An evaluatory study of the methods used in the reconstruction of historical vegetation and land-use, with reference to part of East Sussex, England.

by

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VI - BIBLIOGRAPHY

VI Bibliography - primary sources

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Sussex estate and Tithe Award maps (after F.W. Steer 1962)

Tithe Award maps for parishes of study area

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All works on rural matters which were examined, whether original, reprint or replica editions, have been incorporated in the section on secondary sources, as have references to the 'Annals of Agriculture' vols. 1 - 45, and the Journal of the Royal Agricultural Society of England (1st and 2nd series).

Bibliography - secondary sources

The following abbreviations have been used:-

AA	- Annals of Agriculture
Agric. Hist. Rev.	- Agricultural History Review
Antiqu. Jnl.	- Antiquaries Journal
Arboric. Jnl.	- Aboricultural Journal
Archaeol. Jnl.	- Archaeological Journal
Arch. Cant.	- Archaeologia Cantiana
B.A.R.	- British Archaeological Report
Bull. Inst. Archaeol.	- Bulletin of the Institute of Archaeology, University of London.
C.B.A.	- Council for British Archaeology
C.W.A.A.S.	- Cumberland and Westmorland Antiquarian and Archaeological Society
Econ. Hist. Rev.	- Economic History Review
Geog. Jnl.	- Geographical Journal
J. Biogeog.	- Journal of Biogeography
J. Ecol.	- Journal of Ecology
J. Env. Man.	- Journal of Environmental Management
J. Hist. Geog.	- Journal of Historical Geography
J. R. Agric. Soc. of E.	- Journal of the Royal Agricultural Society of England

J. Soc. Biblphy. Nat. Hist.	- Journal of the Society of the Bibliophily of Natural History
Med. Arch.	- Medieval Archaeology
Post-Med. Arch.	- Post-Medieval Archaeology
Proc. Geol. Assoc.	- Proceedings of the Geological Association
Proc. Preh. Soc.	- Proceedings of the Prehistoric Society
Q. Jnl. For.	- Quarterly Journal of Forestry
S.A.C.	- Sussex Archaeological Collections
S.A.S.N.	- Sussex Archaeological Society Newsletter
S.C.M.	- Sussex County Magazine
S.I.H.	- Sussex Industrial History
S.N. & Q.	- Sussex Notes and Queries
S.R.S.	- Sussex Record Society
T.I.B.G.	- Transactions of the Institute of British Geographers
V.C.H.	- Victoria County History

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V - APPENDICES

APPENDICES

1. List of abstracts, periodicals and series of publications examined.

2. A discussion on the importation of the Invasion Hypothesis into palynological interpretation.

+3. Reports on radiocarbon dates

4. Survey of woody species in hedgerows of study area.

5. Brief examination of treatments used to improve 'peat mosses' and their likely consequences for pollen-bearing deposits.

+6. Archaeozoological data set out in full.

+7. Classification of wood and wood products as used in the Ashburnham estate Timber Accounts: major items.

+8. Classification of wood and wood products as used in the Ashburnham estate Timber Accounts: minor items.

9. The history of major wood - using industries in the study area: nature, duration, distribution and wood consumption.

10. 'The Shaw Exercise'.

11. The calculation of modern volumetric equivalents for historic woodland products.

12. Summarised data on aggregated extractions from Ashburnham estate woodlands.

13. Application of the 'Digitizer' in this study.

14. List of travellers and diarists writing of the study area whose works were examined.

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APPENDIX 1: List of abstracts, periodicals and series of publications which were examined (in alphabetical order: entire series unless stated otherwise).

Agricultural History Review

Annals of Agriculture (As many contributions were anonymous, all but major papers are referred to as: AA, from 1 to 45, dated from 1790 to 1808).

Antiquity

Arboricultural Journal

Archaeological Abstracts

Battle and District Historical Society: Transactions

British Archaeological Reports

Bulletin of the Institute of Archaeology, University of London

Bulletin of the Institute of Historical Research

Council for British Archaeology: — Reports

East Sussex Record Office (publications of)

Ecological Abstracts

Economic History Review (1st & 2nd series)

Geoabstracts

Geographical Journal

Geography

Grana (palynologica)

Hastings and East Sussex Naturalist

Historical Manuscripts Commission (publications of) (Including Guide to the Reports indexed by parish).

Journal of Applied Ecology

Journal of Archaeological Science

Journal of Biogeography

Journal of Ecology

Journal of Historical Geography

Journal of the Royal Agricultural Society of England (1st & 2nd series)

Journal of the Society of the Bibliography of Natural History

Medieval Archaeology

Nature Conservancy Council: Reports Digest

New Phytologist (old and new series)

Oikos

Palaeohistoria

Post-Medieval Archaeology

Progress in Physical Geography

Quaternary Review

Radiocarbon

Review of Palaeobotany and Palynology

Somerset Levels Papers

Surrey Archaeological Collections (Vo. LXI onwards)

Sussex Archaeological Collections

Sussex Archaeological Society Newsletter

Sussex History

Sussex Industrial Archaeology Society Newsletter

Sussex Industrial History

Sussex Notes and Queries

Sussex Record Society (publications of)

Transactions of the Institute of British Geographers (old and new series).

APPENDIX 2: A discussion on the importation of the Invasion Hypothesis into palynological interpretation.

Clark (J.G.D. Clark 1966), who first proposed the hypothesis noted that, in the words of Addyman, "Each invasion had a different character and a different effect, demonstrable archaeologic ally and historically, on indigenous material, social and economic conditions. This criterion for the concepts of invasion and diffusion as a means of culture spread could have exposed the mythology of British pre-history long before Clark (1966) found it necessary to do so" (Addyman 1976, 310). It is contended here that all works cited in the text(5) equate phases of increased deforestation and cultivation with adventitious peoples of distinctive 'material culture'.

An outline of a recent discussion on the problems of archaeological interpretation (Barrett 1980) may both introduce and explain what may seem an eccentric consideration in this context. Barrett, dealing with the Iron

Age in Scotland, concluded that 'archaeological classifications tend to direct analysis rather than being utilised for analysis' (op. cit. 217). This is the inversion of the proper path of reasoning. In effect, an artefact ('the beaker', in this case) had managed to produce a people, rather than vice-versa. In palynological interpretation, phases of deforestation and cultivation are discerned in pollen records and related to co-eval (given, and this is not always so, the support of radiocarbon dating) material cultures. Most commonly, the adventitiousness of the material culture and the onset of the clearance phase, are conflated and, by clear implication and convention, causally related. A rare explicit example describes a 'late phase of greatly accelerated disforestation (sic)' at around 690 bc at Frogholt, Kent; there was discerned 'the influence of a powerful new culture entering the region.....the first Iron Age settlement' (Turner 1981b, 265. Based on original analysis: Godwin 1962). No substantive archaeological data is drawn on in the original analysis, nor accompanies Turner's approbatory citation.

The equation of this and other cited phases of deforestation with adventitious peoples of a distinctive material culture, is without any explicit justification whatsoever.

APPENDIX 4. Survey of woody species in hedgerows of study area.

Species name	Total of records
Ash	6
Beech	1
Birch-Brown+	6
Birch-Silver+	4
Bramble*	67
Butcher's Broom	1
Crab Apple	1
Dogrose+	38
Dogwood	1
Elder	11
Field Maple	2
Gean	8
Gorse: U. europaea	9
Hawthorn+	58
Hazel	39
Holly	28
Oak*	46
Poplar	1
Sloe	40

Species name	Total of records
Sycamore	5
Willow-Creeping	10
-Common Osier	9
-Common Sallow	2
Ivy	43
Honeysuckle*	6
Woody Nightshade	2
Old Man's Beard	17
TOTAL	461

n = 67

$\bar{x}$ = 6.9

range: 2 to 11

* No further taxonomic refinement was felt permissible,

+ Orthodox field identification, with sampling of 'problem' taxa, was executed. Confusion in identification was felt to be feasible.

APPENDIX 5: Brief examination of treatments used in the improvement of 'peat mosses', and their likely consequences for pollen-bearing deposits.

This account draws on a collation of papers on the historic use of the spade (Gailey & Fenton 1970), and in particular, a paper making reference to its use in the south-western counties of England (Dodgshon & Jewell 1970). This last drew freely on examples from south-east England, and distinguished between 'pare and burn' and 'beat burning' on the basis of the tool used and, albeit imprecisely, on the type of land treated. Documented examples for the south-east were: the practice of 'denshiring' (or 'pare and burn', reputedly originating in 'Devonshire', or as 'down-shearing') in Sussex and Surrey in the mid-C17th, (Blith 1652; Daniel-Tyssen 1872). In addition, (and not mentioned by Dodgshon & Jewell) Markham in his 'Farewell to husbandry' recommended the 'burning of baite' (Markham 1638, 20-1). These provide hints as to the prevalence of these, undetailed practices.

