Land, technology and water management in the Tillingbourne valley, Surrey, 1560–1760

P. F. BRANDON

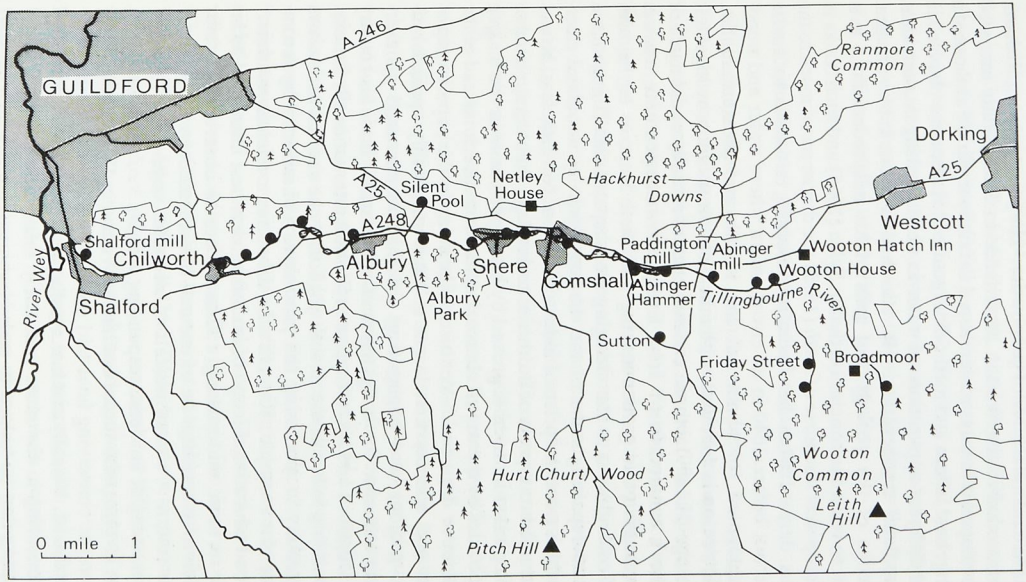
The purpose of this essay is to examine the various, inter-related, facets of man's use of water in the Tillingbourne valley which bear upon his capacity to deal with the natural environment and to consider the influence of the scale of exploitation of water-power on the changing landscape and its historical ecology. By considering these aspects in a single, unified, area of study it is hoped to draw into prominence matters relating to the impact of early industry which tend to be obscured or overlooked in the course of a more specialist approach. The wide-ranging perspective is centred upon the response of the leading landed families in the Tillingbourne valley to the many opportunities and challenges provided by industry dependent upon water and how the outlook and resources of individual landowners could influence their exploitation of the natural and semi-natural environment, particularly that of the woodlands, which were extensively disturbed by early industry.

As a preliminary, detailed field survey was undertaken on both banks of the river Tillingbourne and its headwaters to its confluence with the river Wey at Shalford in order to record all the vestiges of water use in the present landscape (Fig. 1). In all, 21 milling sites were identified. Only 9 sites are known to have been worked before 1500 as corn or fulling mills. The remainder were brought into use during Tudor and Stuart times either as industrial sites or as additional grain mills. Numerous sites have only slight evidence of former milling. These are normally marked by an earthen dam, slight traces of masonry or brickwork and occasionally by apparent building platforms. The existing record of milling on the ground must be reckoned vestigial because of the landscape remodelling from 1642 by John and George Evelyn and their successor, Sir John Evelyn, which has effectively removed traces of former mills immediately to the west and north of Wotton House and possibly elsewhere on the Wotton estate.[1] Nevertheless, the combined evidence on the ground and from documentary sources reveals the remarkable growth of

industrial activity in the Tillingbourne valley during the late sixteenth and seventeenth centuries which created an archetypal rural workshop only marginally touched by the 'Industrial Revolution'.

It is convenient to summarise this remarkable growth. The water of the river Tillingbourne played such a subordinate role at the end of the fifteenth century that even one of its most powerful feeders, the Shireburn Spring (Silent Pool) was let merely for the nominal rent of one red rose annually, 'if demanded'.[2] Yet by 1562 the expanding use of the water-wheel could generate such passion that representatives of a local miller flung a lord of the manor into a fiercely contested 'new digged course' on the same stretch of river.[3] Thereafter, the stream steadily acquired a new importance as a source of energy driving grain and textile mills, trip-hammers for iron, brass and wire manufacture and also wheels for the making of gunpowder, sawmilling, paper-manufacture and knife-grinding.[4] Water-using industries also gravitated to the river, notably leather-tanning, and in addition to the other economic uses to which the regulated river was put, the floating of meadows being a conspicuous example, ornamental canals, serpentined rivers, cascades and waterfalls were applied to garden layouts with the same skilful engineering techniques initially acquired in the industrial management of water. There can scarcely be in south-east England a valley richer in historical associations of the developing art of directing sources of power in nature for the use and convenience of man. The valley was notable also for the corresponding rise of new sensibilities towards the natural environment which were an outcome of the exceptionally high reliance placed upon its water resources by the economic projectors of the seventeenth century. Contemporaries were themselves self-consciously aware that they had created a sharply differentiated landscape. The diarist John Evelyn observed of it in 1675: 'I do not remember to have seen such a variety of mills and works upon so narrow a brook and in so little a compass: there being mills for corn, cloth, brass, iron, powder, etc. . .'.[5] Much earlier, the cartographer John Norden supplied proof of the intensification of milling in the valley by distinguishing on his map of Surrey (1594) a cluster of five water-mills on the short stretch of the river upstream of Gomshall, the largest single concentration of mills depicted in a small area of any of his county maps.[6]

