The Elan Valley Bog

Highlights

The bog has provided a section with a vegetational record stretching through the Devensian late-glacial, including representative parts of the Older and Younger Dryas and the warmer interstadial Allerød, as well as the Holocene up to the point in the record where human activities became a significant factor.

Introduction

The Elan Valley Bog (Gors Llwyd) records detailed evidence for vegetational and environmental changes in Mid Wales during the Devensian late-glacial and Holocene. It is one of only two sites so far studied in Mid Wales with a pollen record extending back to the Devensian late-glacial. It has been studied and described by Moore and Chater (1969a) and Moore (1970), and has also been referred to by Moore and Chater (1969b), Smith and Taylor (1969), Taylor and Tucker (1970), Moore (1972b, 1977), Handa and Moore (1976), Taylor (1980) and Ince (1981).

Description

The Elan Valley Bog [SN 857 756] lies at 384m OD in Mynydd Elenydd. It occupies a relatively flat, shallow depression in till on the watershed between the rivers Elan and Ystwyth, which drain south-east and west, respectively. The bog has probably been drained by both rivers during its development (Moore 1970). Sections through the bog and underlying superficial sediments are exposed along Mon Elan.

A line of borings across the bog (from [SN 855 753] to [SN 859 754]) was used to establish the stratigraphy of deposits within the basin (Moore and Chater 1969a). The detailed stratigraphy at [SN 858 753] is:

6 Peats varying in composition and degree of humification (5.00m)

5 Brown organic gyttja (0.29m)

4 Grey silty gyttja (0.07m)

3 White soft clay gyttja (0.04m)

2 Grey silty gyttja (0.20m)

1 Stiff blue lake clay (bottom not seen)

A simplified stratigraphic section of the Elan Valley Bog deposits is shown in (Figure 25). The sequence indicates initial occupation of the basin by a lake which became infilled with both organic and inorganic deposits. Later, the site was invaded by *Carex* and *Phragmites* and then by birch carr. This eventually gave way to ombrogenous bog, with *Enophorum* and *Sphagnum.* No radiocarbon dates are available for the site.

Interpretation

The pollen biostratigraphic data of Moore and Chater (1969a) and Moore (1970) allow the following sequence of vegetational changes to be reconstructed. The Devensian late-glacial was divided into Pollen Zones I-III. Intermediate pollen zones were also recognised.

The basal blue lake clay (bed 1) contained pollen characteristic of Pollen Zone I (Moore 1970), indicating a vegetation of dwarf shrub heath (*Betula nana* L. and *Dryas*) with tall herb communities. The assemblage shows a period of unstable environmental conditions with disturbed soils, and generally open-habitats. This phase was followed by increasingly shrubby vegetation in bed 2 (Pollen Zone I–II; Moore 1970) with birch carr and/or scrub birch. At this time, *Juniperus* also showed a marked rise. This period can be correlated with the change from periglacial conditions, following wastage of the Late Devensian ice-sheet, to warmer conditions associated with the Allerød.

The succeeding Pollen Zone II (bed 2), is characterised by a rise in tree birch pollen and a continued improvement in conditions, as demonstrated particularly by the occurrence of warmth-demanding taxa such as *Filipendula* and *Urtica.* This assemblage was correlated with the Allerød represented at other sites in Britain and the Continent (Moore 1970).

A transitional zone (Pollen Zone was recognised by Moore (1970). During this period, birch declined but juniper was probably still present on local hillsides. Communities indicative of exposed montane grassland with some disturbed soils are present, and this transitional pollen zone appears to represent colder conditions than Pollen Zone II, but not cold enough to eliminate *Fihpendula* and *Juniperus* (Moore 1970). A July mean of 10°C was estimated, on the basis that such a temperature would restrict *Betula* more severely than it would *Juniperus.*

During Pollen Zone III (upper bed 2 and bed 3) the exposed montane and alpine communities reached their greatest development. Taxa indicating disturbed soils and dwarf birch scrub became more prominent, and the assemblage indicates a return to colder conditions, with associated solifluction and the development of tundra vegetation. An accompanying change in lithology from largely organic to inorganic deposition (bed 2 to bed 3) also occurred at this time, and can be correlated with the Younger Dryas when glaciers occupied cirques in upland Wales (for example, Walker 1980; Ince 1981).

