Historical Ecology

The Documentary Evidence

Institute of Terrestrial Ecology

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The Institute of Terrestrial Ecology (ITE) was established in 1973, from the former Nature Conservancy's research stations and staff, joined later by the Institute of Tree Biology and the Culture Centre of Algae and Protozoa. ITE contributes to and draws upon the collective knowledge of the fourteen sister institutes which make up the *National Environment Research Council,* spanning all environmental sciences.

The Institute studies the factors determining the structure, composition and processes of land and freshwater systems, and of individual plant and animal species. It is developing a sounder scientific basis for predicting and modelling environmental trends arising from natural or man-made change. The results of this research are available to those responsible for the protection, management and wise use of our natural resources.

Nearly half of the ITE's work is research commissioned by customers, such as the Nature Conservancy Council who require information for wildlife conservation, the Forestry Commission and the Department of the Environment. The remainder is fundamental research supported by NERC.

ITE's expertise is widely used by international organisations in overseas projects and programmes of research.

The map on the cover is of Longford Farm in Middle Lavant, Sussex, surveyed in 1728. On its western margin it includes Kingley Bottom, the site of the present-day National Nature Reserve of Kingley Vale. The map is reproduced by courtesy of the Directors of the Goodwood Estate Company Limited with acknowledgements to the West Sussex Record Office and the County Archivist (West Sussex Record Office, Goodwood M.S. E4988).

The three photographs on the cover are from the Institute's Photographic Collection, and show the spread of calcicolous scrub in Kingley Vale National Nature Reserve after the virtual extinction of rabbits following the myxomatosis outbreak in 1953-54. The photographs were taken from the same fixed point in 1956 (Top), 1965 (Middle), and 1969 (Bottom). See also plates 2,3 and 4 for larger versions of the same photographs.

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It is the purpose of this booklet to help the historical ecologist in his search for information on the distribution, abundance and character of wildlife within the natural environment of the past. The booklet will concentrate on documentary sources of information, related to the British Isles in historic times.

I

Documentary evidence takes two forms – printed and manuscript material. Very often, the distinction between the two is artificial. Many printed pamphlets were ephemeral, and personal notebooks and journals sometimes found their way into print. The ecologist interested in a site or species in the past should use both sources. This point may be illustrated by reference to the Chippenham Fen National Nature Reserve in Cambridgeshire: a series of leases preserved in the manuscripts of Chippenham Park describe how the area was drained and cultivated in the early 1790s. Part of the present-day reserve was set aside as grazing ground for the animals of the Poor of the Parish. A book, published in 1801, describes how plantations of oak, beech, elm, Spanish chestnut, spruce and Scotch fir were established, one of which forms a boundary to the reserve today.[1]

A second general point is that relevant information may be discovered almost anywhere. One of the earliest references to water-meadows in Hampshire was found in a church register devoted to the otherwise normal task of recording births, deaths and marriages. Twenty-seven lines of close writing describe how a farmer in Northington was allowed to make bays for carrying water from the Candover Brook onto adjacent meadows.[2]

The search for relevant material might start in a large county library, which usually contains a local history section, together with such basic works of reference as the *Victoria Histories* and the volumes of the English Place-names Society, where these have been published.[3] There will be books designed to help the local historian, and perhaps the quarterly journal *Local Historian*.[4] In addition, there will be books on particular areas and topics, which will illustrate how various pieces of historical evidence can be used to build up a coherent impression of the past. The volumes in 'The making of the English landscape' series may be quoted as an example of this kind of guide.[5]

The county record offices contain the largest collection of historical manuscripts in their respective counties.[6] Under the auspices of the county councils, the offices act as a repository for local government archives, and will accept documents from private organisations and individuals. The archivist and his staff catalogue the collections of documents, and then make them available for study in the office, The research worker starts by consulting the guides, which describe in general terms the various classes of material in the office, and then narrows his search down to individual indexes and lists. Most are arranged alphabetically, identifying documents by personal or place names mentioned within them. Many offices have begun to compile indexes to subjects mentioned in manuscripts, using such headings as plantations, meadows and rabbit-warrens. These indexes are particularly useful for the historical ecologist, although most are necessarily incomplete for their compilation requires a considerable amount of time and effort on the part of the office-staff.

Crown and government papers are preserved in the Public Record Office and its Scottish and Irish equivalents. Guides are published on a wide range of documents available, and transcripts and articles have been prepared, setting out the character and value of many of these sources. It is always advisable to gain some experience in using old documents and in reading early handwriting before visiting these major record offices.

Other manuscripts may be found in libraries or private archives, whether owned by organisations or individuals. Their state of preservation varies. A map may be framed and hang in a prestigious position, or it may be pinned over a crack to exclude the draught from a garden shed. Manuscript files and books may be kept with the current papers of a firm or society, or thrown into a damp cellar and forgotten. Not surprisingly, a large proportion of documents has been, and still is, destroyed, whether by design or accident. The historical ecologist will never find all the pieces he needs to complete his jig-saw puzzle of the past.

II

The historical ecologist wants detailed and accurate accounts of wildlife on readily identifiable sites at specific points in the past. Old photographs are perhaps the finest form of evidence, and those used on the cover of this Booklet illustrate how colour transparencies taken at fixed points over regular intervals of time can be used to monitor the direction and extent of vegetation succession. These transparencies were taken in 1956, 1965 and 1969, and they illustrate the spread of calcicolous scrub following the virtual extinction of rabbits in 1953-54 on the Kingley Vale National Nature Reserve in the South Downs. The effects of the relaxation in grazing pressure were most obvious in the first decade after the outbreak of the disease, myxomatosis.[7]

It is sometimes possible to identify the precise site from which early photographs were taken and to secure prints of the same tracts of scenery today. *Plate 5* is of The Howe, Castleton, in the North York Moors, as illustrated by F. Elgee in his book, *The moorlands of north-east Yorkshire*, published in 1912, and *Plate 6* is of the same view, as taken by C. Quarmby in 1978. Elgee described Mat Grass as the dominant plant, especially in a broad zone round the middle of the hill, with furze being plentiful on the lowest slope. Since that time, bracken has spread extensively down the slope to become dominant or co-dominant. Two garths have remained as rough pastures, but the third has been taken over by bracken. On the lower ground, the hedgerows have been allowed to

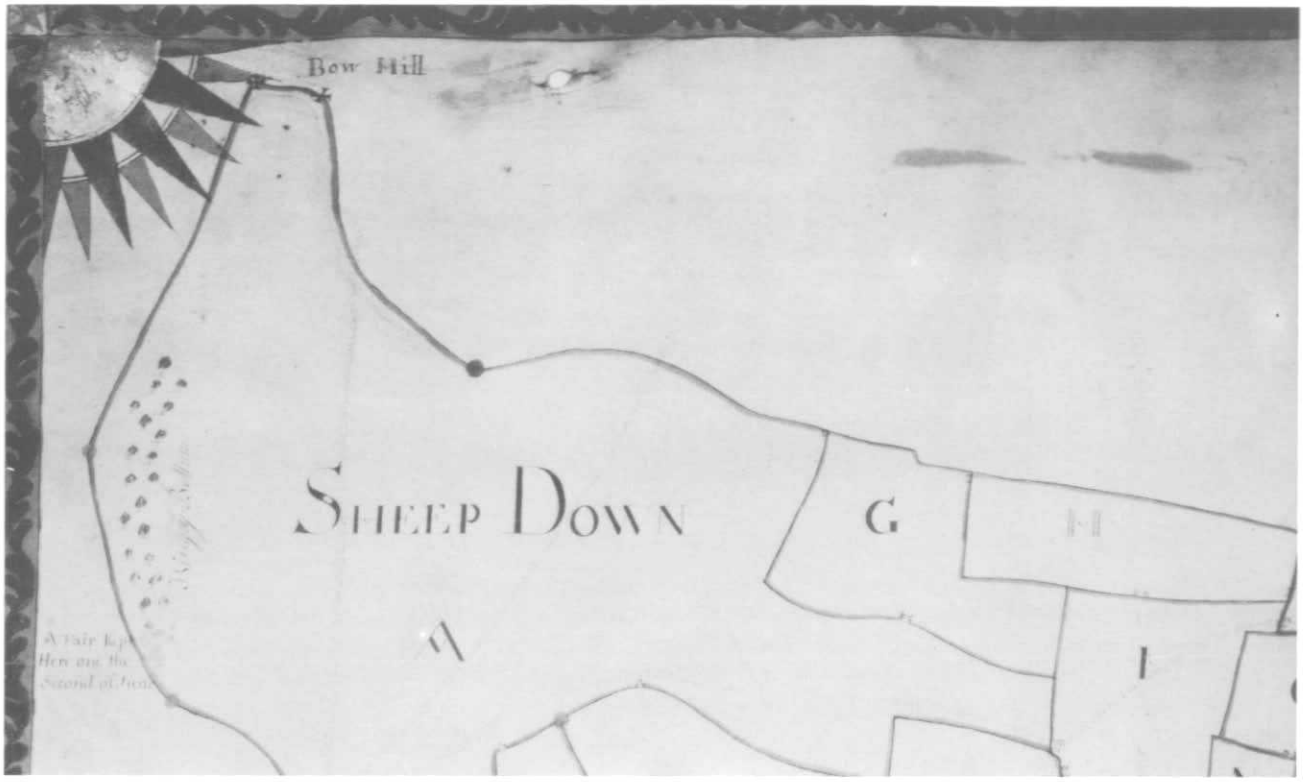


Plate 1 This photograph is of a map of Longford Farm in Middle Lavant, Sussex, surveyed in 1728 (see cover). On its western margin it includes Kingley Bottom, the site of the present-day National Nature Reserve of Kingley Vale.

Plates 2,3,4 These photographs were taken from a fixed point in the Kingley Vale National Nature Reserve in 1956, 1965 and 1969 respectively. They correspond to the smaller colour photographs shown on the cover. These photographs illustrate the spread of calcicolous scrub following the virtual disappearance of rabbits as a consequence of the myxomatosis outbreak in 1953-54.

Plate 5 The Howe, Castleton, North Yorks moors, 1912.

Plate 6 The Howe, Castleton, North Yorks moors, 1978. Photograph by C. Quarmby.

