

---

# LOCH OF WINLESS

*H.J.B. Birks*

OS Grid Reference: ND293545

## Highlights

Pollen grains preserved in the layers of sediment which infill the bed of this loch provide a detailed record of the vegetational history of Caithness during the Lateglacial and Holocene. This information contributes significantly towards the understanding of the environmental history of this ecologically unique area.

## Introduction

Caithness is an area of unique ecological interest. In the north-east, the area of shelly till, the so-called Caithness Plain, is today mainly crofting and farm land. To the west and south, the area of non-calcareous, sandy till is dominated by vast areas of patterned blanket-bog or "flows". This is the largest area of continuous peatland in Britain and is of international importance to ecologists and palaeoecologists (Stroud *et al.*, 1987; Lindsay *et al.*, 1988). Caithness is today one of the most extensive treeless areas in Britain (excluding recent plantations of exotic conifers).

Despite its importance ecologically, very little is known of the Late Quaternary vegetational and ecological history of Caithness. Loch of Winless (ND 293545) is the only site from which a detailed Lateglacial and Holocene pollen diagram, with radiocarbon dates has been published (Peglar, 1979). Loch of Winless lies approximately 8 km west-north-west of Wick at an elevation of 9 m OD. It is a small lochan within a basin now almost completely infilled with fen peat and lake sediments up to 6 m depth. The palynological results from this site are thus of particular significance in the context of Holocene vegetational history of Britain and of Scotland (see Birks, 1977, 1989)

## Description

The sediment infill at Loch of Winless is *Sphagnum* peat overlying coarse detritus (organic) muds, marl, and silts (Figure 5.2). Ten radiocarbon dates are available (Figure 5.2) and suggest that the basal sediments may be as old as 12,800 BP. However, the earlier dates are likely to be subject to hard-water errors because of the calcareous nature of the surrounding boulder clay and underlying Old Red Sandstone. Peglar (1979) proposed that the basal sediments may only extend to about 12,500 BP. The pollen record has been divided into five local pollen assemblage zones (Figure 5.2). Zones LW1 and LW2 are assigned to the Lateglacial; zones LW3–LW5, to the Holocene.

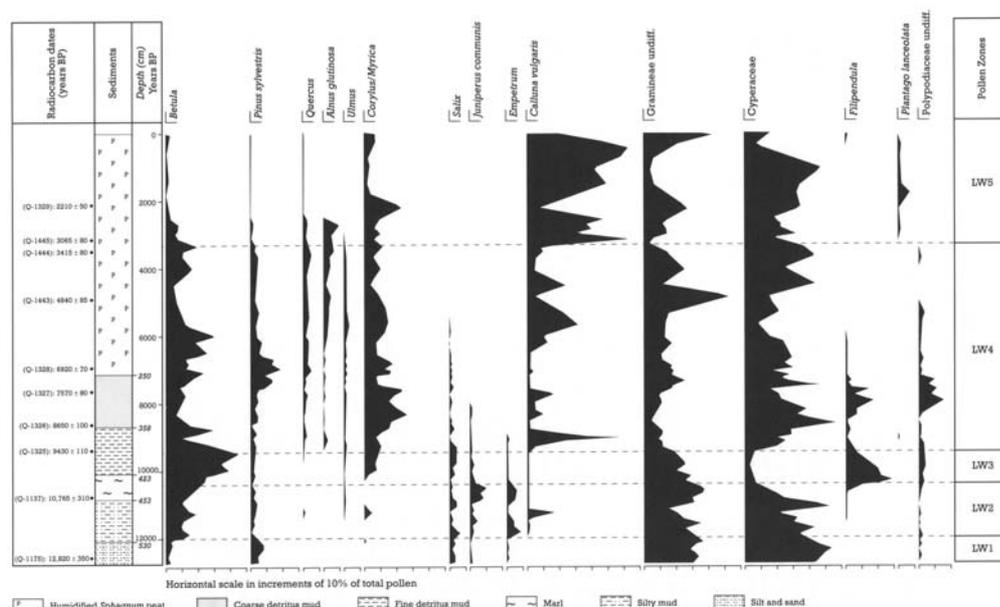


Figure 5.2: Loch of Winless: relative pollen diagram showing selected taxa as percentages of total pollen (from Peglar, 1979). Note that the data are plotted against a radiocarbon time-scale.

