century, in 1424, 1451, 1458, 1471 and 1491, and again as late as 1603 and 1656<sup>(4)</sup>. Locally, bans on playing the game were imposed at places and times as diverse as St. Andrews, in 1497, Peebles, in 1570, and Elgin, in 1586 and 1618<sup>(5)</sup>. Complaints about the practice of football, particularly on the Sabbath, were recorded at Kirkmichael in 1511, Kirkliston in 1585 where the offender was the local minister, Muirton (Perth) in 1591 where one of the offenders was a son of the laird of Luncarty, Blairgowrie and Kincapple in 1600, Aberdeen in

1607, Perth in 1620, Carstairs in 1628, Rayne and Culsalmond (Aberdeen) in 1648, Kirkwall in 1670, Banff in 1684 where players were fined 40 shillings for playing in the streets, and Kenmay in 1724<sup>(6)</sup>.

In spite of its well-documented persistence, this opposition seems to have done surprisingly little to undermine the long-term popularity of the sport. Football is known to have ceased at Logie-Buchan (Aberdeenshire) around the beginning of the seventeenth century, at Monzie (Perthshire) sometime between 1691 and 1711, at Fordice (Banffshire) at the beginning of the eighteenth century and at Scone and Moulin (Perthshire), Cross and Burness, North Ronaldshay and Ladykirk (Orkney) and Montquhitter (Aberdeenshire) long before the end of the eighteenth century<sup>(7)</sup>. But such cases were not typical. With the possible exception of the Cromwellian interregnum when entertainments of all kinds were subject to especially fierce attack, football remained a widespread activity. By 1497, when the Lord High Treasurer supplied money to buy footballs for James IV, it was extensively practised by gentry and commoner alike<sup>(8)</sup>. Among other places, football was reported at Stirling in the late fifteenth century, St. Andrews in 1537 and 1552, Perth in 1546, Glasgow in 1575 and 1609, Shelsay near Kelso in 1595, Lanark in 1618, Glassford in 1638, Garioch in 1648, Aberdeen in the 1630s and 1660s and on Orkney in 1650<sup>(9)</sup>. However badly the sport may have suffered during the period of greatest Puritan fervour in the mid-seventeenth century, it had more than recovered its earlier popularity by the end of the century. Between the late seventeenth and late eighteenth centuries its practice was recorded at venues ranging from Kirkwall on Orkney where in 1787 it was reputedly the “principal diversion of the common people”, “most country parishes of Aberdeenshire” and Aberdeen Grammar School in the north, to Kippen, Scone, Glasgow, Leith and the universities of St. Andrews, Edinburgh and Glasgow in the central belt, and Ancrum, Duns, Hawick, Jedburgh, Melrose, Newbattle, Yetholm and schools at Ayr and Kilmarnock in the south<sup>(10)</sup>. At least until the final quarter of the eighteenth century, such admittedly patchy evidence as there is suggests that football, already a national sport in the sixteenth century, remained as popular as it had ever been<sup>(11)</sup>.

According to some of the surviving evidence, in the course of the late eighteenth and early nineteenth centuries, undermined by the demands of the new urban-industrial economy for space and longer working hours and by a growing commitment to less violent, more civilised forms of behaviour, the popularity of the sport substantially declined. In Scotland, Thorburn has argued, football had ceased to be a popular pastime by 1800<sup>(12)</sup>. Commenting on the situation in Glasgow, Bilsborough, too, has claimed that sports like golf and football largely disappeared during the early decades of the nineteenth century<sup>(13)</sup>. By the 1790s, at Montquhitter (Aberdeenshire) and Moulin (Perthshire), football had become confined to schoolboys and at some time in the fifty years or so prior to the 1830s and 1840s had entirely ceased in the Berwickshire parishes of Wigton and Robertson and Westruther and Foulden and at Cross and Burness on Orkney<sup>(14)</sup>.

Other evidence, however, offers a more optimistic view of the popularity of football in late eighteenth and early nineteenth century Scotland. Writing of his time at Merchiston School between 1855 and 1857, Dr David Murray described football as “the good old Scottish game (which) had been played for centuries.”<sup>(15)</sup> The subject of the present paper – the football match played annually on the Roman Camp at Callander either on Christmas Day, New Year Day or Old Handsel Monday (the second Monday in the year) – may be considered a particularly valuable example of the sport’s continuing appeal.

The first known reference to the Callander football match dates back to 21 January 1842 when the *Stirling Journal* reported that on the previous Monday, “despite knee-deep snow” which had to be “beaten as smooth and firm as marble”, the footballers of Callander played several well-contested “hails” on a field next to the Roman Camp before adjourning to the Roman Camp House, the home of David Fogo, where they were “treated with an abundance of Glenlivet”<sup>(16)</sup>. Subsequent references, however, indicate that the match long pre-dated 1842. In several later reports it was described as having been played “from time immemorial.”<sup>(17)</sup> According to a report of the 1855 match, “many were on the field who had been players for at least forty years.”<sup>(18)</sup> In 1883 Alex McFarlan, aged 78, claimed to have been a spectator for seventy years<sup>(19)</sup>. In reality, as indicated by the fact that in 1879 it was recorded as having been played “for generations past”,<sup>(20)</sup> the origins of the event were almost certainly far older than the early years of the nineteenth century. Whether or not they go back to Roman times is impossible to verify, though the long tradition of football in other parts of Scotland and the frequency with which the Callander match is described as a custom of “immemorial usage” implies that such an assumption is not unreasonable. What is certain is that the game was last played on New Year’s Day 1883, thereafter succumbing to a growing preference for the more organised, less violent sport of soccer and support for the local Callander Rob Roy soccer club, formed in August 1878.