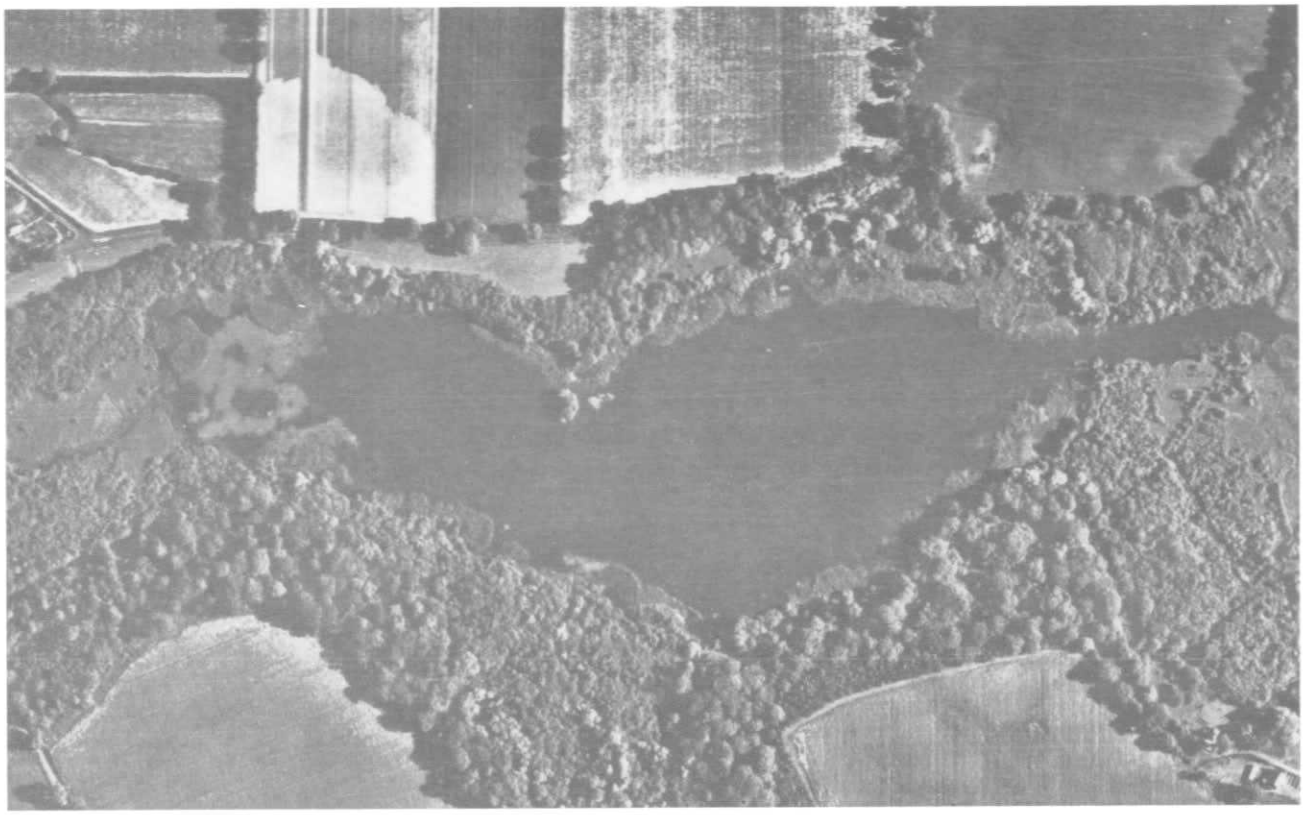


Plate 7 South Walsham Broad, July 1946. Crown Copyright: DOE/RAF Photograph.

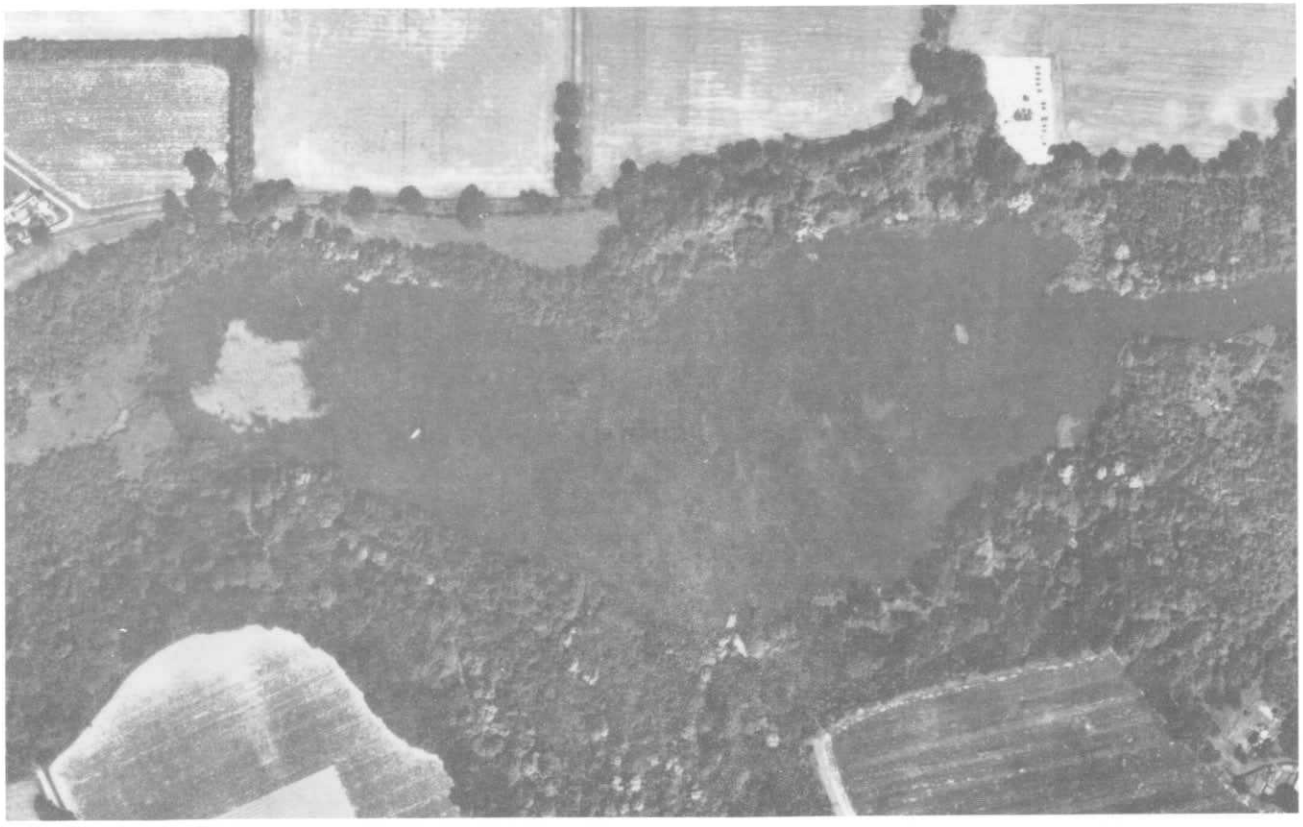


Plate 8 South Walsham Broad, 1963. Crown Copyright: DOE/RAF Photograph.

grow up, and many individual trees on the older photograph can still be identified.[8]

From the 1920s, it was possible to take photographs from the air, both vertically and obliquely. Their potential value in discovering how plant communities have evolved may be illustrated by experience in the Norfolk Broads, a region where historical ecology has already made a considerable contribution by establishing the origins of the water bodies as flooded medieval turf pits. Most of the broads have diminished in area over the last hundred years and, through the use of air photographs taken since the 1930s, the ecologist now has the opportunity to identify and measure another type of change, namely the decline of the reed communities. *Plates 7* and *8* are of South Walsham Inner Broad. On the photograph taken in July 1946, the reedswamp of 2.4 hectares may have already started to break up because bare areas are clearly visible in many of the reed beds. By 1963, only about 0.3 hectares of reedswamp remained. In the western part of the broad, an area of lilies can be discerned by its lighter tone: it marks the outer limits of the shallow water previously occupied by reeds.[9]

Unfortunately, air photographs only became comparatively plentiful in the 1940s, and there are often great difficulties in interpreting evidence on photographs because of the lack of contemporary 'ground controls'. For earlier periods, the information provided by paintings, prints and sketches may be helpful, but its reliability may be considerably reduced by what is called 'artistic licence'.[10]

Old county and regional floras and faunas should be very useful since they were designed to examine individual species in a systematic manner. Unfortunately many are nevertheless imprecise as to the actual location of specimens and the date when they were recorded in the field. Nevertheless, Wells was able to reconstruct the former distribution of *Pulsatilla vulgaris*, a plant associated with long-established grasslands. By comparing records made before and since 1930, he detected a marked decline in the distribution of the plant in England. Babington's *Flora of Cambridgeshire* actually suggested reasons for the local demise of the plant. It states that:

> until recently (within 60 years) most of the chalk district was open and covered with a beautiful coating of turf, profusely decorated with *Anemone pulsatilla*, *Astragalus hypoglotis*, and other interesting plants. It is now converted to arable land and its peculiar plants mostly confined to small waste spots by roadsides, pits, and the very few banks which are too steep for the plough[11]

Usually, the compilers of county flora were less explicit in giving reasons for a change in the status of species, but the cause may be deduced in some cases. For many species, especially the uncommon or rare, they listed individual localities, often with dates as to when the plant was first and, if declining, last seen. If the loss of a plant from a site is taken