## Interpretation

The pollen record shows that the Lateglacial vegetation was grassland and tall-herb communities, with abundant Cyperaceae and a variety of open-ground herbs including some arctic–alpine species which today are restricted to high elevations in north-west Scotland. In contrast to Lateglacial sequences from the north-west Highlands and the Inner Hebrides (see Pennington, 1977a; Lowe and Walker, 1986a) dwarf-shrubs such as *Empetrum* appear to have been unimportant throughout at Loch of Winless and on Orkney (Moar, 1969a), perhaps as a result of the higher fertility of soils on the Old Red Sandstone.

The early and middle Holocene vegetation (10,000–6000 BP) was probably a mosaic of species-rich, tall-herb and fern communities, birch, hazel, and willow scrub, and grassland. The pollen assemblages clearly indicate that oak and pine were never major components of the Holocene vegetation. Indeed it is likely that they were absent from the Loch of Winless area throughout the Holocene (Birks, 1989). The pollen data also suggest that the area was never extensively forested at any time during the Holocene, with tree pollen reaching a maximum of 50% and averaging around 25%. The most likely reconstruction is of birch, willow, and hazel scrub occurring locally in sheltered areas, and of widespread grassland and fern and tall-herb dominated stands on moist, well-drained, and fertile soils. With nutrient depletion by leaching, soils deteriorated and *Calluna* heath and moorland began to expand at about 6000 BP. *Alnus* may have been present in low amounts after about 5500 BP. Despite the abundance of archaeological sites in north-east Caithness, there is very little unambiguous palynological evidence for human impact on the vegetation until about 2500 BP (see Huntley, in press).

Over a wider area this general pattern of Holocene vegetation is reflected in the results of Durno (1958) and Robinson (1987). Fossil pine stumps in the blanket peat of south-west Caithness (Lewis, 1906; Gear and Huntley, 1991) indicate that pine grew locally during the mid-Holocene, but perhaps for only a short time (Gear and Huntley, 1991).

The site and its pollen record are important for several reasons. First, they demonstrate that north-east Caithness was never extensively forested and that the area was the least wooded lowland area of mainland Britain during the Holocene (Birks, 1988). Pine and oak were absent, and birch, willow and hazel scrub probably occurred locally in sheltered areas, possibly with some elm and alder. By extrapolation, the data from Loch of Winless suggest that the flow country to the west and south was similarly never extensively wooded (Birks, 1988).

Second, Loch of Winless provides the youngest dates for the first arrival of *Ulmus* and *Alnus*

during the Holocene in mainland Britain (Birks, 1989). These dates demonstrate that elm took 3000 years to complete its spread through Britain from south-east England (c. 9500 BP) to Caithness (6500 BP). Alder pollen is present in low amounts from 8500 BP, but it does not attain its maximum values until 5500 years later (Bennett and Birks, 1990), presumably because of the extreme climatic severity of this exposed northern area.

Third, the site provides a reference Holocene pollen profile for the ecologically unique area of Caithness. There are, at present, no other continuous, well-dated pollen profiles published from the area (Birks, 1989).

Fourth, the pollen data suggest, rather surprisingly, that human impact on vegetation has never been intense despite the abundance of archaeological sites nearby. Alternatively, the pollen data in such an extreme, exposed, and naturally open or lightly wooded area, are poor reflectors of human impact. There is support for such an explanation from charcoal evidence from further west (Charman, 1992) and south (Robinson, 1987), which suggests that human impact on the landscape may have been significant from as early as 7500 BP.

Fifth, it raises several intriguing and important palaeoecological hypotheses about the extent and control of tree growth in the Holocene (Gear and Huntley, 1991) and about the apparent steepness of vegetational gradients in northernmost Britain (Birks, 1988). The testing of these hypotheses can only be attempted by new investigations in the nearby flow-bog country of central and western Caithness.

Loch of Winless and its pollen record clearly show that the vegetational history of north-east Caithness has been different from anywhere else at low elevations on mainland Britain. It has a unique ecological history and suggests that forest growth this far north was always extremely limited during the last 10,000 years. This palaeoecological lesson from the past is an ecological indicator of the area's unsuitability for productive forestry and of the ecological uniqueness and conservation importance of this part of northern Scotland (Stroud *et al.*, 1987; Lindsay *et al.*, 1988; Huntley, 1991).