A further transitional pollen assemblage (Pollen Zone III–IV) represents a change from the cold Younger Dryas to milder conditions in the early Holocene. This pollen assemblage (bed 4) was marked by a return of *Filipendula* and the re-expansion of *Juniperus* scrub. Birch scrub and carr may also have begun to develop, but the succeeding Pollen Zone IV (bed 5) is marked by a much more rapid rise in birch pollen, although the presence of *Betula pubescens* Ehrh. fruits indicates that the local development of birch carr may have exaggerated this expansion. At this time, juniper probably gave way to birch. Later in Pollen Zone IV, juniper and dwarf birch virtually disappeared as birch woodland expanded. This pollen zone also records the arrival of *Corylus* and a decline in taxa which preferred open-ground.

The succeeding pollen zones all occur in bed 6 (peats). Pollen Zone V shows a sudden expansion of hazel which reaches its maximum in Pollen Zone VIa. This suggests that hazel favoured the maritime conditions of the west, and a similar expansion has been recorded at other sites in north and west Britain. Pine pollen increases sufficiently during this pollen zone, to indicate the local presence of pine trees.

Quercus and *Ulmus* pollen first occurs in Pollen Zone IV at Elan Valley, and it increases in Pollen Zone V and VIa. The latter pollen zone is associated with a decrease in *Betula.* Elm may initially have been more successful in colonising than oak, but by Pollen Zone VIb oak is dominant in the record, indicating the continued invasion of the shallow hillside soils by oak at the expense of hazel. Pollen Zone Via is characterised by a prominence of pine pollen (Moore and Chater 1969a). Oldfleld (1965) suggested that *Pinus* invasion of upland deciduous woodland was in response to increased rainfall, but Moore and Chater suggested that locally at Elan Valley pine invaded the bog surface which was becoming progressively drier, prior to the beginning of Pollen Zone Vila.

Pollen Zone VIIa is characterised by changes in the pollen curves and in stratigraphy. There is a sudden decline in pine, an increase in *Alnus* and *Quercus* pollen, and *Tilia* occurs for the first time. Birch declines still further from the preceding pollen zone. In addition, *Phragmites* (reed swamp) became dominant and *Phragmites* peat accumulated, perhaps indicating flooding of the bog surface. That this increased wetness was caused by climatic rather than local factors is suggested by an increase in alder. This period, as elsewhere in Britain, can be regarded as the time of maximum forest expansion (Moore and Chater 1969a).