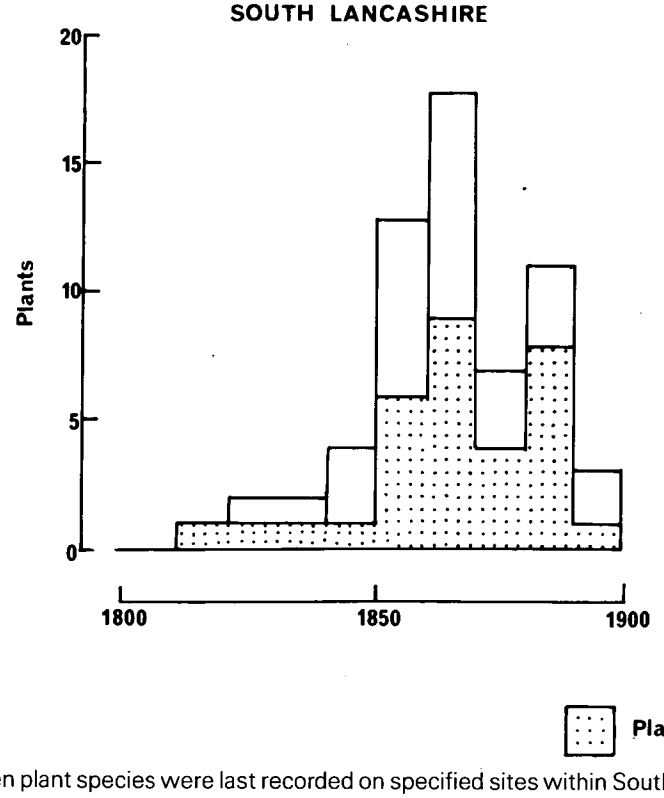


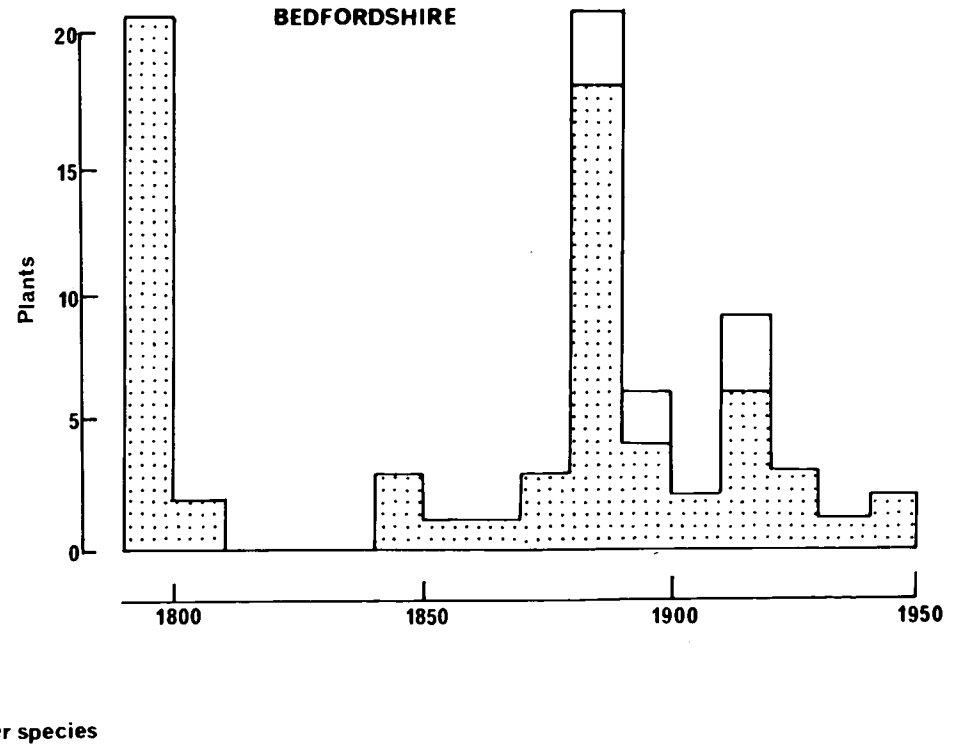
Figure 1 The decades when plant species were last recorded on specified sites within South Lancashire and Bedfordshire, as indicated by county flora (records analysed and plotted by M.D. Hooper).

to represent an extinction, the frequency of these events in time may be plotted, as in *Figure 1*. In the case of south Lancashire, there were two peaks in the frequency of these 'extinction events' as recorded in Travis' *Flora*. The first, between 1850 and 1869, may coincide with the period of High Farming and such improvements as the drainage of extensive peat areas, such as Chat Moss. In Bedfordshire, the earlier peaks may reflect the incidence of underdrainage on the heavy clay soils, and the smaller increase between 1910 and 1919 may be the result of agricultural improvements during the first world war.[12]

It is even harder to trace changes in the wild animal population. In relating changes in bird population to agricultural trends, Jones has emphasised how 'most birds adjusted to shifting land-uses and farm methods far too subtly for their fortunes or fate' to have been recorded at the time in any detail. Use may be made of those Churchwardens' Accounts that recorded the bounties paid on the slaughter of specified pest species. Similarly, lists of the numbers of animals killed by sportsmen or gamekeepers may be used as a guide to demographic trends (*figure 2*). But even when recorded consistently and over a long time period, it is difficult to interpret the data in an absolute or relative sense. For example, the weight of a game bag could reflect not only the number of game in the coverts but also the number and skill of the sportsmen present.[13]

The historian is often faced with the paradoxical situation where the most common species are the least-well documented. This may be illustrated by an example from the fenlands of East Anglia. During the nineteenth century, the Huntingdonshire part of the fenlands was extensively drained and reclaimed for arable farming, and a contemporary lepidopterist noted how the 'highland forms of insect life' were spreading into the fens as a result of 'the introduction and cultivation of their food plants'. He wrote, 'Were it possible to know, with some degree of completeness, what common species were formely taken in the district, it would be very interesting to record the changes that have taken place; but unfortunately no such record appears to have been made, The species recorded are principally those which were noticeable at the time for their rarity, or for not being then taken elsewhere; consequently our knowledge of the more common insects is almost entirely of recent date'.[14] This obsession for the rare and unusual means that it is seldom possible for any kind of comprehensive and rigorous comparison to be made of plant or animal communities in the past and at the present day.

Many of the books designed for landowners, farmers and foresters help in reconstructing wildlife communities in the past. The semi-natural vegetation was studied for clues as to what was perceived to be the inherent fertility of the soils for farm crops and tree-planting. The incidence of particular



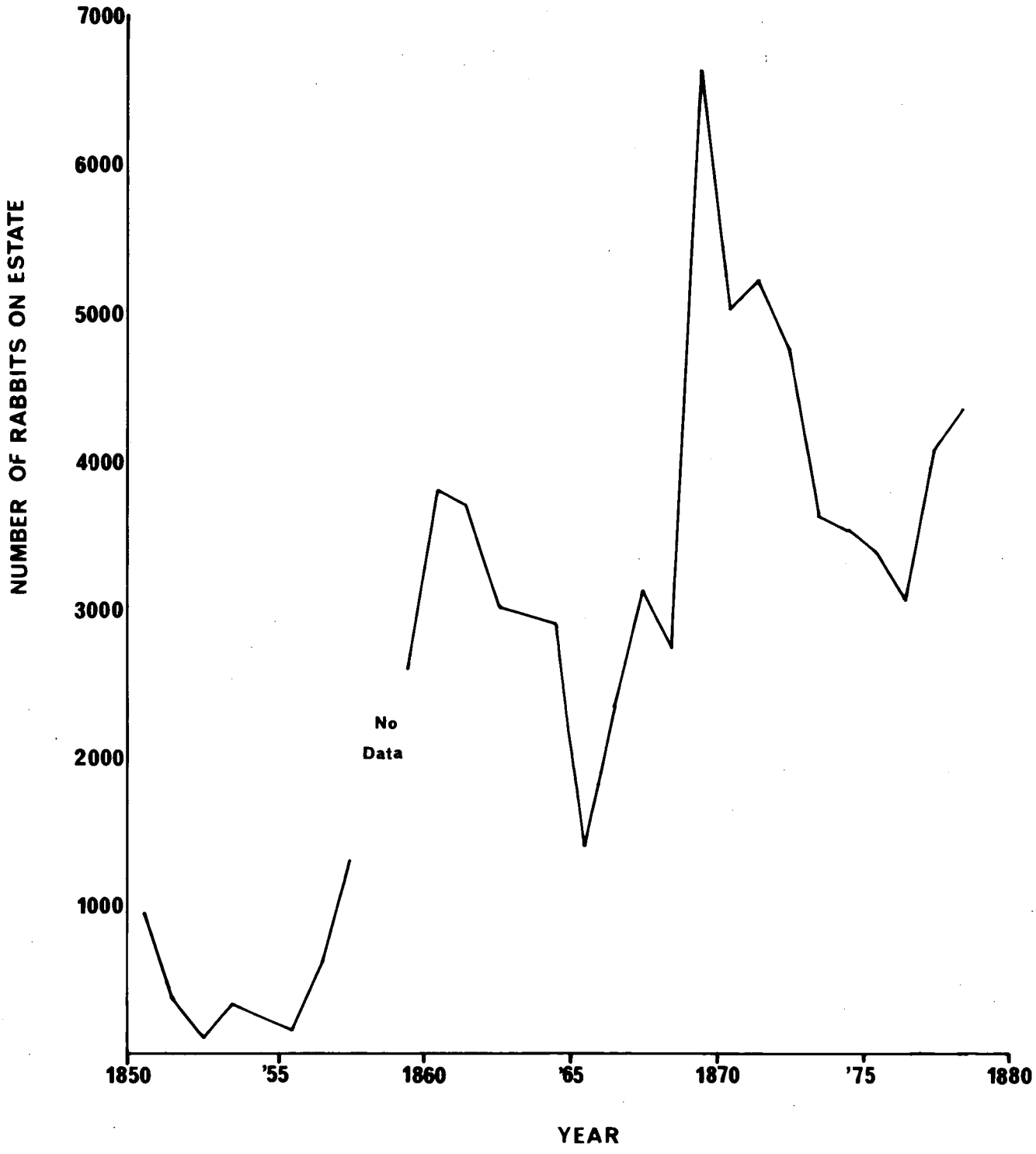


Figure 2 Rabbits killed on a Sussex estate, 1850-1879, at a time when the rabbit population in England rose significantly (East Sussex Record Office, Shiffner MSS, 3297).

species was also taken as a guide to how the land was managed. The journal of the famous agricultural commentator, William Marshall, contains a description of the convex beds of the water-meadows on the river Avon below Salisbury.[15]
He wrote:

> the herbage of the watered beds is various, in species, as raygrass, the meadow poe, the marsh and other bent grass, and the meadow fescue, the *loliacea* and the *pratensis*, here putting on very different appearances. On the sides of the trenches and ditches, the flote fescue, reed canary grass (*phalaris arundinacea*) and the water-poe (*poe aquatica*) are common: also the meadow rue (*thalictrum flavum*) and the water dock