In volumes of the Annals of Agriculture, for instance, the editor and numerous contributors wrote on diverse methods of improving 'peat mosses' and so on for agricultural purposes (AA1 - 45, dated 1790-1808). Draining, levelling, manuring, fuel-cutting and tree-planting featured prominently.

These volumes, slanted towards farming in southern and eastern England, enthusiastically vaunted the practice of 'pare and burn'. The turf and upper peat (or whatever) of the surface were ignited, and the ashes spread over the field and ploughed in. It was considered suitable for breaking up 'heaths, downs, commons, fens and rough pastures'. It was also prescribed to get rid of 'fern', and 'freshen land'. Young, snr. had applied it to over 1000 acres of land in 30 years (AA:43, 133, 658-9; 44, 418; 15, 345-7). Young, jnr. took up his father's enthusiasm and recommended its use in Sussex (Young 1794, 204-5 & 1813, 197-9).

Yet few writers detailed the practice, and in particular the depth of the 'pare'. Young snr. recommended 1 to 1½ in. (AA43, 113). However, Henderson, noting its special appropriateness on land with 'a thick matted sward', recommended a depth of 1 to 2 in. and, on deep soils', the thicker the paring the better' (Henderson 1826, 351-3). It was said to improve most soils, and to be 'absolutely necessary' for others. Young snr. called its use 'one of the most disputed points in husbandry' (AA5, 118) and the 'most admirable of all the practices' (AA34, 122).

The geographical locality of the practice is most difficult to establish. Most treatises and accounts generalised as to its suitability for regions and types of land, and only described the deeds of exemplary 'improving' farmers. No records of 'pare and burn' were traced to the study area, the nearest being Sandwich, Kent and Petworth, Sussex (AA:5, 112-9 & 24, 521-2).

The conjectured consequences of the practice are: disturbance; comminglement of the uppermost strata; aeration; consolidation of deposits; accelerated decomposition of pollen grains; and destruction of a valid pollen record.

A further treatment of land, potentially influential on the pollen record, which has been recorded and recommended from time to time, is the application of mud from watercourses and ditches, or sleech, as it is

known in Sussex. This has been practised on the arable fields of the Barnhorne manor of Battle Abbey estate in the fourteenth century as shown in the records of taskwork (Brandon 1971).

Treatises on husbandry by Markham, by Walter Blith, by Arthur Young all recommended it, as did several contributors to the Annals of Agriculture (Markham 1638, 64-5; Blith 1652, 143-5; A. Young 1813; AA34, 107-9 & AA37, 451).

Such a practice, were it accompanied by scouring or dredging of the watercourse, would excavate sediments, and dispose them on the land. In the case of European coastal marshlands, their history has (to put it simply) been one of natural accretion, together with human reclamation. This reclamation has entailed the maintenance of watercourses by leveeing and dredging. There is a strong indication that this would continuously transpose pollen-bearing deposits from depth to the surface. Great vigilance was therefore required as one pollen analytical site, carefully vetted for this study (Figs. 1 & 2) coincided with the arable fields of Barnhorne, which were treated in such a manner.

APPENDIX 9: The history of major wood-using industries in the study area: Nature, duration, distribution and wood consumption.

The development of diverse industries has long been considered as being particularly rural. The range of industries, and locally distinctive concentrations of a particular industry, at least from the C16th, has long been appreciated (Salzman 1964; Thirsk 1967, 46-9, 54, 69, 79-80; E.L.Jones 1968; Crossley 1981). A characteristic range of industries has been associated with 'woodland-pasture' areas (op. cit.; Birrell 1962 & 1969). The Sussex Weald has been judged to be such an area (op. cit.; Cowley 1965; Clarkson 1966; C.E.Brent 1973 et seq.; Tittensor 1978, 356-66). Substantial employment in rural industries in the study area has been noted for the period, 1540 to 1640. (C.E.Brent 1976, 115-81).

It is now intended to review the time-span and nature of 6 selected industries in the study area. A recent pertinent bibliography was examined

(Coones 1979). It is hoped to gain some measure of the industries as users of wood from local woodland. The main and most persistent rural industries were:-

1. iron smelting and working, 2. clay working and firing, 3. leather making and working, 4. wood-ashes: potash manufacture and lime-burning, 5. industries using large timber, 6. salt making.

1. iron smelting and working

All known local sites of this industry are mapped in Fig. 3. It has been found possible to propose a broad, yet discontinuous time-span for the local industry: It was ephemeral and minor in the pre-Roman and Romano-British period, with output substantial and continuous in only the first, second and third centuries. Only one site, Crowhurst Park, showed a pre-Roman origin (Money 1978, Cleere 1978). Six sites have been established as of late Roman times (Cleere 1974 & 1976). The industry all but disappears until the C16th and C17th. [Exceptions are a C6th Warbleton site — Beswick pers. comm.—and a mid-Saxon site—Tebbutt 1982] In the C16th and C17th there was a great expansion, succeeded by progressive decline and a well-determined end.

The essentials of iron-making are well known (Tylecote 1976; Hodges 1976, 80-90). Output for several works is known, but it is improbable that all works of even the C16th and C17th have been located. Therefore total output and fuel usage for the local industry cannot be determined. It is conceded that the sole means of assessing fuel usage is to total the sites known for each period of iron-making and gain a sense of the importance of the industry. Further, a collation of data on charcoal assemblages (the form in which wood was generally used in smelting iron. Salzman 1964; Cleere 1974, 171-7; Hammersley 1973, 593-613) on proven, dated sites of iron-making is presented (Fig. 22). Identification of archaeological charcoal is offered (Fig. 22). This is an impression; selectivity in species for coaling, the site sampling strategy (volume taken and source and size of pieces) have rarely, and only recently been made explicit

(Leney & Casteel 1975). Doubt has been cast on much past identification of charcoal and wood (Godwin 1975a, 8); such samples may only rarely be re-examined.

Little may be learned of local iron-making from the archives of Battle Abbey and Ashburnham estates. Searle could maintain that 'There is no direct evidence of the iron industry in the Battle muniments' (Searle 1974, 121); this surprised Searle (Searle, pers. comm.) and the writer, as there was heavy use of iron products on the estate (Searle 1974, 121). Charcoal was made and entered in accounts for years until 1351. Faggots were produced in abundance (Fig. 16). The status of the local industry is tantalisingly unclear.

Conventionally, the time-span of the Wealden iron industry is well-known (Straker 1931a; Hammersley 1973; Tomlinson 1977, 383-9); growth was rapid from the 1530's and 1540's until the 1570's and 1580's. In the 1574 lists of ironworks, probably the sole reliable contemporary account, 61 'masters' operating in the Weald, each presumably with one or more ironworks (Cattell 1979; Goring 1978, 204-6). In the study area there were 7 'masters' (Fig. 3). In the 1580's, 54 occupied Wealden blast furnace sites are known (Hammersley 1973, 596). Further to this a furnace and forge, in Crowhurst and Ninfield, were operating in the 1590's (Brent 1978, 43). Using extant records of output, an average annual output of 200 tons has been estimated for the period from the C16th to the mid-18th (Hammersley 1973, 598-600). Fuel for this output could, according to Hammersley, 'have been made for ever from 2000 acres of coppice'. This is certainly endorsed by later extractions of known volume, from woods of known area, on the Ashburnham estate in the C18th and C19th.

It is for this critical period that production accounts of an ironworks in the study area are extant (Crossley 1975b). Transcribed, complete accounts of the Panningridge Furnace provide a detailed insight on the use of wood (from 1542 to 1563: Summary Accounts for all 11 years, and a Furnace

Book, a daybook for 1550). In the Summary Accounts there are annual totals of cords of wood cut, and of loads 'coaled' (turned into charcoal). Four points have been elicited:-

a. the irregular rate of annual 'cutting' and 'coaling'.

('cutting': range - 53 to 4328 cords; mean - 2479 cords

'coaling': range - 118 to 1424 loads; mean - 709 loads)

b. the rarity of any mention of species.

There were two mentions of oak and one to 'topping of 25 okes' (op. cit., 113, 185). This was also the case with Ralph Hogge's Ironworks Accounts, covering the period 1576 to 1581, for several furnaces on Ashdown Forest (Crossley 1975a). Similarly, rare mention of oak was made in 'Westall's Book of Panningridge', an ironworks clerk's record for 1546 (Straker 1931b). In the sole extant contemporary treatise of Sussex ironmaking by Walter Burrell (Lower 1849, 200-3), no species was specified for charcoal.