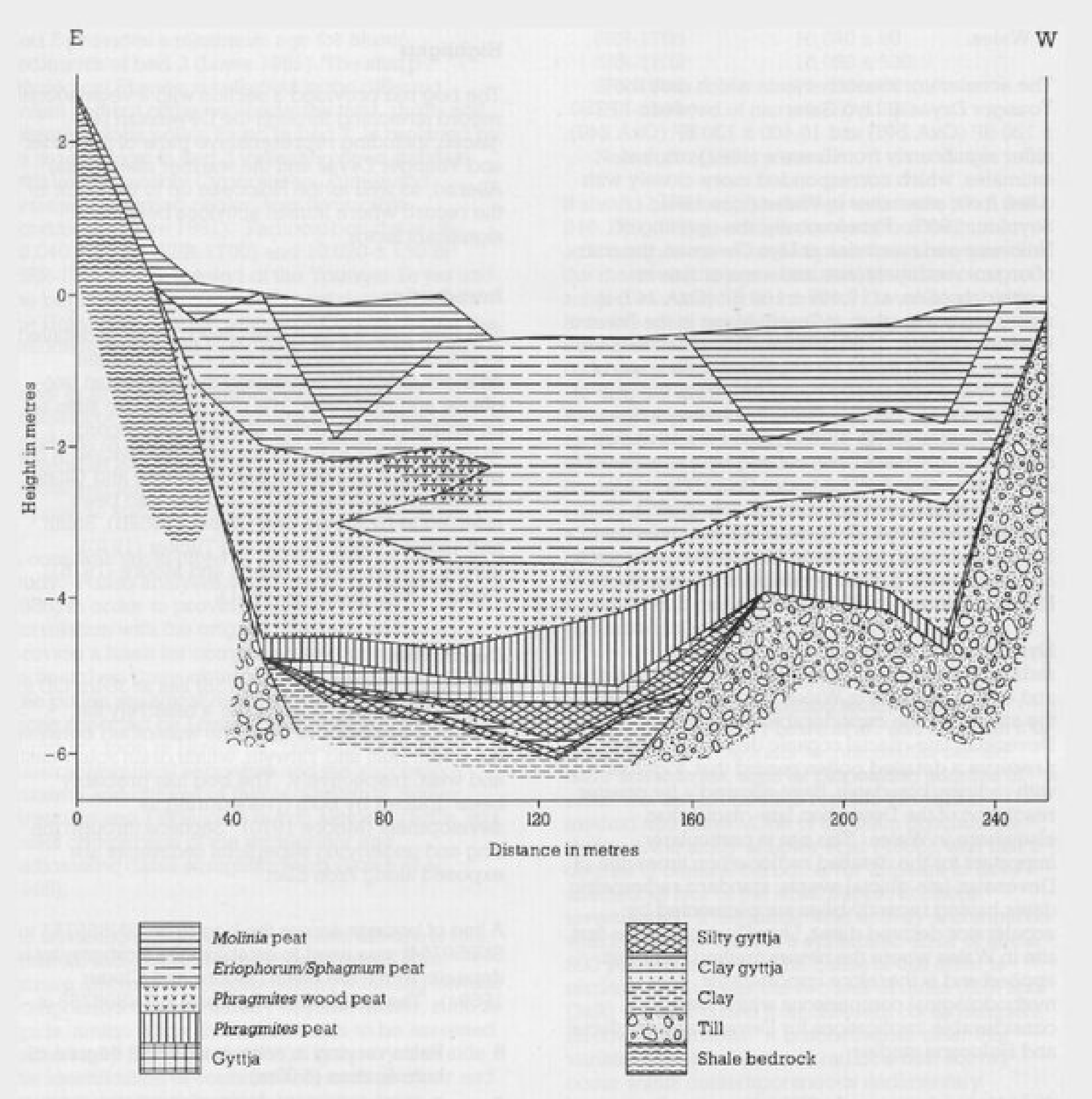
The elm decline, frequently taken as denoting the onset of Pollen Zone VIIb, is well marked in the Elan Valley Bog pollen record, although the cause is not clear. Two distinct but conflicting lines of evidence can be deduced from the pollen spectra. First, there is evidence for climatic change involving an increase in the ratio of precipitation to evaporation. This is accompanied by a sudden increase in the rate of peat formation as shown by the stratigraphy and related pollen frequency index. This phase coincides with the initiation of blanket peat formation at several other sites in the area, and generally indicates wetter conditions (Moore 1966). Second, the pollen evidence suggests that human activity began to influence vegetation at the time of the elm decline: pollen of *Plantago lanceolata* L. (ribbed plantain) and an increase in *Pteridium* (fern) spores, suggests human interference by forest clearance and the grazing of domestic animals. Turner (1964) has suggested that *P. lanceolata* can be used as an indicator of grazing. Thus, although both climatic and human influences have been discerned in the record, it is not possible to attribute the changes to either of these mechanisms with certainty (Moore and Chater 1969a).

The Elan Valley Bog contains an important pollen biostratigraphic record of Devensian late-glacial and Holocene environmental and vegetational changes. The sub-division of the Devensian late-glacial sequence into a number of intermediate pollen assemblage zones as well as Pollen Zones I, II and III has allowed greater precision in interpreting the vegetational record (Moore 1970). The Devensian late-glacial record at Elan Valley shows that following the wastage of the Late Devensian ice-sheet a time of relatively severe conditions, dominated by broken, open-habitat vegetation with disturbed soils, occurred. This was followed by an improvement in conditions when birch and juniper flourished. A succeeding colder phase is then indicated, equivalent to the Younger Dryas (*c.* 11,000–10,000 BP), when glaciers again occupied many cirques in upland Wales. At this time, large perennial snow patches and even glacier ice may have occupied the relatively low-level cirques at nearby Cwm Ystwyth (Watson 1966). The pattern of Devensian late-glacial events recorded at Elan Valley, closely follows the tripartite division comprising the Older Dryas, Allerød and Younger Dryas of the Continental Late Weichselian Stage (Late Devensian) — see Mangerud *et al.* 1974. It reflects a single warm phase equivalent to the period that Ince (1981) described at Clogwynygarreg as the 'late-glacial interstadial', preceded and followed by colder climatic phases. The site provides contrasting evidence, therefore, to sites at Nant Ffrancon and Cors Geuallt (Snowdonia) and Traeth Mawr (Brecon Beacons) which show evidence for a possibly more complex sequence of Devensian late-glacial events.

Conclusions

The Elan Valley Bog provides evidence for a continuous record of vegetational and environmental history for the last 14,000 years up until the time when human interference with the vegetation became a significant factor. It is an upland site for demonstrating important regional variations in the vegetational history of Wales.

References



(Figure 25) Elan Valley Bog: Devensian late-glacial and Holocene sequence (from Moore and Chater 1969a)