At the heart of manipulating water for these various industrial 'projects' was the Evelyn family whose experience of the many related problems concerned with the practical application of water was to develop and diversify in each of the first four generations of the family in residence at Wotton. The diarist's grandfather, George



The Tillingbourne Valley. Black circles represent milling sites in use during the period 1560–1760. The Valley's woodland resources are indicated approximately.

Evelyn (the first), who bought the Wotton estate in 1579, became famous as a manufacturer of gunpowder.[7] His youngest son, Richard, who succeeded to the Wotton inheritance in 1603 greatly extended and developed it in ways remembered in family tradition as those of a 'thriving, neat, silent and methodical genius'.[8] He became involved in several different applications of water as well as having modern ideas on woodland conservation. He also had a remarkable practical knowledge of the geology and soils of his neighbourhood.[9] It is difficult to resist the conclusion that in *Sylva* (1664) and such books as *A philosophical discourse of earth* (1675) the diarist owed much to the stimulus derived from his father's conserving attitudes to nature worked out before 1640 in an environment where water and woodland accounted for almost all the wealth and pleasure in life. Richard's role was followed, with much less consistence, by his eldest son George (d.1699), whose extravagence eventually undid much of his father's conservation.[10] John Evelyn's own tastes were towards re-afforestation and garden-making and these were to be his own special contribution to the changing landscape of the Tillingbourne valley, so repairing some of the damage done by woodland clearances which were the price of industrialisation. Nevertheless, he was also attracted to aspects of industrial technology that were related to his ecological studies, as is proved by his experiments in the making of gunpowder by the use of charcoal made from beech instead of the usual alder or dogwood.[11] Yet his real bent lay in the popularising of the arts and sciences first learnt at Wotton, notably applied hydraulics, geology and engineering. In this he exercised an ever-widening influence for enlightenment which made both his country seat at Deptford and his birthplace at Wotton internationally famous. As a founding fellow of the new Royal Society he showed enthusiasm and ingenuity in increasing the productivity of industry by recommending, for example, Ramelli's *Le diverse et artificiose machine.*[12] The broad educational scope of his influence is best illustrated by his counsel to those undertaking a Grand Tour to observe 'Whatever you think may hereafter be of use and for ornament in your country on your return . . . draw models of all useful engines for raising of water, carrying of burdens, suspending weights . . .'.[13] His grandson, Sir John Evelyn, who succeeded him at Wotton in 1706, managed the estate on the conserving lines laid down by his immediate predecessor, the diarist. Visually and historically, he is most closely associated with pioneering in the more sensitively informal naturalist style of landscaping that he helped to make fashionable and which partially survives as a rare example of the early period of informal design.

Although the Evelyns were the most ambitious of the local

projectors they were by no means the sole source of water-power technology in the Tillingbourne valley. The Hills of Abinger, the Morgans and Randalls of Chilworth, the Brays of Shere and the Le Steeres of Wotton and Ockley were also energetic participators in industrial ventures. Apart from the le Steeres, an old landed family, the others, including the Evelyns, were *arriviste* Tudor gentry whose migration to the valley was evidently primarily due to the opportunities it offered to the enterprising industrialist.

The Exploitation of Water – *gunpowder manufacture*

Although the first new form of industrial activity brought into the Tillingbourne valley was that of iron manufacture, notably Thomas Elrington's forge at Abinger Hammer, founded in 1557 (famous on account of its special exemption from restrictions on fuel-cutting within the area of London),[14] gunpowder making became more important because it had better conditions for growth. The location and development of gunpowder manufacture was determined as much by a sufficiency of fuel supplies and of water-power as by a sparsely populated remoteness which offered greater safety in working. Sites were also favoured by accessibility to London, then the chief source of imported saltpetre and of stores powder. Moreover, along the river were a number of mills or mill sites awaiting development. Both wood and water were important in gunpowder making. Apart from the alder or dogwood used for charcoal and wood fuel needed for drying the mill cake after it was granulated and glazed, wood was used for burning pyrites to make sulphur. Water was needed in powder-making in the re-crystalisation of saltpetre and as a drench to minimise explosion. The mix of saltpetre, charcoal and sulphur were incorporated by means of grind-stones operated by relatively small amounts of water-power. Dogwood was invariably disbarked after soaking the bundles in water. The final product was conveyed from Chilworth to the nearest navigable point at New Haw on the Wey at Weybridge and the Tillingbourne was probably used for the conveyance of the various materials at different stages of manufacture between the various buildings, strung out to minimise explosion.[16]