However, a suggestion of the preference for oak in ironmaking emerged in a C16th Commission of Inquiry (Historical Manuscripts Commission: 9 Salisbury XIII, 19-24). Under oath one 'Alexander Collyn' was reported to have 'cut down the most part of all the oaks standing in the same wood and ground and beginneth to cut down the beeches'. This was on a common in Lamberhurst, in the Kentish Weald.

c. the largely unknown location and extent of the woodland areas which yielded the wood (Crossley 1972, 60).

d. the scanty information on fuel consumption.

Interestingly, where there has been intensive field-walking, as in the Rother Valley area (Cattell 1972), a density of iron-making sites far in excess of Straker's 'surveyed' total was identified. In Cattell's study area, Straker located 3 sites; Cattell added 31. This led Cattell to conclude that Straker's work was 'a far from adequate guide'. Cattell's study area was contiguous northward to that of the author. The study area met all requirements for the industry (Cattell 1972, 20), and numerous pits indicated extensive, temporary working (Sweeting 1930 & 1944).

Hammersley's argument is, in the main, accepted. He prompts exception with his description of coppice woods in terms of crude area. This takes no account of the suitability of any species for charcoal, actual or perceived. This point has been discussed above (III-C-iii-d).

In the Ashburnham estate records, the three major classes of woodland product used by the estate ironworks were cordwood, kiln faggots and charcoal. Charcoal was made at the ironworks from cordwood. Cordwood and runtwood were simply wood measured and stacked in a standard and specified manner (Definitions: App. 7). This cordwood is considered to have been mainly, oak; this is argued above (III-C-iii-d). The volume of faggots used was negligible. This usage in terms of the area of the estate, was emphatically minor.

The time-span, scale, distribution and conjectured wood usage of this industry is set out (Fig. 15). This table summarises this and succeeding sections.

2. clay working and firing

Local record of the industry is late and slight. This despite reviews of the chemical composition and physical properties of local Hastings Beds clays as suited for brickmaking. They are described as generally durable and much used. (Butterworth & Honeyborne 1951-2; Highley 1975, 561-2). The earliest local record of clayworking is that of a tilery at Battle Abbey, in the accounts of the cellarer, from 1275 onwards (Searle and Ross 1967). Purchases of tiles, and payments to a tiler are recorded (this precedes 'the earliest' in a review of local clayworking. Beswick 1977, 7-9). Production at Battle was minor, several thousand tiles per annum, and was largely for abbey use. A tilery was recorded at Ashburnham in 1362 (op. cit.). The likely usage of fuel at this time may be judged from a tilery owned by Battle Abbey at Wye, Kent (Salzman 1952, 177-9). Accounts are extant for the 1330 to 1380 period; in 1355, the 10 kilns were fired with 1000 faggots to produce 10,000 tiles. Faggots were the customary fuel for brick kilns in East Sussex as elsewhere (Leslie 1970-1).

A compilation of sites of Medieval clayworking has been made from documentary and archaeological sources for East Sussex (Musty 1974, 41-66). From this, it would seem that clayworking was, until the C18th or C19th, dispersed, and without strong local representation. Wood usage as fuel is taken to be commensurately minor. In the C18th and C19th the focus becomes sharper. The Trade Directory for 1867, for instance, lists only three works in the study area. The faggot usage for the Ashburnham works has been set out (Fig. 20). The Ashburnham Woodcutting Books occasionally (with dubious completeness) noted that faggots went to brick kilns. Leslie in her account of the brickworks, from 1840 onwards, noted that the full range of underwood and brushwood was used, but that birch and hornbeam were preferred (Leslie 1970-1, 2-22). This usage, in terms of estate area, was minor.

Clay firing and working is an industry which was too commonplace to merit such contemporary comment or detailed subsequent study. An impression of a dispersed, small-scale industry is gained.

3. <u>leather making and working</u>

These industries have had a long, direct association with areas of 'woodland-pasture', including the study area (Clarkson 1974, 136). The first mention of tanning in theBattle Abbey records was in the late C13th and early C14th (Searle 1974, 302): By the C15th, Battle was a centre (Searle 1974, 300-1). Mention of leather was, however, rare in the Cellarer's Accounts (Searle and Ross 1967).

The scale of the industry is impossible to determine until it becomes subject to taxation. From the C17th the industry is well-documented and well-studied (Clarkson 1966 & 1974), and the requisites of the industry may be determined. These requisites are hides from the everpresent cattle, quicklime or fresh wood-ashes as a depilatory agent (App. 9-4), and bark as a tanning agent (<u>op. cit.</u>). Most bark was taken from oak. Clarkson maintained that 90% of all leather in the 1660 to 1830 period was tanned with oakbark. Reviews of archaeological evidence (Hodges 1976, 148-52) and

of documentary evidence (Salzman 1927, 248; J. M. Lindsay 1975, 87), and recollections of the craft of tanning (Edlin 1973, 84) confirm this selectivity. Local evidence is scanty on this point: Searle accepted that oakbark was used for tanning at Battle (Searle 1974, 300-1) although it was rarely specified as such (Searle, pers. comm.). Arthur Young simply noted - bark demanded a 'large fell of oak' of late (A. Young 1794, 384), and 'the great demand of late years for bark' (A. Young 1813, 165). In the Ashburnham archives, little value was put on bark. It was treated on a par with 'waste' and 'litter' with value rarely declared. This status of bark as a by-product with low value and incomplete accounting, is accepted; (ESRO: Ashburnham MSS. 1900-44); this is endorsed by Clarkson's work (Clarkson 1974, 143, 148). Roberts, a Sussex woodman and wood manager of great experience, noted the great difficulty in selling bark at the turn of the twentieth century (T. Roberts 1909, 187).

4. Wood-ashes: potash manufacture and lime-burning

The importance of wood-ashes in a 'woodland-pasture' economy was in their use, after lixiviation, as potash; potash was used as a fertiliser for soil, and in soap manufacture. This was the case in Sussex (A. Young 1794, 210-1, 255-6, &1813, 208). Such ashes were a by-product of any kiln or furnace using wood fuel; for instance, wood-ashes were sold from the Sidney Ironworks in most years of the C16th for which accounts survive (Crossley 1975b). No quantities were detailed. Markham had recommended the use of wood ashes to improve farmland (Markham 1638, 55-6). Young noted that 'soap-ashes' made an 'excellent (fertiliser dressing) for meadow' in Sussex (A. Young 1794, 210-1). 'Soap-ashes' and 'wood-ashes' were both praised (A. Young 1813, 218). He, however, listed only one potash works in Sussex at Petworth (op. cit., 436). Potash-making would seem to have been conducted by individual farmers.

Further, it is important not to be too circumscriptive as to the type of fuel used. A C17th grant of monopoly in soap-manufacture stipulated, 'bean straw, pea-straw, kelp, fern and others vegetables to be found in our own dominions' (Bland, Brown and Tawney 1914, 463). Davies-Shiel

(Davies-Shiel, pers. comm.) suggested furze as a commonly used fuel.

Potash manufacture is perhaps one of the least well known of medieval industries. The fuel of the industry in Cumbria, the best studied area, was wood in the period up to c. 1700, and was bracken after that. There is record of regular mowing of bracken for this purpose (Davies-Shiel 1971, 1972, 1974 & pers. comm.). There is mention of its use for lime-burning in Sussex at Warton, in the early C18th, (cited by Davies-Shiel 1972).

Evidence for this industry in the study area is decidedly flimsy. It is indirect and superficial. It is surmised that the 'industry' was part and parcel of any clearance of woodland.

As with potash manufacture, lime-burning was an industry based on recognised deficiencies in Wealden soils (thoroughly discussed; Hall & Russell 1911). Battle Abbey estate records note lime-pits, lime-kilns and payments to limeburners (Searle 1974, 300-1) and transactions concerning lime appear in most years of the cellarer's accounts until the end of the C14th (Searle & Ross 1967). Lime and limekilns feature only occasionally in the Sidney Ironworks Accounts in the C16th (Crossley 1975b, 185-6, 193).

Limeburning on the Ashburnham estate was an important use of fuel, and may be dated with accuracy. Arthur Young snr. after conversation with the 2nd Earl's limeburner noted that new 'draw kilns' had recently been installed. The fuel was 'copse growth .... of a large size used to make cord wood'. The 'refuse wood (as for flame kilns) would not do for them' and neither would faggots. The Earl was in 1789 the 'greatest limeburner in England'. (AA11, 259-60). Another visitor was Gideon Mantell in 1821. He noted that no more than 12 kilns were then burned in a year, as compared with 'not less than from 70 to 100' only a 'few years before'. This dated a phase of limeburning, with known type and volume of fuel (Curwen 1940, 39-40).

In 1793, Arthur Young jnr. visited Ashburnham and questioned the limeworks superintendent. Then, the 2nd Earl possessed 'the largest plantations of wood inthe whole county', the 'chief purpose' of which was to fuel lime-kilns. 'All his Lordship's extensive woods are consumed in the kilns'. The cut was at 16 years, apart from the 'poor woods' of heath and broom which were cut at 7 or 8 years (A. Young, 1794, 254-68.

