# Chapter 18 South-west Scotland

## Introduction

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South-west Scotland comprises that part of the Southern Uplands west of the A74 and the coastal lowlands along the Solway Firth (Figure 18.1). Little is known of the Quaternary history of the area prior to the last, Devensian ice-sheet glaciation, although, as in the rest of Scotland multiple glaciation may be inferred from the evidence from neighbouring regions, as well as the presence of landforms of glacial erosion that have developed over a long period.

The mountains in the Loch Doon area acted as one of the major centres of the last ice-sheet, as is indicated by the transport of various erratics to the north, west and south as well as the distribution of ice-moulded landforms and striated bedrock surfaces (Geikie, 1894; Charlesworth, 1926a; Cornish, 1982, 1983). The ice-sheet centred in the Galloway hills appears to have built up more slowly than that in the south-west Highlands, for the Highland ice initially impinged on the Southern Uplands, transporting erratics into the northern valleys of the hill mass as well as into the western coastal areas in Ayrshire and the Rhins of Galloway. The subsequent expansion of the Southern Uplands ice deflected the Highland ice to the east and west, producing typical till sequences in which lower, frequently shelly, tills with Highland or Ayrshire erratics are overlain by tills with Southern Uplands erratics. This classic sequence of the 'debatable ground' (J. Geikie, 1877) is shown at Nith Bridge (Chapter 15) and Port Logan.

On the southern and western side of the ice shed the pattern of ice flow is recorded in one of the largest drumlin fields in Scotland, covering much of lowland Kirkcudbrightshire as well as the Machars and Rhins of Wigtownshire (Cutler, 1978; Kerr, 1982); drumlins also occur in the eastern Solway lowlands (Hollingworth, 1931). Cornish (1979) has demonstrated that towards the ice-shed zone the drumlins merge into rogen moraine, the only instance of this type of moraine documented in Scotland. Charlesworth (1926a) noted a change over a short distance in the direction of the long axes of the drumlins in the Machars of Wigtownshire, which he interpreted as being due to a readvance of the ice, correlated with his Lammermuir–Stranraer Readvance. However, such changes in direction of drumlin long axes are not infrequent (Kerr, 1982; D. G. Sutherland, unpublished data) and appear to relate to topographical influence on ice flow rather than readvancing ice.

Many of the valleys on the southern side of the uplands contain massive spreads of glaciofluvial sands and gravels (Stone, 1959; Sissons, 1967a), with kames, kettle holes, kame terraces, eskers and meltwater channels forming complex and extensive areas of 'dead'-ice topography. The deposits around Stranraer where such features are fronted by a major outwash terrace merging into raised beaches (Sutherland, unpublished data) were considered by Charlesworth (1926b) to have been formed at the western end of his Lammermuir–Stranraer Readvance kame-moraine, but there is no evidence for such a readvance (e.g. Cutler, 1979), as has also been pointed out by Sissons (1961c) for the central and eastern parts of this putative limit.

Along the eastern Solway Firth coast the features of ice decay cannot be related to raised shorelines (Jardine, 1977, 1982; cf. Eyles and McCabe, 1989). In western Wigtownshire, however, such shorelines occur at altitudes of at least 20 m OD implying greater isostatic depression and/or later deglaciation in this latter area. In the Rhins of Wigtownshire there are possibly the only known examples of Errol beds on-shore in the west of Scotland (Brady *et al.,* 1874; Peacock, 1975c), these being deposited shortly after the deglaciation of this area These beds, with their arctic fauna, suggest that deglaciation occurred prior to the oceanic polar front moving to the north of the British Isles, that is some time prior to about 13,000 BP.

There are no radiocarbon dates, however, that closely limit the time of deglaciation. A number of sites containing sediments deposited during the Lateglacial Interstadial have been investigated for both their pollen and beetle remains which have provided limiting relative ages on deglaciation as well as information about the progress of environmental change during the interstadial (Bishop, 1963; Moar, 1969b; Bishop and Coope, 1977; Jones, 1987). The sites with the

earliest dated sediments are those of Roberthill and Redkirk Point in Dumfrieshire. At these localities coleopteran remains, from around 13,000 BP, indicate that the climate was almost as mild as at present although, due to low rates of migration, the vegetation was dominated by grasses and open-habitat taxa (Moar, 1963, 1969b; Bishop and Coope, 1977). Subsequently, during the interstadial, temperatures are inferred on the basis of the coleopteran faunas to have declined by 2–3°C, although there was during this period an increase in vegetation cover with the occurrence of stands of tree birch, willow and juniper. The freshwater and terrestrial deposits of Lateglacial age at Redkirk Point occur in the present intertidal area, indicating sea level to have been below that of the present throughout that period.