Few details are available of the nature of the Callander match. If the procedures current in the third quarter of the nineteenth century were typical of earlier times, intending players gathered outside the Dreadnought Hotel at around eleven o’clock on the morning of the match. From there, headed by a piper, they marched through the town to the Roman Camp where they were divided into two teams led by respected footballers and citizens like Walter Buchanan, a solicitor, and the two Finlay Fergusons, the one a boot and shoe maker, the other a builder. At the 1876 match each team comprised about fifty players. At that of 1879 eleven members of the local Rob Roy club played against 55 drawn from the male population of the town. How representative these numbers were of the size of the teams at other times we have no way of knowing. Play began at mid-day and lasted four hours, during which four or six “hails”(goals) were normally contested. Otherwise, almost nothing is known about the way the game was played<sup>(21)</sup>. Tantalisingly, a report on the 1862 match mentioned that “the players on both sides ... took advantage of all the modes of attack and defence which the rules of the game allow”, also

noting that “the agile feats performed at the back, centre, points and cahouchan of the hail were of such an exciting and manly kind as to draw frequent applause from the numerous male and female onlookers”.<sup>(22)</sup> But nowhere are these rules and positions more precisely specified.

Whatever its format, there is no doubt that the Roman Camp football match attracted large numbers of spectators and generous patronage. That of 1850 was watched by “a great number of the inhabitants of Callander.” In 1854 “the whole country turned out for miles around.” The following year “hundreds assembled from various parts of the country to see and take part in Auld Scotia’s manly game.” In 1862 and 1865 the spectators were described as “numerous”<sup>(23)</sup>. Lord and Lady Willoughby d’Eresby, the owners of the Roman Camp, David Fogo and James and A Stewart, its tenants, made available the ground on which the match was played. Other members of the social elite of the district, among them Walter and Peter Buchanan, John Ferguson, Duncan McGregor, Angus McDonald, a banker, G.C. Robertson of Torrie and Peter Strang, supplied the copious quantities of whisky required for the post-match festivities<sup>(24)</sup>. In contrast to what many historians have hitherto tended to assume, the case of the Roman Camp football match demonstrates that by no means all of even the more violent traditional sporting activities suffered from a calamitous withdrawal of public and elite support in the first half of the nineteenth century.

It is also obvious from the observations made in local newspaper reports of the Roman Camp spectacle that it was merely part of a much wider and persisting culture of folk football. On 13 January 1865 the *Stirling Journal* noted that

“last Monday, Mr Finlay Ferguson, the veteran General of the players, issued an official order by the public crier of the place calling on all players to muster in full force on every evening of this week to put themselves in preparation for the exciting games that are to be played on Old Handsel Monday – that day being the grandest football festival of the season in Callander.”

Clearly, as common-sense might have led us to suppose, the practice of football at Callander was not restricted solely to the annual Roman Camp match. Nor, to judge from other comments in the pages of the *Stirling Journal*, was it restricted solely to the inhabitants of Callander, even if standards of play were rarely as high elsewhere. “Perhaps there is no place in Scotland more celebrated for the ancient and exciting game of football than the village of Callander”, the newspaper claimed in January 1854<sup>(25)</sup>. “We believe few villages in Scotland could turn out to try the fortune of the day against our own athletic mountaineers”, it was observed a year later<sup>(26)</sup>. “The football players of Callander are second to none at the fine old athletic game ... not even to the celebrated ‘Souters’ of Selkirk ... the seniors could be proud of their sons in maintaining the ancient and hitherto unapproached by any other glory of this parish for football”, the *Stirling Journal* continued to insist in the late 1850s and early 1860s<sup>(27)</sup>.

Infrequent and sparse in detail though they are, the newspaper reports of the Callander Roman Camp football match serve as an important reminder to historians not to understate the extent to which older forms of football survived until well into the second half of the nineteenth century when the modern world of institutionalised, codified and commercialised sport first effectively emerged. That they did so goes far towards helping us to understand why their successors, rugby and soccer, proved so popular from the outset.

## References

- 1 Sandy Thorburn, *The History of Scottish Rugby*, London, 1980, p.324.
- 2 Harpastum was played between two teams on a rectangular pitch divided by a centre line. The aim was to force a small, hard ball over the opposition's end line.
- 3 Thorburn, 1980, pp.1-4.
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- 16 *Stirling Journal* 21/1/1842.
- 17 *Stirling Journal* 6/1/1871. See also *Stirling Journal* 28/1/1853, 22/1/1858, 20/1/1860, 17/1/1862, 5/1/1877, 27/12/1878.
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## BOOK REVIEW

Stop press

**Bannockburn Revealed:** a reappraisal – the problems, sources, solutions, status of the arguments, and discoveries in topography. William Scott. Elenkus, Rothesay. 490pp. ISBN 0.9521910.1. 6. £25.

In our brief review of the book *Bannockburn* by Peter Reese on page 110 above (prior to knowledge of this Scott book) we remarked that “William Scott will no doubt be peeved that his contribution to the story is not recognised at all here by Reese who claims his is ‘the first dedicated analysis of the battle in over 75 years’”!! So here is a major contribution to this controversial, very Scottish, subject.

In the author’s words in the preface, it is not a straight read descriptive work but ‘mainly argument’. And he presents it in a very discursive manner. It is as Paul Scott says “told with such pace and imagination that it is a compulsive read.” The book contains and discusses all the relevant passages in the ancient chronicles and their commentaries, by eg. Professor Duncan.

Work done with maps and on the ground explores and clarifies conflicting features in the sources and between scholars/researchers. There are discussions of versions of the battle, with various maps and colour illustrations of sites, including a dozen of stages of the battle from Day 1 Noon to Day 2 6.30 am with the English in flight.

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