It is usually easier to find data on woodlands than on other habitats. Whereas the incidence of the monkey orchid or Deptford pink was not directly relevant to the economic well-being of an estate, tree species had a direct bearing on the value of a wood for timber or fuel, and a hedge as a barrier for livestock. Consequently, surveys often indentified individual species and commented on the age and structure of woods and hedges. A sale of underwood in 1857 from the present-day National Nature Reserve of Monks Wood in Huntingdonshire confirms the presence of ash poles, hazels and blackthorns, together with 'a quantity of oak saplings of good lengths, suitable for strong fencing'. The following quotation is taken from an earlier survey of woods in the north of England, belonging to the Duchy of Lancaster in 1587. In the woodlands of Haverthwaite, Cumberland, there were:

> 480 acres besett with hesle eller asshe and other small ramell woodd of an old grothe and in the same there is 2,200 faire okes for buyldinge timber worth 6/8d the tree but they are in such cragges and montans that they cannot be carried away

These descriptions provide the historical ecologist with a basis for reconstructing the former mosaic of habitats within the woodland community.[16]

It is similarly easier to assess the impact of cultivation on wildlife communities than that of animal husbandry. Estyn Evans has remarked of north-west Ireland that 'it is one of the attributes of a society where primary interests are pastoral that it can function without written contracts and records'. This lack of evidence makes it especially difficult to trace changes in parts of upland Britain where the grazing of livestock constituted the principal form of livelihood. Hughes *et alia* have tried to estimate the size of the sheep population of north-west Wales in the past, preparatory to assessing the impact of grazing on the development of the present-day vegetation cover of those mountains. Their schematic conclusions are given in *figure 3*, indicating a rise in population from 0.05 ewe units per acre in medieval times to more than 1.0 ewe units per acre in the nineteenth century. They were obliged to use a number of disparate sources for their study, including the *Taxatio ecclesiastica* of 1291, farm inventories, an early diary, and the Annual Returns made to the Ministry of Agriculture. These sources provided approximations of animal population, but could not be used for statistical inference.[17]

Often the details provided by these sources are so scanty that the historical ecologist can only reconstruct the patterns of distribution and abundance of particular species by drawing analogies with other areas, or by making deductions based on his present-day field experience. This procedure may be illustrated with reference to the impact of water-meadows on fish. In Hutchins' *History and antiquities of Dorset*, a dramatic decline is recorded in the number and size of trout at Cerne Abbas following the creation of water-meadows. Once a trout weighing eight pounds had been caught and others had often approached that size until 'within these few years' of the creation of the meadows. In his study of the *Salmo salar,* Berry treated this reference as a clue to the occurrence of a phenomenon which he had observed in the water-meadows of the 1930s. Berry had noticed that abrupt changes in the level and direction of water disrupted the movement and feeding habits of fish. Many were stranded by a sudden fall of water level, and fell prey to herons and other predators. The fish were also deprived of large quantities of food, which was strained from the water as it flowed through the long grass of the meadows to the drains, and back to the river. The example clearly emphasises the need to corroborate and supplement the evidence gained from documentary evidence with that found in the field today.[18]

III

Communities of known age provide the historical ecologist with opportunities for comparative studies of the rates of colonisation. The origin of some habitats is relatively easy to establish. The bulk of material excavated from the railway cutting at Sharnbrook Summit in Bedfordshire dates from the construction of the line in the 1850s, and the base-rich deposits now support such species as *Lotus corniculatus*, *Chrysanthemum leucanthemum*, *Melilotus officinalis* and *Trifolium pratense*. The site is leased by the County Naturalists' Trust as a nature reserve. It should be noted, however that although the construction of canal, railway and roadside verges can usually be readily dated, subsequent engineering and management schemes may have caused severe disruption of plant succession and have left little, if any, documentary record of their incidence.

In the agricultural context, it is even harder to establish precisely when a grass site was last ploughed or was affected by a particular form of management. Whilst the documentation on projects for reclamation and the installation of under-drains may be comparatively full, there is usually very little on the 'tumble down' of arable land to grass, or the breakdown of drainage. Landowners and occupiers were less keen to publicise such changes and probably regarded them as purely temporary phenomena. In a study of the wheat depression of the late nineteenth century, Olson and Harris have demonstrated the difference between the actual trends in the profita-

bility of crops and the trends as perceived by contemporary farmers. It sometimes took several years before the farmers recognised what was really happening. By this time, the date of change was forgotten or irrelevant to a new landowner or occupier, and accordingly passed unrecorded.[19]

It is often easier to trace the history of areas of land subject to communal management. Among the post-medieval documents for the borough of Cricklade in Wiltshire is a glebe terrier which alludes to 'lammas tythes of cattell goinge in common accordinge unto ancient custom'. An intricate pattern of grazing and mowing has persisted at North Meadow, a flood meadow of 44 hectares, since at least early medieval times. Residents of Cricklade are entitled to pasture ten head of horses or cattle between the 12 August and 12 February, and twenty head of sheep between the 12 September and 12 February. For the rest of the year the meadow is laid up for hay and reverts to the owners. The fact that so many persons had an interest in commonland meant that rules had to be made and recorded, thereby providing a much fuller account of management practices in the past. In addition, this pattern of management tended to inhibit changes or 'improvements' in the use of the pastures, and this continuity of management practices is likely to be reflected in the species composition. At North Meadow, the closely-regulated regime has been particularly important for the conservation of the fritillary *Fritillaria meleagris* to the point where 80 per cent of the present British population is now confined to this site.[20]

The incidence and efficacy of management practices may be recorded in documents concerned with disputes over landownership, and tenant and common rights. Following a dispute over the management of Beddingham Tenantry Down (near the Lullington Heath National Nature Reserve) in Sussex in the 1820s, it is recorded that the tenants were given powers to demand that the lord of the manor should clear scrub if the encroachment of 'furze or litter' threatened to reduce stocking rates. Usually only sheep were allowed on the Down, but the tenants were permitted to turn out oxen and other cattle in seasons when 'rough grasses increased on the Down to the injury of the Sheep pasturage'. Details of past management may be deduced from farm leases which included covenants designed by the landlord to sustain the value of his property. Further insights may be obtained from the regular reports made by some land stewards and agents to estate owners, especially absentee owners.[21]

IV

The historical ecologist seeks documents which will provide an insight over as continuous a period as possible, and for as extensive an area as possible. Accordingly, Rackham made considerable use of a series of annual accounts for Hardwick Wood in his study of ancient woodlands in south-west Cambridgeshire. The accounts survive from 1340 onwards and, in spite of numerous gaps in the record, he was able to

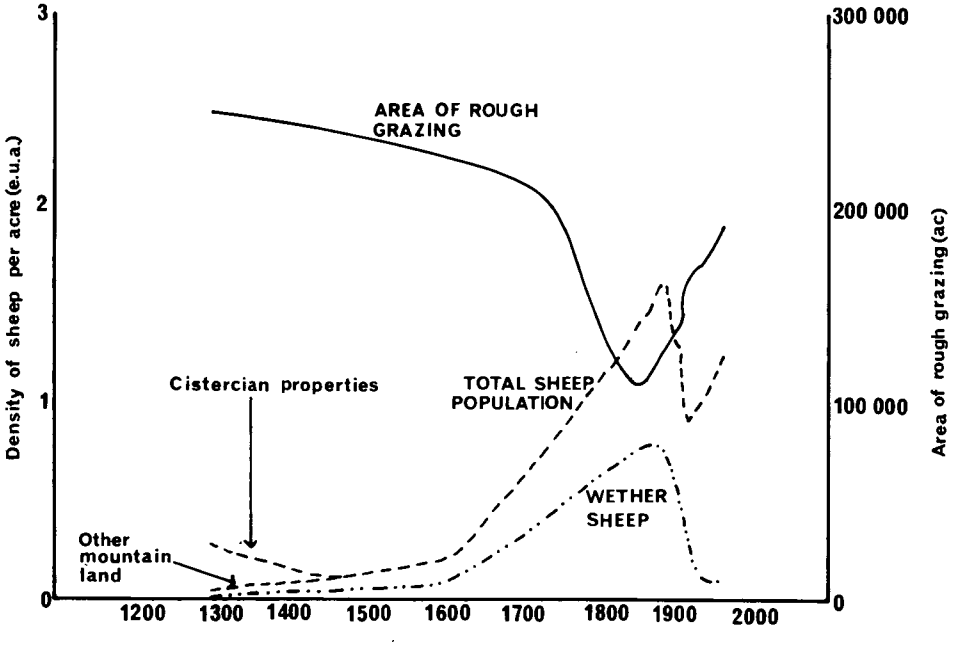


Figure 3 Changes in the area of rough grazing and sheep population in Caernarvonshire since 1300 (after Hughes *et alia,* 1973, reproduced by kind permission of the author and the Journal of Applied Ecology).

deduce the general trends in the area of coppicewood cut annually until the later medieval period (*figure 4*). The management of both the coppice and standards proved to be very irregular: the area of coppice cut ranged from over a third of the wood in one year to none in three successive years. The coppicing cycle was short, amounting to no more than six to seven years in the fourteenth century. Instead of relatively small quantities of oak standards being felled regularly, as the need for large timber arose, Rackham found instances of clear-felling, followed by long periods before further trees could be felled. Clearly, such historical data are invaluable in studies of the former development and stability of the woodland ecosystem and its component parts.[22]

The most extensive survey was the Domesday Survey of 1086, which identified the possessions of the principal landowners of each county. Beside data on taxation, human population, plough lands and teams, the Survey alludes to woods, pasture, meadows, saltpans and waste. Darby *et alia* have used the returns to reconstruct the geography of Domesday England and, in doing so, they have stressed that the Survey is far from being a straightforward document. Like so many documents from the past, the exact method of compilation and the precise meaning of many of the terms used in the Survey are obscure with many inconsistencies in presentation of information. Accordingly, it is difficult to be sure of the exact area and location of a wood mentioned in the Survey, and some woods may have been omitted altogether.[23]

The *Statistical Accounts* of Scotland are another example of a comprehensive survey, completed within a comparatively short space of time. Between 1791 and 1799, a series of 21 volumes was published, providing an account of the human population, prosperity, character and use of land in each parish. The information was provided by the minister of the Church of Scotland in each parish, in answer to a questionnaire provided by the editor of the *Accounts*. A further survey was published in 15 volumes between 1845 and 1858. In his *History of Scottish forestry*, Anderson referred to the *Accounts* as providing extremely useful notes on natural forest remains and on tree-planting'. On the other hand, the standard of the individual parish reports varied a great deal 'with the attitude of the incumbents of the various parishes, many of whom were interested in natural history, including that of trees, but others were not'.[24]