A. Young jnr. digested his accounts of previous visits. (A. Young, 1813, 164-86). He noted that 'the spray-faggot of all his extensive woods' was cut down 'for his (the Earl's lime) kilns'; it was further described as 'of the smaller sort'. Plainly there were two processes of lime-burning with distinct fuel requirements on the estate. Where, inconsistently, entries in the Woodcutting Books detailed end-use for faggots and cordwood in the limekilns, this was plain. These entries suggest, and credence in A. Young jnr. indicates, the predominant importance of faggots as fuel in the estate limekilns. Lime-burning is unusual in that its duration, at least on the Ashburnham estate, is known.

5. Industries using large timber

The conventional history of lowland English woodlands has been summarised and reviewed above. This included periods of great concern as to the future of timber supplies, most notably for ship-building. Local surveys of timber have been reviewed. No assessment of the effects of timber extraction for shipbuilding from the study area is attempted; use of timber for shipbuilding was minor other than in the period 1780 to 1860 (O'Connor, cited in Rackham 1976, 100). Within this period much contradiction has been noted in the evidence (J. Farrant 1976, 108-10). Official surveys laid no emphasis on timber, and its dearth, while commentators, such as Marshall and Young greatly bewailed this. Volumes of timber abstracted may not be attributed to specific woodland areas; Sussex oak was agreed as a paramount shipbuilding timber (op. cit.) but its usage, and the 'standing crop' cannot be assessed.

It is proposed to concentrate on the use of timber in building. The critical transformation in the nature of this industry was 'The Great Rebuilding' (Hoskins 1955 & 1963; Machin 1977). This process would seem, in general, to be complex, with protracted improvements, usually accompanied by increasingly permanent buildings, using larger structural timber (op. cit.; Rackham 1974, 65-6). This is a generalisation, but has been supported by surveys of extant, 'vernacular' buildings in the study area (D. Martin 1978 & pers. comm.). Mason dated it as being in C15th, recommencing in c. 1570, and continuing until c. 1700.

Selectivity of species and age has been noted; surveys of extant buildings showed a preponderance of oak (Mason 1969, 65; D. Martin pers. comms.), with the main posts being of young trees, seldom exceeding 50 or 60 annual rings (Mason 1969, 65). Oak has been demonstrated to be the commonest forest tree in the study area, and was to be feeled at over 100 years in Sussex (A. Young 1813, 174) and at 90 to 120 years (T. Roberts 1909, 188). This roughly endorsed the findings of Rackham on medieval East Anglian buildings; oak was used above all, and felled at between 25 and 70 years (Rackham 1974, 64-8; Rackham 1976, 73-4).

The estate archives of Battle Abbey and Ashburnham yielded no data on the construction of the 'vernacular' buildings of the locality.

The conclusion drawn is the contrast between 'The Great Rebuilding' and, previously, when 'wattle and daub' was 'extremely common at all periods' (Salzman 1952, 187-194); between the increased use of greater timber, and the preponderant use of smallwood and timber of medium age; between the use of a diversity of smallwood species and a marked selectivity of oak.

Usage of wood seems to be substantial, yet over a protracted period and dispersed in source. The decline in the use of timber in building would appear to complement the increased use of bricks in the late C18th and C19th.

6. Salt-making

Evidence for salt-making in eastern Pevensey Levels has been compiled from documentary evidence (amplifying a recent review. Holden & Hudson, 1981) and field evidence - especially of 'waste'. The time-span of this 'industry' is only known from intermittently dated residues and records.

The ubiquitous importance of salt for preservation of food (Carter 1975) is accepted: As the authoritative treatise puts it, it was 'proper for curing fish, flesh, and other provisions' (Brownrigg 1748, 253). It is proposed to consider the process of manufacture, its raw materials and fuel, output, its manifestations in the landscape, and any variation over time and space.

Prior to large-scale mining of rock-salt in the C17th, salt was manufactured as 'bay salt' and 'white salt'. 'Bay salt' was extracted by evaporating brine in the open air, and 'white salt' by boiling (Brownrigg 1748, 7-8). By general consent, the processes were often combined (ibid. 124-32, 193 et seq.). Two periods, each with a distinct process of manufacture, are known locally (Holden, pers. comm.). The earlier is attributed to the Iron Age, including the Romano-British period. Sea water would be partly evaporated in pools within the intertidal zone of estuaries and creeks. The 'liquor' was placed in clay vessels and heated over fire. These vessels, when discarded form waste now recognisable as 'red hills' and 'briquetage' in the landscape (papers in de Brisay and Evans 1975. Also Holden pers. comm.).

Experimentation has demonstrated that the process produced such waste (de Brisay 1975, 5). A single site has erstwhile been ascribed to this period in the far west of the study area (Dulley 1966, 28). The writer field-walked all drainage 'sewers' within the study area. These 'sewers' have been maintained since the reclamation of the Levels. Banks of 'inned' fields have been leveed and frequently aggraded, and 'fresh' sections continuously appear. Considerable volumes of 'red hill' were

exposed in aggradations of 1975 and 1976, along the East Stream, by Northeye Prison. The redness quickly dulls on exposure, and becomes indistinguishable from superficial alluvium. These remains have been surveyed recently (Dulley 1966), and are only examinable in section and locally. 3 areas of mounds of saltmaking waste have been mapped (O.S. Archaeological Records & Sheets). Little consistent trace of the 'industry' is evident above ground.

Some of this 'red hill' was sampled by the writer and subjected to particle-size, mineralogical and differential thermal analysis. The particle-size composition was indistinguishable from that of its contextual alluvium. Unlike the context, however, it contained no plant macrofossils. The mineralogical analysis, together with electron microphotography, revealed a high proportion of illite, a mineral distinctive of marine clay (Frost, pers. comm.). Differential Thermal Analysis (D.T.A.) enables the quantification of mineral salts present; this would be expected to correspond to those salts found in uncrystallised brine. This showed a marked degree of eluviation. (Cox, pers. comm.).

The second distinct process of salt-making has also been recognised in the study-area. Salt was made thus: superficial sand-cum-silt was collected in upper creeks where salt had crystallised. Water was poured through the sand in troughs. The brine flowing off would be boiled in shallow vessels, and the salt raked off. The sand would be rejected as waste on-site, as heaps. These heaps are not distinguishable from their context by particle-size, or presence of salts (largely eluviated); rather, they are unstratified mounds in a flat landscape, and localised along upper creeks. Sets of these mounds have been mapped for the eastern Levels (Dulley 1966; Holden pers. comm.). Similar sets are known for <u>all</u> other Levels and estuaries in Sussex (Holden & Hudson 1981).

In brief, it may be said that such mounds may not be attributed to salt-making. No other land-use, known locally or on analogous marshland, satisfactorily explains the mounds, their volume and abundance. The most obvious explanation, is the use of sewer mud as a treatment of farmland (App. 5). The mounds, however, do not include any deposits materially different from the uppermost strata in, say, 0.2 m, and are the result of superficial scraping. The mounds are not composed of such mud and this explanation is rejected.

It seems plausible that the voluminous waste would be dumped near the site of manufacture. These sites are all in the upper reaches and creeks where the intertidal range is most extensive on a flat, low-lying coast, and so where the tide may ebb into pools which form naturally (Pethick 1974). Such areas were understandably used by man; the tide would recede leaving an expanse of shallow water which may be allowed to evaporate. Plainly such waste heaps indicate former coastlines and tidal limits (Akeroyd 1972). Documentary evidence is available only for the latter process. The broad chronology of reclamation is well established for Pevensey Levels from documentary and field evidence (Salzman 1910; Dulley 1966) and, with this work (and with much debateable. III-D-iii) from pollen analysis. The data on salt-making is superficial, with only occasional reports of sites and their broad location. There are C8th charters relating to salt pans on the Levels (Barker 1948, 118-22, & 1949, 61). The sole comprehensive survey was conducted under the Domesday Survey. This was simply a count of saltpans. 77 were listed for manors including a 'frontage' on Pevensey Levels (Darby & Campbell 1971, 456). There would seem to be doubt as to completeness of this inventory (King 1971, 456).

The requisites of the salt-making industry are few: Salt water in abundance; clay and sand; fuel. The more demanding requirements (after Brownrigg 1748, 38-44; papers in de Brisay & Evans 1975) would be regarding the site. It would be on a low plot of ground by the sea, underlain by an impervious base, and with no incoming fresh water.

Ponding must occur, or be created. All these features are judged to have been present on Pevensey Levels.