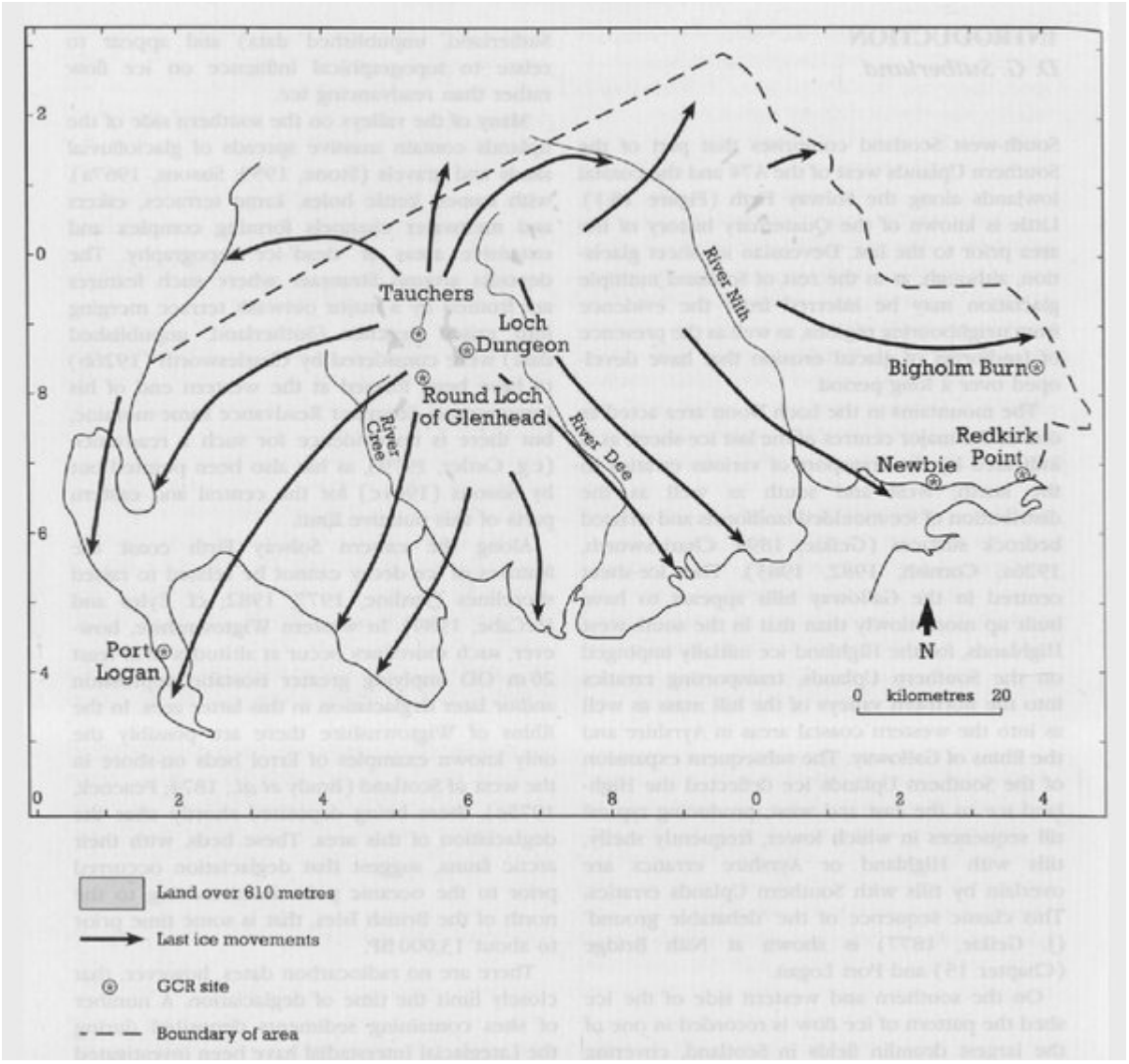
At the end of the Lateglacial Interstadial, at about 11,000 BP, there was a severe climatic deterioration and small glaciers became reestablished in the Galloway hills (Cornish, 1981), depositing particularly clear end moraines at the Tauchers and Loch Dungeon. At lower altitudes there was slumping and solifluction of glacial deposits, as demonstrated at Bigholm Burn near Langholm (Bishop and Coope, 1977). This is one of the few lowland sites in Scotland where Lateglacial organic deposits have been found disrupted by soliflucted debris, allowing dating of the period of solifluction and analysis of the contemporaneous environmental conditions. Summer temperatures at that time were at least 6°C colder than at present (Bishop and Coope, 1977), which gave rise to a sparse, tundra-type vegetation.

The Holocene vegetational history of both the uplands and coastal lowlands has been investigated by Nichols (1967), Moar (1969b), and Birks (1969, 1972a, 1975). Mean summer temperatures rose very rapidly at the beginning of the Holocene and plant migration resulted in an early phase of juniper and herb dominance at around 10,000 BP. Birch and hazel expanded rapidly after this, and woodlands with those two species dominating became widely established by 9500 BP. Mixed deciduous woodlands with the addition of oak and elm developed in the lowlands by 8500 BP; pine appeared in the area by 8000 BP but was never a dominant species, attaining its widest extent in the Galloway hills at between 7500 and 6800 BP. The treeline at the time of maximum expansion of trees was at least at 600 m OD.

As demonstrated at both the Loch Dungeon and Round Loch of Glenhead sites, blanket peat began to expand in the middle Holocene, and pine was reduced significantly as an element in the forest composition. Man's initial impact on the forests is manifest in the decline of elm at slightly prior to 5000 BP, but the diatom and radiocarbon analyses carried out at the Round Loch of Glenhead are particularly important for the temporal framework they provide for the much more recent human impact related to acidification. This can be demonstrated to have increased markedly in this area in very recent times (Jones, 1987; Jones *et al.,* 1989).

During the early Holocene, sea level was several metres, at least, below its present level (Jardine, 1975, 1980b) and peat accumulated across the low-gradient coastal fringe. With the onset of the Main Postglacial Transgression these peats were successively transgressed, and radiocarbon dating at sites such as Redkirk Point and Newbie (Jardine, 1971, 1975, 1980b) allow the progress of the rising sea level to be followed. At its maximum, major marine embayments occurred at the head of the Solway Firth, at the mouth of the Nith valley and at the head of Wigtown Bay. Subsequent regression of the sea resulted in the renewed accumulation of peat on the surface of the estuarine deposits. Curiously, this sequence of events, although taking place between 8000 and 3000 years ago has been incorporated into folklore in the form of a witch's curse in which Lochar Moss by Dumfries was 'once a moss and then a sea' and became 'again a moss and aye will be' (Wood, 1975).

**References**




*(Figure 18.1) Location map of south-west Scotland and generalized directions of ice movement.*