Surveys on the scale of the Domesday Survey and the *Statistical Accounts* were clearly exceptional: topographical accounts compiled by individual persons were more commonplace. The historical ecologist must show just as much discretion in accepting the evidence provided. Information might be recorded in an almost random manner, or a topographer might be very selective in what he reported, frequently concentrating on the strange and unfamiliar. Thus, John Boys described Sutton Heath in east Suffolk simply because 'the whole appearance was so totally different from any thing we ever saw, that it is like being in another world'.[25] This kind of

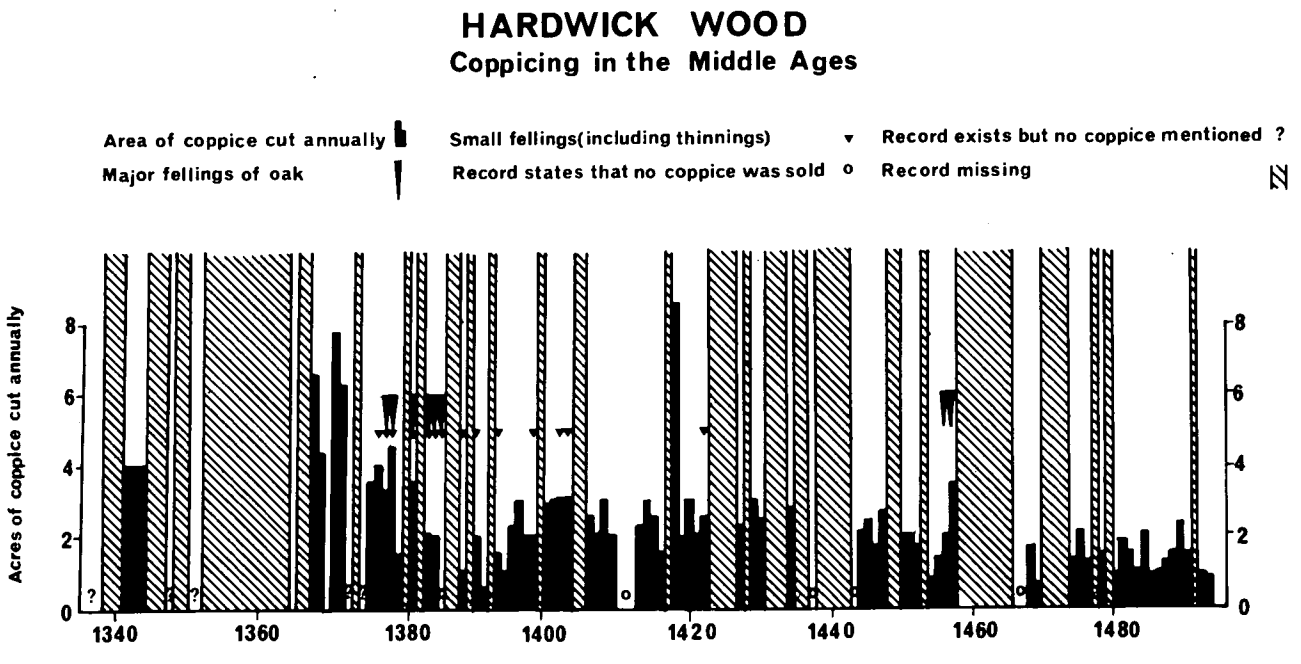


Figure 4 The incidence and scale of coppicing in Hardwick Wood, a wood of 8 hectares in Cambridgeshire, as indicated by documents in Pembroke College, Cambridge (data analysed and plotted by O. Rackham).

topographer might ignore the commonplace and thereby give a misleading impression of an area.

Every opportunity should be taken to check the records of one observer with those of another near-contemporary source, if available. By doing so, MacDermot was able to discover several errors of fact and opinion in a Parliamentary Survey of Exmoor in 1651. This was one of many surveys made of former royal property at that time. In this example, the surveyor referred to many of the natural features on the moorland, which he described as 'a verrye sound sheepe pasture' with parts 'overgrowne with heath', yielding 'a pore kind of turfe of Litle vallue'. The surveyor was, however, a complete stranger to the moor and spent only eight to ten days on the survey. MacDermot found a great deal of confusion and several errors in the identification of features, when he compared the survey with another made by local men with an intimate knowledge of local topography and place-names.[26] Unfortunately, the opportunities for checks of this kind do not often exist.

Surveyors not only make mistakes, but frequently they are partial in their judgements. Agricultural historians have made considerable reference to the volumes published by the quasi-official Board of Agriculture between 1790 and 1820, which systematically reviewed the status of agriculture in each county, with sections devoted to such topics as arable land, grass land, gardens and orchards, woods and plantations, and wastes. A set of instructions was issued to each author, and it is the following request that should put the historian on his guard.[27] This stressed that:

> the surveyors should inquire into new or peculiar practices, and should ascertain as minutely as possible, the nature and effects thereof; for a single practice discovered, by means of these surveys, in a narrow district, or even on a single farm, if spread through the medium of the Board of Agriculture, over the whole Kingdom, may add more to the national wealth than the possession of the Indies

As a result, many writers concentrated on the progressive, and therefore atypical, kinds of land use and management, which rarely formed the habitats of wild plants and animals.

There has always been a wide range in the standards of land husbandry. As Sidney wrote in 1848:

> in England and Wales, we have specimens of the very worst as well as the very best farming. We have afforded breeding stock, feed, treatises, models and Scotch bailiffs to the whole world, and have yet specimens of cultivation that would disgrace a French peasant or a Baden bauer[28]

The range of farming standards may have provided a rich mosaic of habitats within a short distance, stimulating a greater diversity and richness of wildlife. The possibility of these being poorly-managed holdings, although hardly documented and usually overlooked by contemporary writers, should never be overlooked by the historical ecologist.

V

The value of many early books and documents as source material is limited by the impossibility of indentifying on the ground many of the sites or wildlife communities described. In this context, the best form of historical evidence is a large-scale map which helps to relate each feature to the present-day landscape. The cover of this Booklet reproduces part of an estate map, compiled in 1728, of Langford Farm in Sussex. The area of the Sheepwalk, marked as Kingley Bottom, now forms the eastern part of the Kingley Vale National Nature Reserve. The location and character of the trees marked on the map correspond closely with one of the two areas of older yew woods on the reserve today.[29]

According to Harvey and Skelton, there are, however, only about thirty extant maps for the period before 1500 for England and Wales.[30] The craft of land surveying and the professional surveyor did not emerge until the sixteenth century, when they began to play a key role in agricultural improvements, providing 'models' of how estates might be reorganised. In other cases, the maps served as evidence of how changes in field size, shape and arrangement had been achieved. The longer-term value of these plans was recognised by Joseph Lindley, who hoped that his recently-completed survey of Surrey would be useful to antiquaries of the 25th century in:

> affording them an opportunity of determining the positions of many places in the County of which the devouring hand of time may not, perhaps, have left the last vestige remaining[31]

Lindley was, however, exceptional in his concern for the historian's wish to reconstruct former environments. A large proportion of plans was destroyed once they had served their immediate purpose.

George Adams, an instrument maker, stressed that the land surveyor had a special responsibility to make plans of so valuable a commodity as land as accurately as possible. In spite of this, and the neat and precise appearance of many plans, errors not only occur but many map-makers simply and uncritically plagiarised earlier surveys. The need for carefully scrutinising early maps may be demonstrated by an extreme example. The map drawn up of the parish of Stagsden in Bedfordshire in 1812, at the time when the land was reallotted and physically enclosed by parliamentary commissioners, shows the eastern boundary of Astey Wood bowed outwards and coinciding with the parish boundary. The tithe commutation map of 1839 and an estate map of 1847 show an identical boundary, but these later maps must be copies of the enclosure map because they reproduce the same fundamental error in surveying. The boundary should have bulged inwards, and not outwards. This is indicated by the enclosure map for the neighbouring parish of Kempston, drawn in 1804, and by the Ordnance Survey map at a scale of 1:2,500, produced in 1882.[32]

So long as this kind of potential pitfall is borne in mind, maps can provide invaluable evidence of changes that have occurred in the natural environment and in the disposition of habitats and species. A comparison of the successive revisions of the Admiralty and Ordnance Survey maps may provide, for example, a detailed chronology of changes in the configuration of the coast. This kind of comparison is made for the Suffolk parishes of Benacre, Covehithe and Easton Bavents in *figures 5 to 7*. The position of the present-day coast is indicated in *figure 5*, which is based on current Ordnance Survey 1:250,000 maps. It may be compared with the position shown in *figure 6*, based on a survey of 1840 and made as part of the Tithe Commutation Survey of that period. As a preliminary to commuting all tithes to money payments, a large-scale survey was made of those areas liable to tithes. The greater part of the coastline retreated in the intervening 130 years, with accretion occurring only in the north of Benacre parish. Without these maps, the ecologist might fail to appreciate the extent to which the water-bodies have changed in shape and area, and the rapidity with which the streams have had to adapt their gradients, with obvious repercussions for the changing area of coastal marsh and floodplain.[33]

By constructing series of maps, it may be similarly possible to reconstruct the pattern of human intervention over a wide range of habitats. *Figures 8-10* illustrate how the extent and degree of fragmentation of grassland on the western part of Salisbury Plain can be reconstructed from a comparison of 'national' surveys. From the 1850s onwards, the Ordnance Survey began to compile maps at a scale of 1:2,500, and the western part of the Plain was surveyed between 1873 and 1885 (*figure 8*). The published maps distinguish tracts of rough pasture. The second map in the series (*figure 9*) indicates the distribution of grassland, as recorded by the Land Utilization Survey in the 1930s. It is based on data recorded on 1 : 10,560 Ordnance Survey maps by the surveyors, working in the field. Both maps provide a general impression of the contemporary extent of the grassland habitat, and the third map in the series (*figure 10*) uses the evidence to suggest the range in the maximum age of the grasslands. Thus, those areas under arable in the 1930s sustain grasslands today of a conjectured age of up to forty years, whereas those areas under grassland in both surveys may contain examples of turf of over one hundred years in age. The juxtaposition of grassland communities of a variety of ages may clearly help to explain any differences observed in their floristic composition.[34]