Battle Abbey household accounts (Searle and Ross 1967; Searle 1974) show the use of large quantities of 'white salt', the condiment, and 'lump salt' for preserving and salting away. Source was rarely stipulated; consignments were from Schorham (Shoreham), Wynch (Winchelsea?) and Bexley (Bexhill?). These may be anomalies, and so in more detail, or merely incidental detail. The overall decline in usage has been attributed to the assignment of provisioning the storeroom from the cellarer to another official (op. cit., 32). Similar small amounts of salt and 'baye salt' were purchased by the Sidney Ironworks (Crossley 1975b).

Work on commodities recorded as being in trade, and on trade occupations, mark the end of salt-making locally. Shipments of salt were few and minor in the C14th (Pelham 1928, 170-82). No mention of salt as an exported item is made in the authoritative study of Sussex trade in the 1650-1750 period; much is at this time imported (J. H. Andrews 1954, 155-284). No mention was made of salt-making occupations in 1540-1640 period (C. E. Brent 1976) and the 1550-1750 period (Cowley 1965). No salt pans were recorded on Pevensey Levels by narrators on their journeys (App. 14). It can be said confidently that salt-making ended locally with the 'inning' of Pevensey Levels. The demanding requirements of site were no longer present and the industry, at some inexactly known time, ended.

7. Summary

Several other industries were also considered. A symposium volume on the archaeology of the pottery industry in Sussex (Freke 1980), accounts of the documentary evidence for and the excavation of such kilns (le Patourel 1968; Musty 1974), and accounts of the local glass-making and paper-making industries (Kenyon 1967; Coleman 1958) did not prompt more detailed consideration.

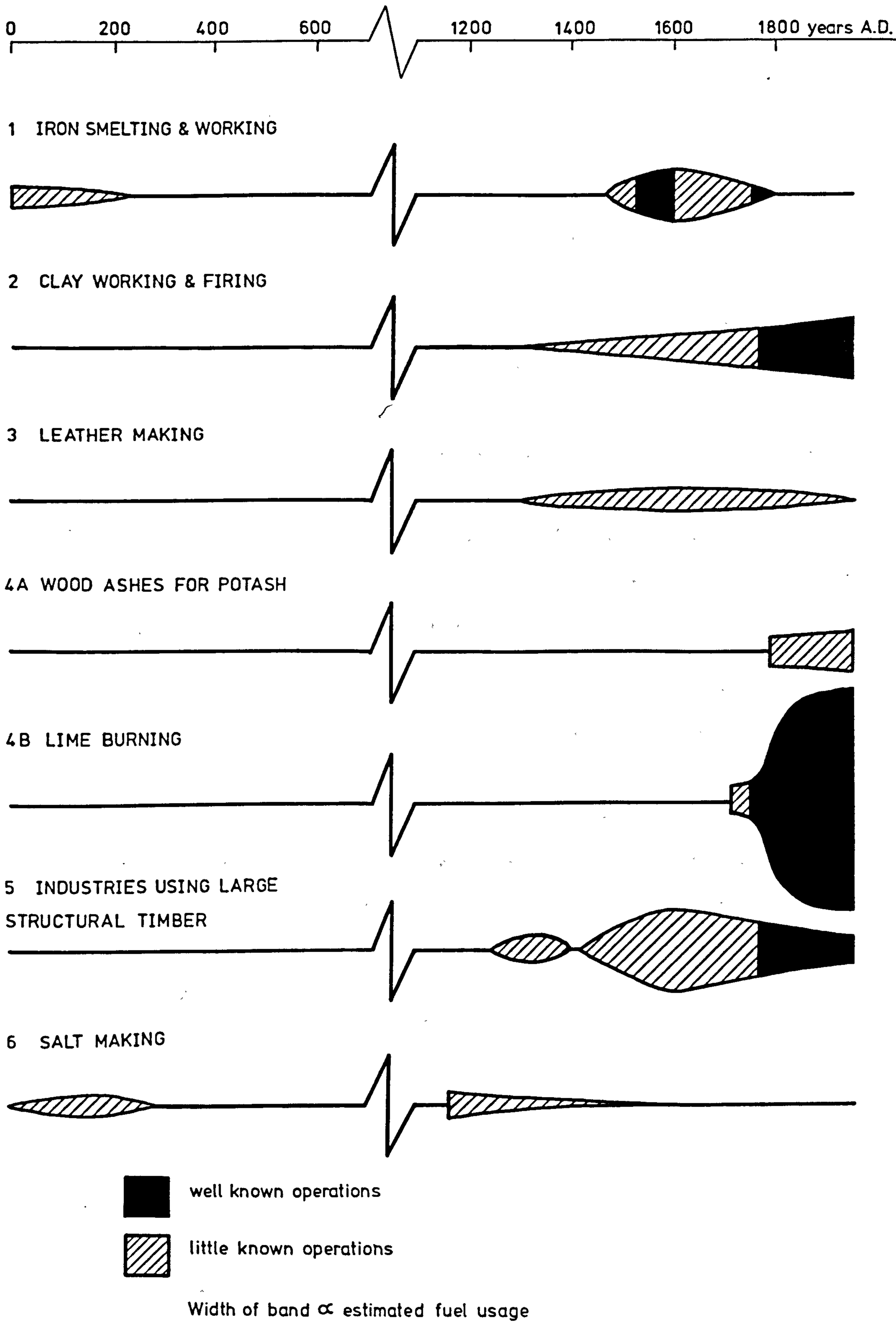

Fig15 INDUSTRIES SECTION — SUMMARY DIAGRAM

In Fig. 15, a summary diagram of this section ('Industries using wood in the study area') has been set out. From the data amassed, one conclusion only may be reached; that these industries have not been a major, sustained influence on the state of wood-bearing vegetational formations. They may not be construed to be a significant agency of vegetational change. The number of known sites, their time-span of operation and estimates of fuel usage - [following contemporary treatises and accounts, and subsequent studies, and in particular, the works of Burrell, Cleere, Hammersley and Young on iron smelting; Leslie and Salzman on clay firing; Clarkson and Young on tanning; Mantell and Young on lime-burning; Farrant, Martin, Young on the use of structural timber; Brownrigg and Holden on salt-making. (Full references: supra). The contemporary treatises tend to be approximate, prescriptive and generalised; the subsequent studies, speculative or extrapolated from a few well-recorded works] - have allowed no other conclusion.

Fig. 15 presents this; the industries have had, to the limits of our knowledge, few centres and time-spans of operation which have been demonstrated to be relatively brief, discontinuous and asynchronous (see Fig. 15). Accepting generous figures of production and fuel usage (the highest estimates proposed by the above workers) and moderately conservation-minded woodland management, these six industries are judged to be unimportant in their usage of local wood, and as an agency of woodland change.

APPENDIX 10: 'The Shaw exercise'

Numerous travellers through the study area have been struck by, and have commented upon its densely wooded state (reviewed above III-D-iv). Several agricultural writers of a reformist bent have critically commented on the peculiarly local feature of shaws; a shaw is a 'strip of wood or underwood forming the border of a field' (O.E.D.) which was characteristically 2 to 4 rods wide (AA11, 179-80; A. Young 1794, 628-31) and contained timber

trees. Arthur Young noted 'a forest in every hedge-row' and 'detestable screens of hedge-row' which were 'teeming with timber'. 'The timber woods, coppices and shaws, are sufficiently mischievous to grazing land: to the growth of corn they are ruinous and destructive to the last degree'. 'The very extensive and predominating range of timber, so very congenial to the soil of this country, and the singular custom of their shaws, render Sussex one of the most thickly-enclosed of any in the whole island.' He noted that the 'woods, plantations, coppices, shaws, &c' made up 170 to 180,000 acres, and affected about 300,000. 'Every little enclosure' in Sussex was surrounded by shaws. (A. Young 1794, 205; A. Young 1813, 62-3, 178-82, 418, 463).

Caird, writing of 1850-1, thought the Sussex Weald 'too much occupied and cut up by over-grown hedgerows' (Caird 1852, 126). This was echoed in 1878 by Whitehead (C. Whitehead 1878, 266-7). By the turn of the century it was judged that 'hundreds of acres' of shaws had been grubbed up in Sussex since the time of Arthur Young (VCH 2 1907, 274)(This grubbing up had been noted, with a related heavy loss of timber trees, since the earliest years of the century. ESRO: 'Various papers': State of Timber, dated 1807).

In a recent study of changes in tenancy on the Ashburnham estate in the mid-C19th, the smallaverage field size was noted (in the 1840's it was 5.7 acres in Ashburnham parish as surveyed for the Tithe Awards)(Short 1975).

After conducting the earlier pollen analyses it was necessary to explain the negligible local presence of those pollen taxa representing field crops (Figs. 6). Shaws acting to filter out the sparse, low-growing crop pollen seemed a possible explanation. It has justifiably been pointed out that writers have unquestioningly accepted the origin of shaws as being relics of woodland, and so continuously present (Brandon 1978a, 86). He noted from extensive fieldwork that some, other than 'the relics' which were 'largely confined to steep, unploughable ground', were planted as hedges or grew up

on lynchets. This does not gainsay the view of a densely wooded locality; the historical nature of woodland has however been little studied, and is a focus of this study.