## Conclusions

The deposits at Loch of Winless provide a detailed record of the vegetational history of Caithness during the Lateglacial and Holocene, during approximately the last 13,000 years, based on pollen analysis and radiocarbon dating. The results show that the area has never been extensively afforested and that it was the least-wooded lowland region of the mainland during the Holocene. Loch of Winless contributes important information towards establishing the pattern of spread of tree species during the Holocene and is a key reference site for reconstructing the vegetational and environmental history of this area of the northern mainland.

## Reference list

- Bennett, K.D. and Birks, H.J.B. (1990) Postglacial history of alder (*Alnus glutinosa* (L.) Gaertn) in the British Isles. *Journal of Quaternary Science*, **5**, 123–33.
- Birks, H.J.B. (1977) The Flandrian forest history of Scotland: a preliminary synthesis. In *British Quaternary Studies: Recent Advances* (ed. F.W. Shotton). Oxford, Clarendon Press, 119–35.
- Birks, H.J.B. (1988) Long-term ecological change in the British uplands. In *Ecological Change in the Uplands* (eds M.B. Usher and D.B.A. Thompson). Special Publication of the British Ecological Society, No. 7. Oxford, Blackwell Scientific Publications, 37–56.
- Birks, H.J.B. (1989) Holocene isochrone maps and patterns of tree-spreading in the British Isles. *Journal of Biogeography*, **16**, 503–40.
- Charman, D.J. (1992) Blanket mire formation at the Cross Lochs, Sutherland, northern Scotland. *Boreas*, **21**, 53–72.
- Durno, S.E. (1958) Pollen analysis of peat deposits in eastern Scotland and Caithness. *Scottish Geographical Magazine*, **74**, 127–35.
- Gear, A.J. and Huntley, B (1991) Rapid changes in the range limits of Scots Pine 4000 years ago. *Science*, **251**, 544–7.
- Huntley, B. (1991) Historical lessons for the future. In *Scientific Management of Temperate*

- 
- Communities for Conservation* (eds I.F. Spellerberg, F.B. Goldsmith and M.G. Morris). British Ecological Society Symposium, No. 31. Oxford, Blackwell, 473–503.
- Huntley, J.P. (in press) Palynological investigations at Freswick, Caithness. In *Excavations at a Norse Settlement Site in Northern Scotland* (eds C.D. Morris and C.E. Batey). Highland Regional Monograph, No. 1. Inverness, Highland Regional Council.
- Lewis, F.J. (1906) The plant remains in the Scottish peat mosses. Part II. The Scottish Highlands. *Transactions of the Royal Society of Edinburgh*, **45**, 335–60.
- Lindsay, R.A., Charman, D.J., Everingham, F., O'Reilly, R.M., Palmer, M.A., Rowell, T.A. and Stroud, D.A. (1988) *The Flow Country. The Peatlands of Caithness and Sutherland*. Peterborough, Nature Conservancy Council, 174pp.
- Lowe, J.J. and Walker, M.J.C. (1986a) Lateglacial and early Flandrian environmental history of the Isle of Mull, Inner Hebrides, Scotland. *Transactions of the Royal Society of Edinburgh Earth Sciences*, **77**, 1–20.
- Moar, N.T. (1969a) Two pollen diagrams from the Mainland, Orkney Islands. *New Phytologist*, **68**, 201–8.
- Peglar, S. (1979) A radiocarbon-dated pollen diagram from Loch of Winless, Caithness, north-east Scotland. *New Phytologist*, **82**, 245–63.
- Pennington, W. (1977a) Lake sediments and the Lateglacial environment in northern Scotland. In *Studies in the Scottish Lateglacial Environment* (eds J.M. Gray and J.J. Lowe). Oxford, Pergamon Press, 119–41.
- Robinson, D.E. (1987) Investigations into the Aukhorn peat mounds, Keiss, Caithness: pollen, plant macrofossil and charcoal analyses. *New Phytologist*, **106**, 185–200.
- Stroud, D.A., Reed, T.M., Pienkowski, M.W. and Lindsay, R.A. (1987) *Birds, Bogs and Forestry. The Peatlands of Caithness and Sutherland*. Peterborough, Nature Conservancy Council, 121pp.