The historical ecologist should always remember that surveyors varied in their ability and desire to record different types of land use and management. In the case of the tithe surveys, pasture was distinguished from meadows and water-meadows in some parishes, whereas other surveyors might use the term 'grassland' to cover all categories. Many of those taking part in the Land Utilization Survey of the 1930s

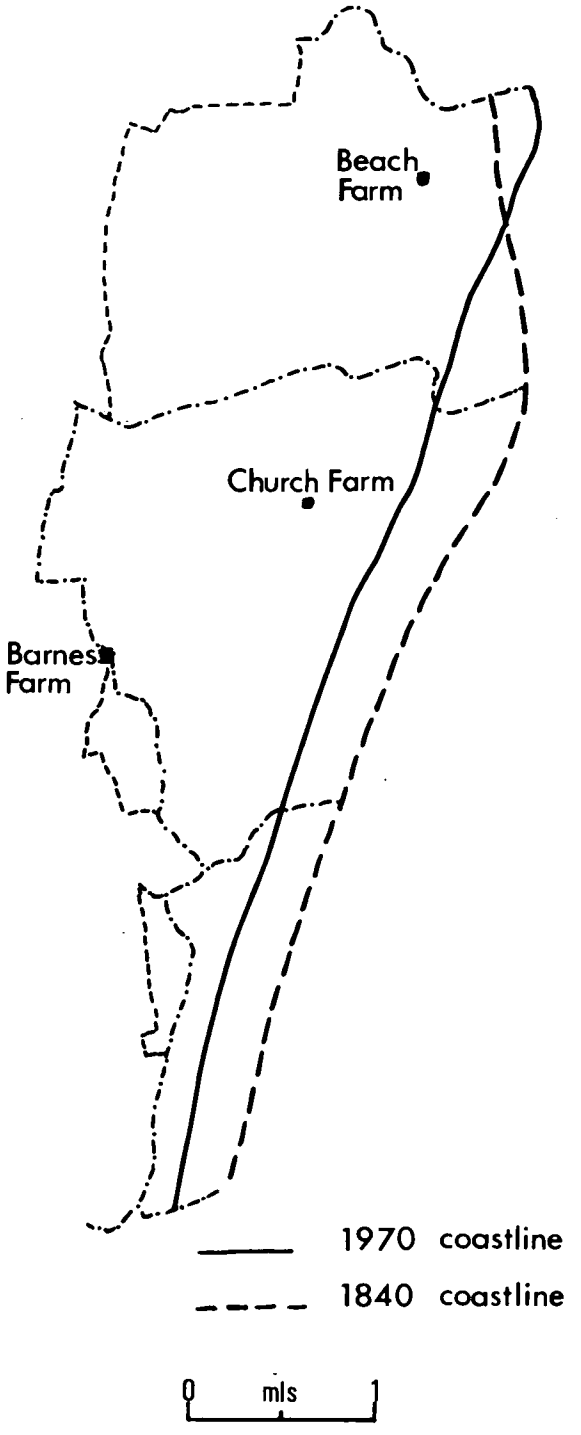


Figure 5 A comparison of the position of the coastline of the Suffolk parishes of Benacre, Covehithe and Easton in the 1840s and 1970s as indicated by contemporary surveys. Figures 5, 6, 7 reproduced from Ordnance Survey maps with the permission of the Controller of HMSO. Crown Copyright reserved.

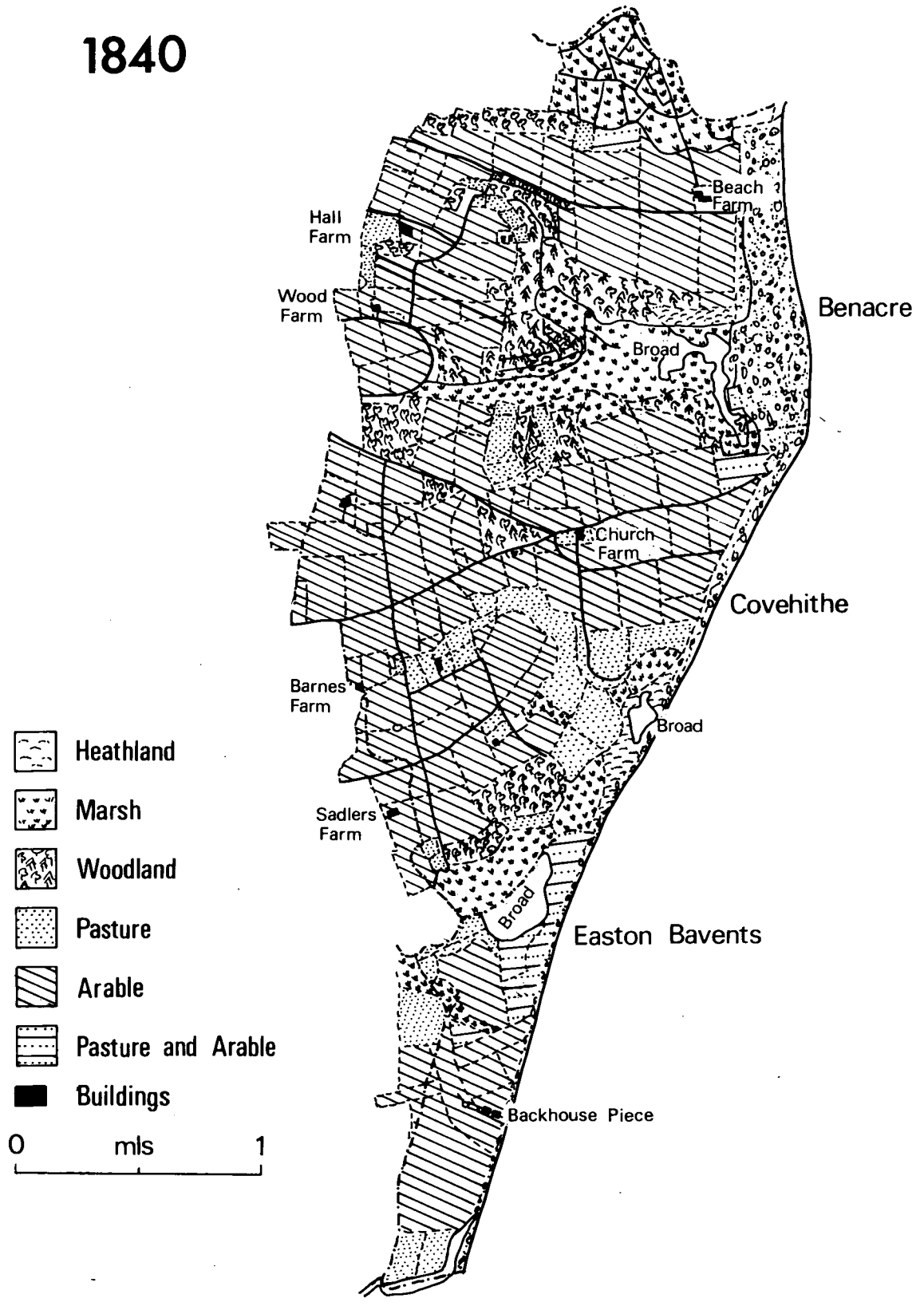


Figure 6 The position and character of the coastline as indicated by the Tithe Commutation Survey of 1840.

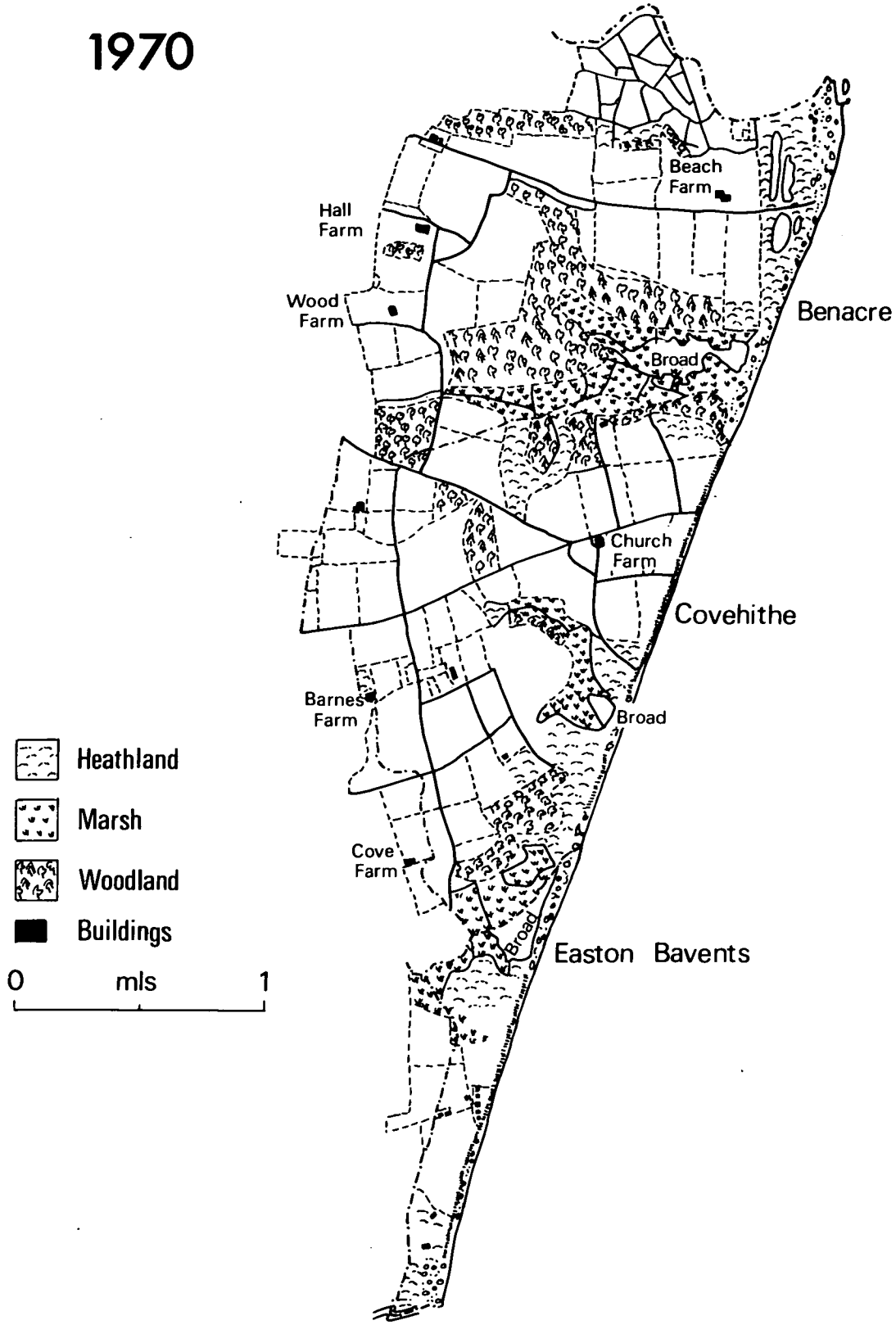


Figure 7 The position and character of the present-day coast as indicated by the Ordnance Survey.