The effects of shaws on wind speed would appear to be similar to those of shelterbelts of related density and permeability. Thus, a 'moderately dense' shelterbelt, 30' high, would provide useful shelter for 150 to 200 yards to the leeward (Caborn 1965, 17-37). It has been frequently observed that dense tree and shrub growth filters out pollen (Tauber 1967 & 1977. Discussed in detail: II-C). Yet the writer was only able to trace one piece of work which monitored the dispersal of pollen from cultivated fields (Vuorela 1973). This, when so much interpretation of the pollen record is anthropocentric, is regrettable. It was found that cereal pollen was 'swamped' by other non-arboreal pollen, and decreased sharply along transect lines out into the surrounding forest. The forest structure which was closed from base to crown, and of diverse species composition is considered to be directly analogous to 'the shaw'. It was surmised that a similar degree of impermeability to airborne pollen may prevail in shaws, and so a field experiment was set up to test this.

A shaw-bound field was located (TQ 711088); it had an area of 3.1 ha (c. 8 acres) and was located on the edge of the Levels as defined above (III-E-iii). The shaws were continuous on all four sides of the field, broken only by a footpath and a road end. Petrie dishes containing agar were laid out on a grid pattern on the outside of the shaw (7 ranks of 7 lines, 5 metres apart and 25 metres out seriatim into the marsh); a single rank of 7 dishes was placed at the edge of the field alongside the shaw. The field was sown with wheat one year, 'Brassicas' one year and barley on the other year of the survey; the dishes were laid out for the three weeks before anticipated (and, as it transpired, actual) harvest. The marsh was in use as permanent, 'unimproved' pasture.

The dishes were collected at the time of harvest in the summers of 1975 1976 and 1977; 27 of the 56 were upended, by curious agar-loving cattle. These were discarded. In the remainder a total pollen count of c. 12,200 grains was obtained. In none of the dishes outside the shaw was cultivar pollen registered; a total of 7 grains (4 'Triticum' & 3 'Hordeum') were registered inwards of the shaw. The vast majority of the pollen originated from pollen local to the marsh (>85% Alnus in toto), species present in that and other shaws (c. 6% Corylus, c. 1% Quercus and c. 1% Betula, overall. Curiously, a count of c. 5% of Tilia was recorded; this exceeded the count of the entire palaeoecological study) and grass pollen.

This was a short-term experiment, conducted on a single site; the site was peculiarly suitable as it was one of few 'pure' shaws and conformed to the description of shaws and the field-size of historical record. The field also abutted onto 'the Levels', the site of pollen collection. The distance from other cereal-carrying fields in these years was c. 2 km; at least 2 and, more usually, more hedgerows intervened.

This study is of only local validity. Yet, it does strongly indicate that shaws act to filter out pollen of field crops; dispersal is judged to be minor and extremely localised to the growing plant. This conclusion has great consequences for vegetational history in this locality and, it is proffered, further afield.

APPENDIX 11: The calculation of modern volumetric equivalents for historic woodland products.

Definition of major products presented difficulties. Drawing together the disparities and ambiguities from Appendix 7 & 8, the major problem is one of looseness, variety and variability. Whereas 'cordwood' and 'hop poles' may be accepted as unequivocal, 'faggot' eluded precise practical definition in national, general or local sources. Several methods of inquiry were used. First, the several statutes which attempted to standardise the faggot (Statutes of the Realm 1817) as a unit in the

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measurement of fuelwood in commerce: Five were of relevance. The first three were for the assize (OED: an ordinance regulating weights and measures) of fuel. The first dated 1542-3, directed a minimum length of three feet and a minimum around at the band of 27 inches for 'the bundle' (:34-35 Henry VIII, c.3). The second and third, respectively dated 1552-3 and 1601, kept that minimum length, but with a minimum around at 24 inches (:7 Edward VI, c.7; 43 Elizabeth I, c.14). These were in force until repealed after the present period of study. (:19-20 Victoria c.64; 26-27 Victoria, c.24).

Secondly, treatises on woodland management were examined. John Evelyn, who had a thorough knowledge of south-east England (if not the study area), accepted and promulgated making up faggots to these last dimensions in the first five editions of his 'Sylva'. (Evelyn: 1664; 1670; 1679; 1706; 1729). Alexander Hunter who edited and updated 'Sylva' in the two editions until the period of study did so too (A. Hunter 1776 & 1786).

Thirdly, J.E.T. Roger's monumental survey of the prices of agricultural products, including fuelwood, from the C13th to C18th, was examined. (J.E.T.Rogers 1866-1892). Rogers repeatedly inferred that from price differentials faggots were of very varied sizes (J.E.T.Rogers: 1866 I, xviii, 24, 426; 1882 IV, 496-7; 1887 V, 393). Finally he discerned a distinct 'south country' article in the C17th which was apparently more costly and larger, overriding local price differentials (J.E.T.Rogers 1887 V, 649-50).

The strictly local data adds little to this discussion. The estate records provided no intimation as to definition. Much of the Youngs' observation reflected on this study, yet little bore directly on the present problem. A single reference made in 1793 at the Duke of Richmond's Sussex estate classified its underwood, with the bottom part going as 'great faggots', the middle part as 'baker's faggots' and the top as

'kiln bavins' for use in 'lime kilns etc'. (A. Young 1794, 238). This provides some framework for further discussion.

The Youngs used all these terms readily, and as their origin, form, age and end-use will demonstrate they are distinct and precise terms.

It was necessary to classify the woodland areas of Ashburnham estate on the basis of relative volume of the major products extracted from them. To this end, a conversion of the measures used had to be made. This took account of the dimensions set out above, tested against the volume of water displaced upon the immersion of faggots and poles in a tank of water.

	house faggot	kiln faggot	hop poles (10)	cord
single item	9.4 cu.ft. (3' x 2' 'cylinder')	14.1 cu.ft. (4'6" x 2' 'cylinder')	30 cu. ft. (14' x 3" pole)	128 cu.ft. (8' x 4' x 4' stack)
ratio of volume	8 :	12 :	24 :	100

1 cord = c. 40 hop poles = c. 8 or 9 kiln faggots = c. 12 or 13 house or domestic faggots

Considering the looseness and variability in the above definitions, and the difficulty inherent in measuring the volume of loosely bound and stacked wood, no more precise conversion factors were felt permissible.

APPENDIX 12: Summarised Data on Aggregated Extractions from Ashburnham Estate Woodlands

All woodland areas which could be located on the estate were given a unique code number based on geographical location.

1 to 64	In the co-terminous core of the estate
101 to 109	In northern outliers of the estate
200 to 233	Named woodland areas which could not be located
301 to 305	South-eastern outliers
401 to 404	Western outliers (not mapped)

Further the aggregated extractions was classed in terms of volume of faggots ('cord-equivalents'. App. 11), and in terms of equivalent proportion of

volume of cordwood.

c. 9200 items from the Woodcutting Books were broken down on these bases. From this the composite map Fig. 23 was produced.

APPENDIX 13: Application of the 'Digitizer' in this study

The hardware and software of the 'Digitizer' have been found particularly useful in various forms of spatial analysis. (See 'Area' 1976-82). Employing packages which were on-line at the 'Digitizer' unit of the Dept. of Geography, University of St. Andrews (J. Jarvis, pers. comm.), it was found practicable to apply it to several problems in this study, namely:

A. confirmation that the piecework of hedging and ditching paid for by length on the Ashburnham estate, and recorded in the Woodcutting Books, was a task carried out thoroughly eachyear around each wood on the estate.

B. confirmation of the area of estate woodland, separately and in aggregate. This was accomplished using the detailed, if inaccurately, drawn estate maps of the late C18th and the C19th, and relating these using linear, permanent features e.g. streams, roads, banks with ditches and so on, which formed woodland boundaries to the most recent corresponding local Ordnance Survey mapping. This formed the basis of Fig. 23.

C. confirmation of the area of certain types of land-usage as detailed in the body of the thesis.

APPENDIX 14: List of travellers and diarists writing of the study area whose works were examined.