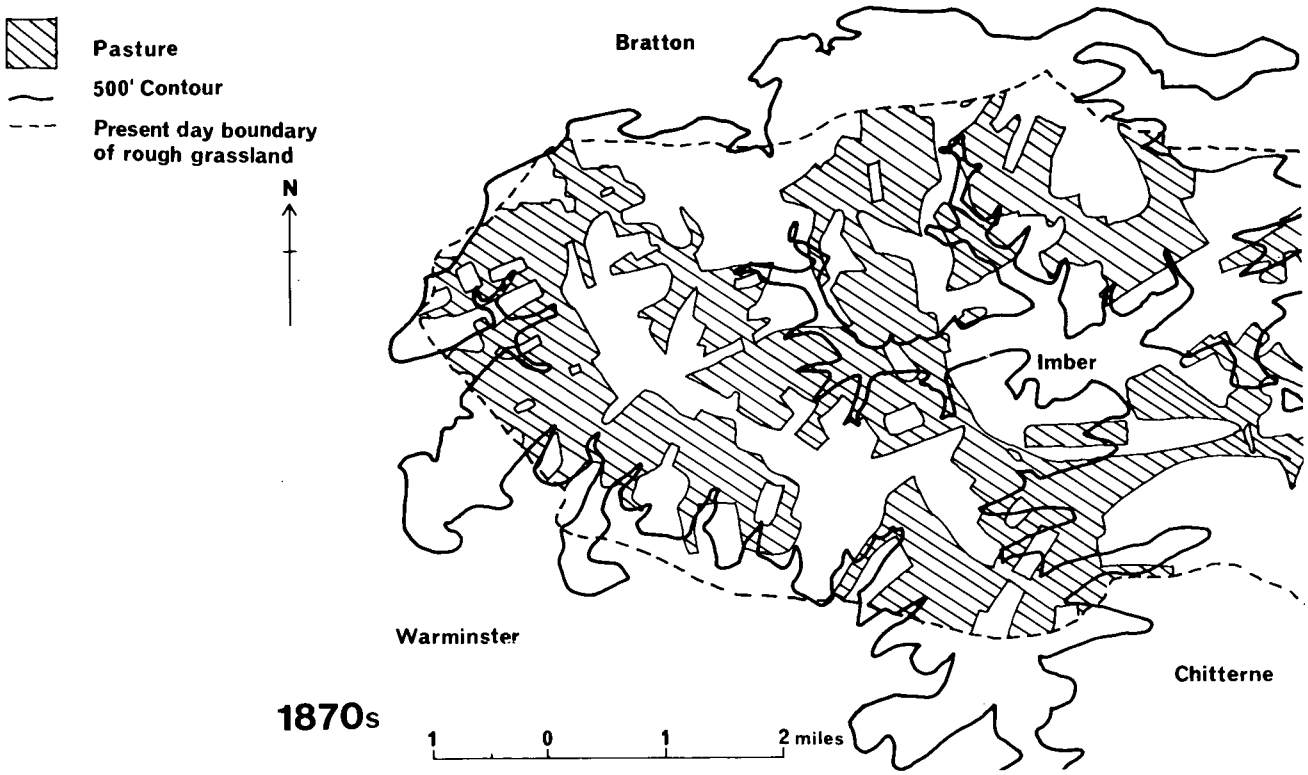


Figure 8 The extent of rough grassland above the 500-feet contour and within the area of present-day grasslands on the west part of Salisbury Plain, as indicated by the Ordnance Survey in the 1870s.

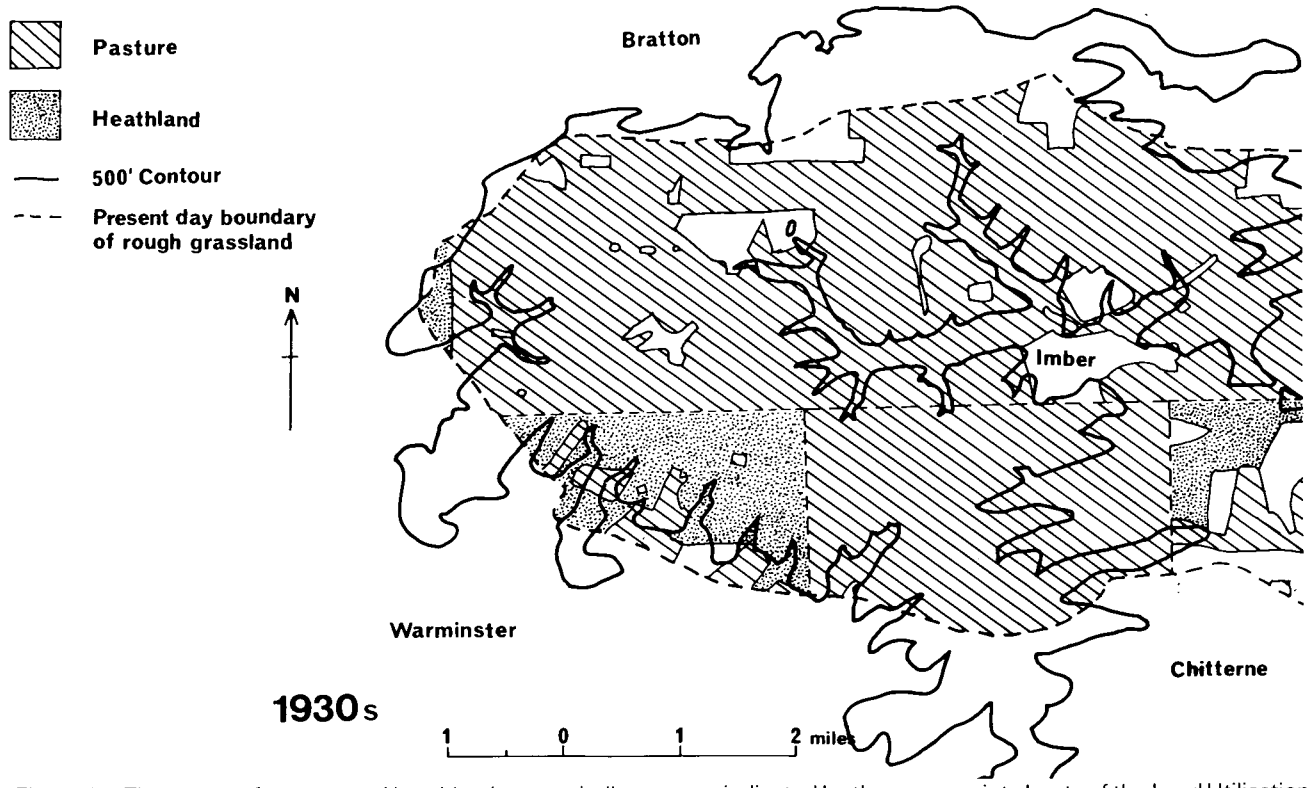


Figure 9 The extent of pasture and heathland over a similar area, as indicated by the manuscript sheets of the Land Utilisation Survey in the 1930s.

found it difficult to distinguish permanent grassland from long-leys, and scrubland from woodland. The distinction between permanent grassland and heath on the maps of Salisbury Plain seems to have been poorly-defined, and the 'straight boundaries' drawn between some of the grasslands, heath or arable coincide with the boundaries of the field-sheets, highlighting the problems of land classification. These defects in the source material should be seen in proper perspective. An analysis of air photographs taken of the area today frequently reveals striking changes in the appearance and structure of the chalk grassland, corresponding with differences in land use as recorded on early maps. Confidence in the historical sources is further enhanced by a survey of the distribution of *Cirsium tuberosum* on Salisbury Plain. The downland south of Bratton is the most important station for the plant in Wiltshire: it has hybridised with *Cirsium acaulon* elsewhere.[35] The 'pure' colony is almost entirely confined to one area, for which there is no cartographic evidence of cultivation. Indeed, the map of the 1870s shows the site as an island in a 'sea' of arable. There are a very few plants today on the edge of the adjacent former ploughland, indicating perhaps that sufficient time has now elapsed for the thistle to have begun to colonise the more recent grasslands of that part of Salisbury Plain.