Burrell, Timothy	barrister of Cuckfield keeping diary, 1683 to 1714	(Blencowe 1850)
Burton, Dr. John	visit, in c. 1739-43	(Blaauw 1856); J. H. Farrant 1979a)
Byng, Hon. John	visit in 1788	(C.B.Andre 1934)
Camden, William	visit, or visits in last quarter of sixteenth century	(Copley 1977)
Cole, William	visit in 1735	(Torr 1945)
Defoe, Daniel	visit in very early C18th (exact date much disputed)	(Defoe 1724-7; J. H. Andrews 1960)
Fiennes, Celia	visit in c. 1694-7	(C.Morris 1947)
Gilpin, William	visit in 1774	(Gilpin 1804)
Hammond, Lieutenant	visit in 1635	(Legg 1936)
Haggard, H. Rider	visit in 1901-2	(Haggard 1902 & 1906)
Horsfield, T.H.	frequent visits in early and mid-nineteenth century	(Horsfield 1824-7 & 1835)
Mantell, Gideon	geologist, keeping diary of frequent visits in early nineteenth century	(Curwen 1940)
Moore, Reverend Giles	kept diary from 1655 to 1659 at Horsted Keynes. Occasional visit.	(Blencowe 1848; Bird 1971)
Norden, John	cartographer: visit in 1595	(J. H. Farrant 1978)
Pennant, Thomas	'about 1800', a visit	(Pennant 1801)
Pococke, Dr. Richard	visit in 1754	(J.A.Cartwright 1889)
Turner, Thomas	merchant, keeping diary, 1754-65. Well-travelled locally	(Worcester 1948)
Walpole, Horace	visit in 1752	(Hadley 1959)

>Writers 'in the rural tradition' (after Keith 1975) with connections proven with the study area (after gazetteers: Hardwick 1973; Daiches & Flower 1979) were a possible further source. Only Gilbert White, William Cobbett and Coventry Patmore were drawn on (White 1887 & Holt-White 1901; Cobbett 1822, 1825, 1830, 1838 & Sambrook 1973; C. Patmore 1886 & D. Patmore 1949)<

APPENDIX 3: Reports on significance of radiocarbon dates, as submitted to "Radiocarbon'.

SRR-918 Pevensey Levels 3715 ± 80

$\delta^{13}C = -25.7^{o}/_{oo}$

Wood (Alnus glutinosa) in woody/peat stratum at ca 2.8m depth and immediately overlying silty estuarine clay at Pevensey Levels, Sussex, England (50°51'N, 0°23'E, National Grid Reference 697090). Coll 1975 by B. Moffat Polytechnic of North London subm. by R.D. Lake, Inst. of Geol. Sci., London. Comment (BM).

Base of pollen-bearing deposits. Most landward site in series (cf.SRR-1442) with other shallower dates (SRR-1443, 1444, 1445). Assemblages suggest extensive secondary forest although no local archaeological record until Romano-British time. Conventional notion of 'primeval' Wealden forest is rejected. Sparse direct indication of human activity until uppermost 0.5m.

SRR-1442. Norman's Bay Sluice (PLC/1) 2760 ± 50

$\delta^{13}C = -23.6‰$

Wood sealed at ca 2m depth in continuous peat stratum overlain by ca 6m levee, Norman's Bay Sluice, Pevensey Levels area, Sussex, England (50° 49'N, 0° 24'E, Natl Grid Ref 683 062). Coll 1978 and subm by B Moffat, North London Polytechnic. Comment (BM):

Seaward site in series (SRR-918; SRR-1443, 1444, 1445) to reconstruct progress of local inning. Sheep skull found in situ.

Court Lodge Bottom series, England

Clay/silt or wood in sediment profile at Court Lodge Bottom, Pevensey Levels area, Sussex, England (50° 52'N, 0° 24'E, Natl Grid Ref 691 086). Coll 1978 and subm by B Moffat.

SRR-1443. Court Lodge Bottom (PLC/4) 490 ± 50

$\delta^{13}C = -28.8‰$

Organic detritus in clay at 0.2 to 0.3m below ground surface.

SRR-1444. Court Lodge Bottom (PLA/2) 480 ± 50

$\delta^{13}C = -28.4‰$

Organic detritus in clay at 0.3 to 0.4m below ground surface.

SRR-1445. Court Lodge Bottom (PLC/3) 3490 ± 80

$\delta^{13}C = -26.0‰$

Wood fragment sealed in sedge peat at c 2.4m below ground surface.

General Comment (BM):

These complete series on key changes in pollen spectrum (a further three obtained within 3 km.). Oldest: local, rather ambiguous decline in Ulmus. Others: date striking increase in values of diverse herb and non-timber-bearing woody taxa. This, related to estate records of vicinity (Battle Abbey & Ashburnham), argues for local establishment of extensive woodland management, and progressive open-up of dense hedgerows.

N.B. Coded site numbers in brackets, after site name, are for writer's use only.

Species	Head Count	Period Covered	Remarks	Source
(1) RED DEER	15 or a small herd in Ashburnham Park on 5 occasions.	: Records made in 1867, 1873, 1885, 1892, 1900	Only recorded in parks. Early records of large herds of deer at Ashbur--nham and Herstmonceux are almost certainly of fallow, judging from later surveys and refer--ence to carcases as bucks and does.	Shirley 1867, 64 - 8 ESRO: Ashburnham MS 2510; Ellis 1885, 10; Whittaker 1892, 152; Butterfield 1905, 306.
	None recorded in parks of Battle Abbey. In 1587, Assize records of 6 deer being poached in Battle Park.			Searle 1974 & pers comm ('absolutely no mention' of deer in estate archives) ERSO 1973.
	For Herstmonceux see remarks.			Cockburn 1875, 1044.
(2) FALLOW DEER	283E*; 200; 170; 200. (Ashburnham Park)	: In 1814; 1867; 1892; 1900.	Only recorded in parks	ESRO: Ashburnham MS 2444; Shirley 1867, 64 -8; Whitaker 1892, 151; Butterfield 1905, 306.
	200E*; 150*; 170; 200. (Herstmonceux Park) (E - estimate. * see remarks)	: c. 1580; 1770; 1873; 1885.		In E. Venables 1851; Shirley 1867, 134; both, Ellis 1885, 10
	Disposal of carcases. (Ashburnham Park); bucks ranged 30 to 40; does 22 to 28 (and a '12')	: 22 yearly accounts with bucks and does separate all relate to to period, 1801 to 1814.with one for 1769.		ESRO; Ashburnham MSS, 2423 - 43.
	Similar at Herstmonceux.	: Atypical selections over 1643 - 9 period.		Lennard 1905.

(3) SWINE			Swine have been exploited in 3 major ways.	
a. On pannage	In the Domesday Survey minor renders or rents of Swine relate to places in the study area.	: period immediately prior to 1086.	Survey data is aggregated within administrative structures and not particr places. The render has a debatable relationship with the numbers of swine owned, and the area of land fed upon. Charter data, the staple of such a study, all but absent.	Darby 1977, 149-54 & 177-8 S.P.J.Harvey 1976, 195-9; King 1971.
	Rare records of pannage in the leuga of Battle Abbey, and not yet by Searle, in Manor of Marley.	: mid C.13th to 1380	Emphatically minor, and almost certainly data is incomplete. Comparison with neighbouring Weald of Kent where c.60000 swine were estimated to be in forest pastures; High Population region of Warwickshire Avon, in 1086 There, Charter data is abundant.	Searle 1974, 57-8 & pers comm. Searle & Ross 1967, 57. DuBoulay 1962 & 1966; Witney 1976; W.J.Ford 1976.
	Also in Parliamentary Survey. Swine carried 13; work in progress; 6.	: 1649 - 53		Daniel-Tyssen 1871-3

b. in the pigfold	In transcribed annual Cellarer's Accounts the maximum 'opening stock' of pigs in the Battle Abbey pigfold was 54, and the maximum increase was 71. Pigmeat brought into abbey ranked 3rd or 4th in value after sheep and cattle in the first 23 years up to 1435. In the next 9 years it ranked first.	: 32 years' summaries over the period of abbey occupancy.	Reflects only the abbey household economy.	Searle & Ross 1967
	First Livestock Return for East Sussex; 26455 hogs and pigs.	: 1801		VCH II, 276; G.H.Kenyon 1950, 61-2
	Sole count on Ashburnham Estate; 38.	: 1841		Ashburnham MS. 1202.
c. on free forage and in the wild.			*no quantified data. Debate as to preferability of pigfold or free forage recurs in the region. This suggests concurrent practices.	Markham 1638, 126 - 36; anon., 1767, 166; A.Young 1813, 381 - 90. Salzman 1910, 43-5.

(4) SHEEP	Losses of sheep drowned on named areas of the levels are recorded.	: c.1150 on	Apart from the places mentioned (ie the Weald proper) flocks were almost non-existent.	Melville 1931, 23. Searle 1974, 267 - 323.
	Nonarum inquisitiones, a levy of one ninth of the sheep flocks. Parish total were; Bexhill 'over 1000 head'; Herstmonceux and Wartling, 'over 500 head'. The estates of Barnhorne (both in Bexhill) had a flock of 378, and 108 lambs and Northeye had around 1000. The levels & adjacent upland of the study area carried 4-5000 sheep, at this time it is estimated. These totals reflect those 7 years earlier.	: 1340-1		
	In Cellarer's Accounts the maximum sale was 543, but 100 was more typical. Of manors supplying the abbey with sheep only Barnhorne (see above) was in the study area. Sheep absent from 'Corn and Stock accounts'. Sheepmeat ranked first in value for 23 years; fell to third or fourth thereafter.	: 32 years of summaries over the period of Abbey occupancy.		Searle & Ross 1967; Searle 1974
		: 13 years of Corn and Stock Accounts 1405/6 to 1512/3		
	First Livestock Return for East Sussex; 203, 603 sheep and lambs	: 1801		as above
	Sole count on Ashburnham Estate; 491	: 1841		

(5) CATTLE & OXEN	In the Domesday Book in the study area, the manors of Bexhill and Wartling, had 66 teams, and so c.528 oxen in draught harness	: c.1086	The correspondence of plough-teams and plough-lands is often obscure. All subsequent data on cattle and oxen complement that of sheep	Darby 1977, 95 - 136; S.P.J.Harvey 1976, 195.
	In Cellarer's Accounts the maximum 'opening stock' was 21 oxen and 5 yearling Annual sales of hides amounted to (maxima) of 70 of adult cattle, 37 of underage cattle and 192 of calves. Cattlemeat, by value, ranked first in the first 23 years; in the next 9 years it ranked fourth.	: 32 years of summaries over the period of Abbey occupancy.	Despite the paucity in quantified data Searle has repeatedly declared that the leuga was predominately given over to cattlefarming at least from the late C14. Oxen grazed by tenants, upon payment, in all leuga forests; herd sizes are not known.	Searle & Ross 1967; Searle 1974, 45 - 67 & pers. comm.
	In'Corn and Stock Account' maximum opening stock was 21 oxen and 5 yearlings.		Establishment of cattle husbandry as dominant land use on newly reclaimed levels in early C14th. This has been continuous until the present.	Brandon 1971, 134.
	First Livestock Return for East Sussex; 10223 cows, and 10693 oxen.	: 1801		as above.
	Sole count on Ashburnham Estate; 94	: 1841		

(6) RABBIT	Rare purchases of rabbit meat and, accepting 10 rabbits=1 wether, c. 80 were bought from Crowhurst Warrens.	: 1371 - 2	Containment in warrens, primarily, with escapees, until the C17th locally, when the population is overwhelmingly feral.	
	An annual rent of 480 rabbits at Herstmonceux warren in Elizabethan times, suggests an extensive warren.			E.Venables 1851, 200 - 1.
	Bags on the Ashburnham Estate ranged from 28 to 835 in the 'Game Books'	: 1863/7 - 1904/5.		Searle & Ross 1967, 52 & 67
	Totals killed by game-keepers on the Ashburnham Estate as recorded in 'Rabbit Books', ranged from 1300 to 14562	: 1864/5 - 1884/5 & 1892/3 - 1904/5.		Ashburnham MSS. 2444A-2494; 2587-92.
(7) HARE	Single minor imports (with partridge) into cellar of Battle Abbey.	: 1320 - 1 & 1306 - 7.		
	Ashburnham Estate bags ranged from 10 to 185.	: 1863/7 - 1904/5		
(8) PARTRIDGE	216 to 2381	: 1863/7 - 1904/5		
(9) PHEASANT	186 to 3009	: 1863/7 - 1904/5		

app:7

Classification of wood and wood products as used in the Ashburnham estate Woodcutting Books (ESRO: Ashburnham MSS. 1900-31)

Name	Definition from Oxford English Dictionary	Definition from Adams 'Agrarian Landscape Terms' (ALT); from Parish's Dictionary of the Sussex Dialect (SD) and Rackham's 'Ancient Woodland' (AW)	Units of Measurement in Accounts	Species named, and their frequency
Major Items				
Cordwood	'Wood stacked in "cords"; wood for fuel cut in lengths (usually) of 4 feet.' A cord is defined as 'A measure of cut wood, especially that used for fuel (probably so called because originally measured with a cord): a pile of wood, most frequently 8 feet long, 4 feet broad, and 4 feet high, but varying in different localities'.	As O.E.D. In addition, -stack may be of round or cleft wood. -volume is 128 stacked cu. ft.(ALT) Dimensions as OED. Imprecise recollection of local 126 cu. ft. cord. A stack 'cut up for burning' (SD). Used by GM. (Bird 1971)	Cord & feet	None
house faggot kiln faggot heath faggot top faggot bush faggot	A faggot is 1. 'A bundle of sticks, twigs, or small branches of trees bound together' and a.'for use as fuel'. A further meaning, perhaps applicable, is 3., 'a bundle or bunch in general...'	No definition given for any faggot (ALT, SD). Faggot: 'a bundle of cut underwood, tied with a band, often of specific size and used as a unit of measurement' (AW). GM used: house, hedge, top & spray faggots.	number	Occasionally 'fir'. Rarely beech and oak
hop poles	'A tall pole on which hop-plants are trained'	As OED (ALT, SD, AW). GM used.	number. Lengths specified. (Occasionally 'hundreds' and 'scores', '6 scores to the hundred)	none

app:8

Minor Items				
mule faggot	See above. The mule faggot, it is surmised, is a hybrid, an intermediate form, of the virtually everpresent house and kiln faggot.	Not known	number	a single reference to batch of fir, heath, chestnut and holly.
timber, pollarded. Specified as with or without top.	2. 'A tree which has been pollarded or cut back, at some height above the ground, so as to produce at that point a thick a rounded head or mass'.	Pollards - 'the parts cut off'(SD). 'Tree which is cut at 8-12 ft. (2½-3m) above ground-level'.... 'bolling to produce successive crops of wood' (AW).	cords and feet	usually specified as beech
runt wood	A runt is 1. 'An old or decayed stump of a tree'. This meaning is attributed to 'runt-wood'.	As a verb, to grub up roots of trees (SD).	cords and feet	
tillow or tiller wood. Sometimes specified as 'upon the stem'	A tiller is defined as 1. 'A plant, a shoot, a twig; especially a shoot or sucker from the root' and 2. 'A young tree, a sapling; especially a stock-shoot, rising from the stock or stool of a felled tree'. A tillow is a variant of meaning 3. of tiller, i.e. the lateral shoots of a herbaceous plants.	Listed as a local name for a standard (ALT). Tillow or teller - 'A young oak tree', 'left in an underwood to grow into a timber tree'. 'A storer' (SD). In 1852 agreement to sell Ashburnham underwood ... 'seller at liberty ... to mark out tellows to be saved ...' (Ashburnham MS 1969)	cords and feet	usually specified as ash, beech or alder
coppice wood	A coppice is simply 1. 'A small wood or thicket consisting of underwood and small trees grown for the purpose of periodical cutting' or 2. as collectively, coppice wood or underwood.	As OED (ALT,SD). 'Underwood trees which are cut to near ground level every few years and then grow again from the stool'. Such woodland, and the act of cutting As OED (AW).	cords and feet	
Spray ('commonly called rice')	Is, collectively, the 'Small or slender twigs of trees or shrubs, either as still growing or as cut off and used for fuel etc; fine brushwood and branches such as is used for thatching (?)' Rice is similarly defined.	Faggots of brushwood used in ovens. Rice - young underwood (SD). Tops and branches of underwood (AW).	loads, or not specified	
tops			loads	occasionally oak or beech
crooks and knees	A crook is 'a crooked or incurved piece of timber' and a knee is a 'piece of timber having a natural angular bend, or artificially so bent'	As OED (ALT,SD).	~~cords and feet~~	

Minor items

poles, fence poles, groyne poles, ladder poles, tan poles and plain poles				
stakes staves sticks, pea sticks rods, thatch rods bows, wheel spokes dowl wood cut binders hoop stuff bat(t)s prongbats		meaning satisfactorily corresponds to modern meaning (author).	number, or bundles	always holly or dogwood
wattles	'Rods or stakes interlaced with twigs or branches of trees, used to form fences and the walls or roofs of buildings. Also, rods and branches collected for this purpose'.	As OED (ALT, SD).		usually alder or willow
bavin	1.'A bundle of brushwood or light underwood, such as is used in bakers' ovens, differing from a fagot in being bound with only one withie or band instead of two' b. Collectively, brushwood or firewood.	'brushwood faggots' (an alternative given in Accounts)	number	
timber (occasionally called 'round timber') usually of named species		(Young 1813, 174; tree exceeding 6" in girth)	cords and feet; occasionally footage	usually specified as ash, beech or alder.
timber, cleft			cords and feet	usually beech
planks, pole ash, bow ash, cooper's ash, birchen bats for yokes, alder, for patten wood-makers' use		meaning satisfactorily corresponds to modern meaning (author)	various	
wifts, litter, refuse, scraps			usually loads	
bark				usually specified as oak