Old maps make it possible to assess the extent to which a site may have acted as a refugia for wildlife in the past. Often the historical ecologist would like to know whether the vegetation of a site is representative today of a once more extensive and significant ecosystem. A study of the vegetation of the nature reserve at Kirkby Moor in Lincolnshire may be taken as an example of this kind of enquiry. Today, two-thirds of the area of 57 ha are dominated by *Calluna*, *Pteridium* and *Deschampsia flexuosa*: the site stands on the ancient river gravels to the west of the heavy clays of the Bain valley (*figure 11*). Historical sources suggest that the area may never have been representative of the entire heathland on the alluvial gravels. According to the enclosure award for the parish of Kirkby on Bain in 1798, the enclosure commissioners, who were responsible for redistributing the lands of each farm within ring-fence holdings, decided to subdivide the heathlands into two parts, which they called the Best Moors and the Worst Moors. The Best Moors extended over 122 ha and were considered fertile and 'capable of considerable improvement'. They allotted each person a share, according to his rights in the formerly unenclosed moorland. The remainder of the Moor, the Worst Moor, was 'of a lingy and very bad quality and not worth the expense of dividing and enclosing'. The Enclosure Act allowed this area, which included part of the present-day reserve, to remain common pasture, grazed by all the animals belonging to the commoners.[36]

The enclosure commissioners realised that land values might rise and that one day it might be worthwhile physically enclos-

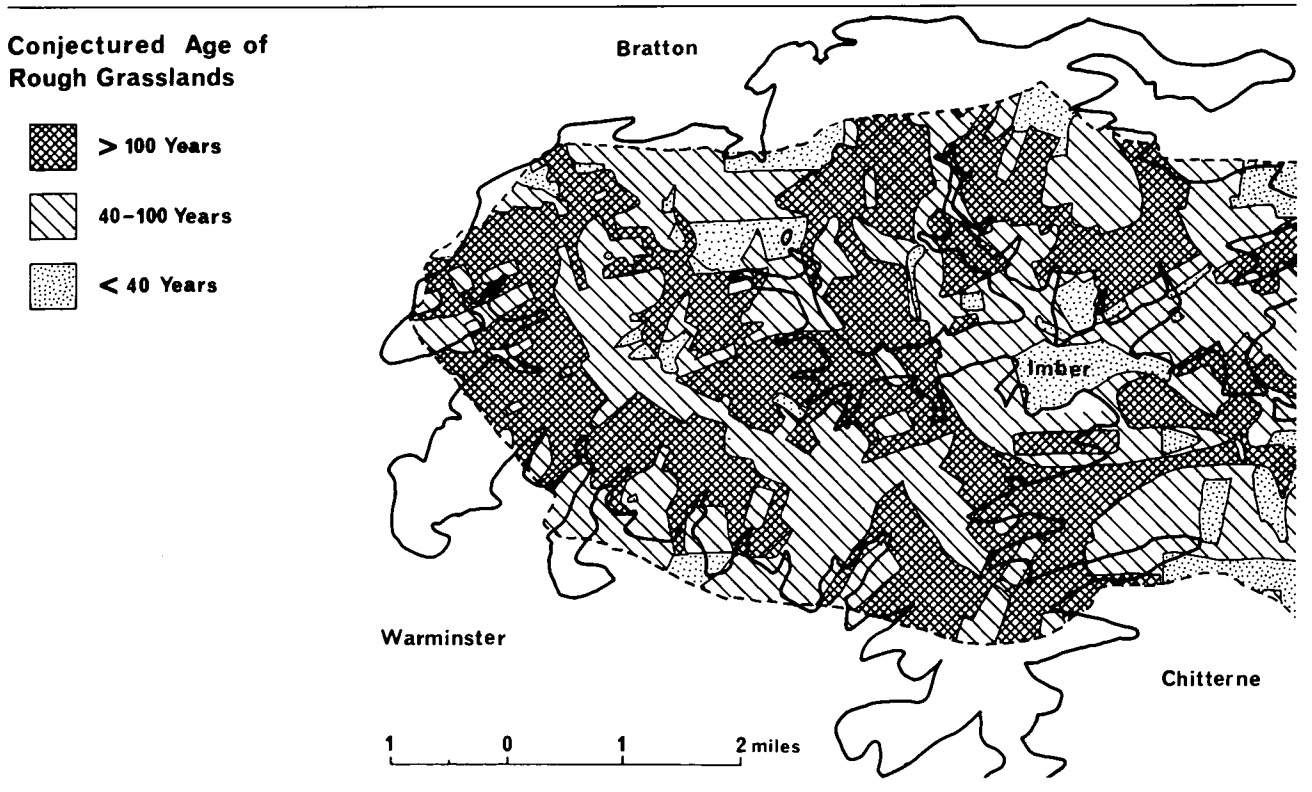


Figure 10 The conjectured age of rough grasslands over the western part of Salisbury Plain, as indicated by surveys of the 1870s and 1930s.

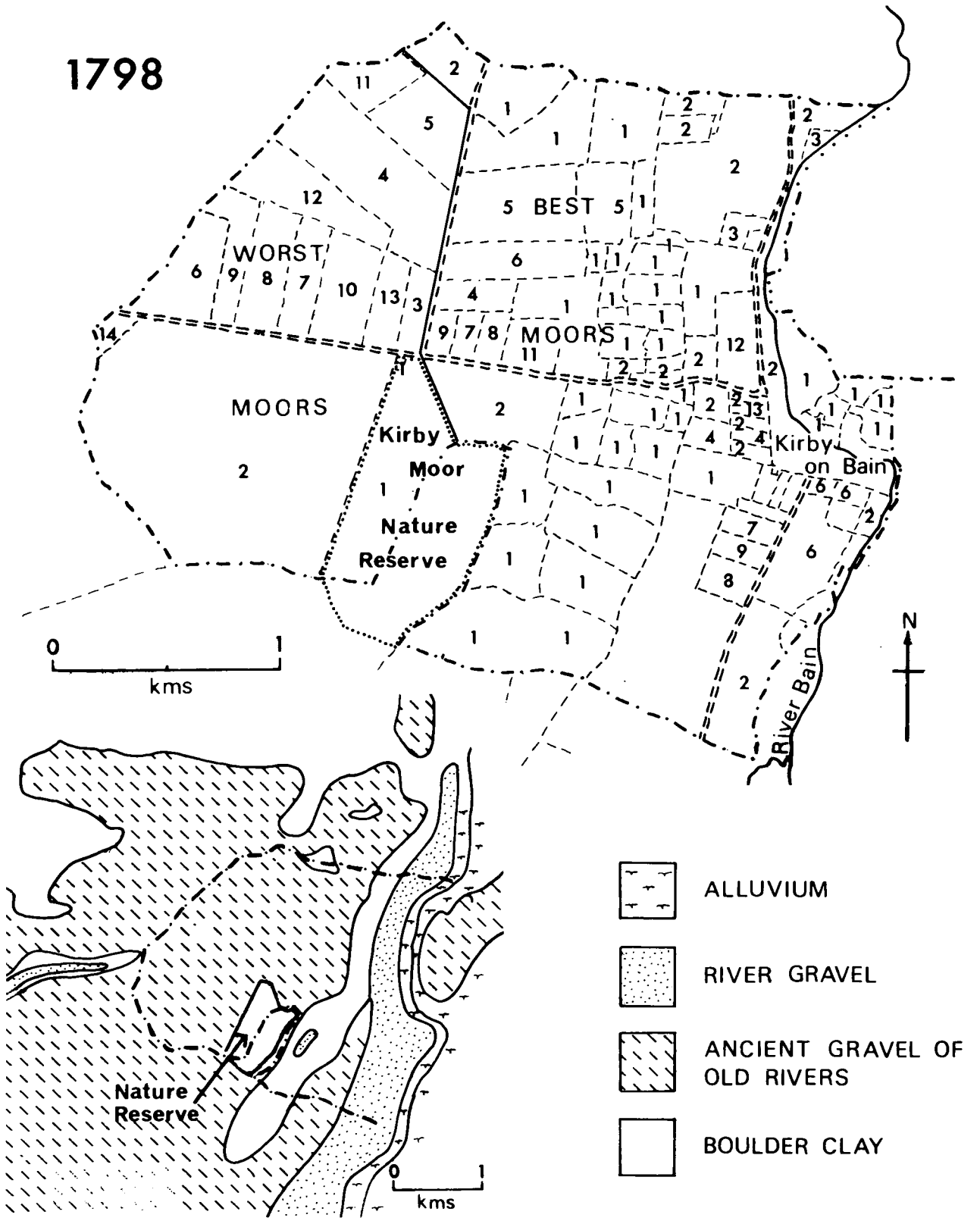


Figure 11 The physical setting of the Lincolnshire parish of Kirkby on Bain, and the perception and allotment of land during the parliamentary enclosure of the arable and moor land in the late eighteenth century. The allotments of each of the 14 former commoners are indicated by a number. It will be noted that each was given a tract of the Worst Moor.

ing the Worst Moor. To prepare for such an eventuality, the commissioners allotted each part to a commoner who might enclose his allotment whenever he wished and thereafter manage it in severalty. Subsequent surveys indicate that the present-day heathland communities are not 'direct descendents' of the eighteenth-century heath. Some parts were ploughed up when wheat prices were high in the early nineteenth century, and parts of the present-day reserve were cultivated as late as the second world war. Knowledge as to the status of the reserve-area in the past and the incidence of periodic disturbance will help not only in the interpretation of the distribution of present-day plant communities, but it may also provide insights into the optimal methods of managing the vegetation for nature-conservation purposes in the future.

VI

In spite of the wide range of source material available, the historical ecologist will almost always find his information imprecise and incomplete. Frequently, he seeks data on gradual and extremely complex processes which even the ecologist today can monitor only imperfectly. Elton has stressed how, for example, the dispersal and interchange of plants and animals is 'on the whole a rather quiet, humdrum process', whether stimulated by natural processes or by human activity. He cites the example of the daily transport of four loads of thorns for fuel from Wytham Wood to the nunnery at Godstow, a mile away, in the medieval period, and he observes, 'all the transport of dead wood about the countryside must have provided additional opportunities for the dispersal of many kinds of animals and some plants'.[37] It would be hard enough for ecologists to record all the implications of this kind of traffic today: it is churlish to expect Everyman to have made and left detailed records of these activities in the past.

This booklet has attempted to identify some of the more important types of documentary data of potential relevance to the historical ecologist. It has indicated some of the more obvious defects in the sources. It has been assumed that the ecologist, far from being deterred, will welcome the occasional cautionary tale. Sceptics might argue that past events should be disregarded because their incidence and significance can never be verified beyond doubt, but this is a short-sighted view because the past can never be entirely left out of the ecological reckoning of the present and future. An historical perspective will always be required. Although the eventual historical reconstruction of the past may turn out to be limited and imperfect, the study of historical ecology has already become a fascinating study in its own right for many ecologists.

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Historical Ecology Discussion Group

Some indication of the increasing interest being taken in historical ecology is provided by the continued support for this informal group, organised from the Monks Wood Experimental Station. The Group meets about twice a year, and twenty meetings have been arranged since 1969, attended by archaeologists, ecologists, geographers and historians, employed in a wide range of fields. Most meetings have included an indoor session and field excursion. Subjects have included 'Arable weeds and good husbandry', 'Relict species in woodlands', 'Climate in historical times', and 'The ecological interpretation of place-names'. Any person interested in knowing more about the Group should write to the Institute of Terrestrial Ecology, Monks Wood Experimental Station, Huntingdon, Cambridgeshire PE17 2LS, enclosing a stamped addressed envelope.

Notes

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