Three early sites of gunpowder manufacture can be identified in the Tillingbourne valley. The most nebulous relates to George Evelyn's works at Wotton and thus many questions concerning his gunpowder activities there cannot be answered at present. Their existence is testified by two unrelated statements by John Evelyn and

his father. The former's letter to John Aubrey, written in 1675 and published posthumously at the head of his *The natural history and antiquities of Surrey* (1718–19) refers to the former presence of powder mills near his brother George's house at Wotton 'upon the streams and ponds *since filled up and drained* . . .' and to an explosion at one of the mills which broke a beam of his brother's house.[17] Another indication of their former presence near Wotton House comes in a letter of 1625 from Richard Evelyn in which he alludes to his current difficulty in increasing his revenues from mills: 'These parts of the country are already so full of mills. I myself have found that whereas I had £40 per annum for powder mills, they being now removed, I cannot make £40 per annum of them. . .'. This removal of the Wotton powder mills at some time subsequent to Richard's inheritance of the Wotton estate in 1603 is doubtless linked to the patent for powder manufacture granted on the death of his father to his brothers John and Robert Evelyn of Godstone.[19]

The exact location of George Evelyn's powder works at Wotton cannot be determined precisely but the probability is that one at least of the sites was a cluster of comparatively small works drawing their power from the common water supply of a millpond called the Pigeon House pond. In a valuable sketch John Evelyn shows this existing in 1642 immediately to the east and north of Wotton House, a site which was the location of the brass and wire mills tenanted by Peter Brocklesby in the 1620s.[20] (Plate One). This identity of industry with the Pigeon House site is strengthened by the earlier intention of David Owen, the then owner of Wotton, of making a pond near Wotton House for the purpose of serving two unspecified mills.[21] Another possible site of powder making at Wotton is at G.R.117470 where a levelled platform, probably raised to carry an oblong timber building, is visible on the left bank of the river, set with its long axis parallel to the stream. Still further possible powder works include the *Brookmyl* connected with the enclosure of Wotton Common called the *Brookwerk* on the Tillingbourne headwater near Broadmoor and the site marked by a pond-bay upstream of Friday Street on the other branch of the river.

There is more positive information available regarding gunpowder manufacture at Abinger, the parish bordering Wotton downstream. In 1595 part of the manor became the property of William Morgan of Chilworth and his partners who leased the mill to George Bromell, a local man, for making powder.[22] This site can be identified with Abinger (Elwix) mill, a half mile upstream of Paddington mill. The initial manufacture of powder at this site was probably Richard Hill, a previous lord of the manor of Abinger and a partner of George

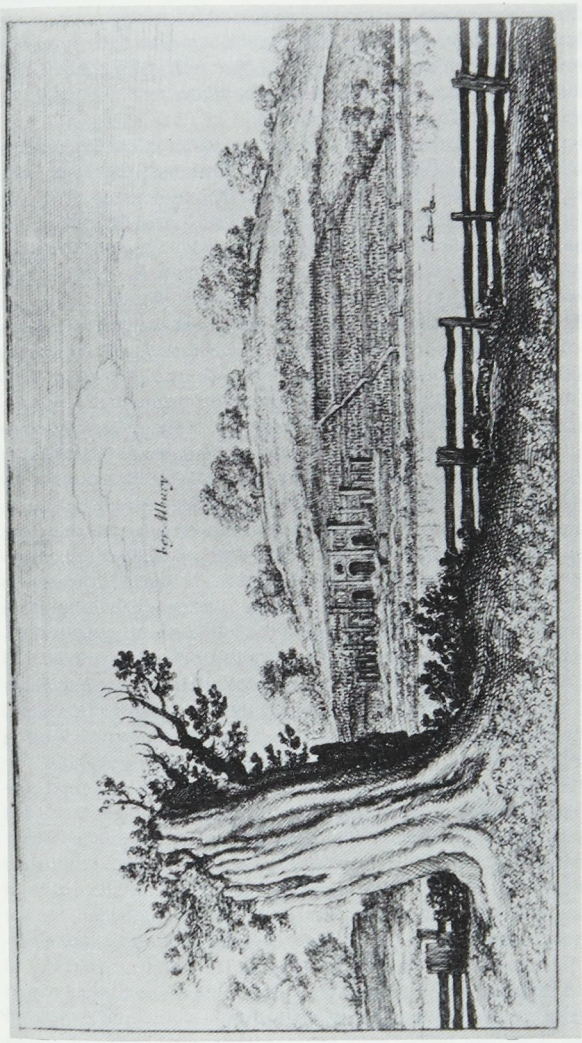


Plate One John Evelyn's sketch of Pigeon House pond on the west side of Wotton House (1642)

Evelyn in powder-making.[23] That powder-making was still in continuance, or had recently ended, is indicated by a reference to the 'powder bay' at Elwix mill in 1622.[24] In the same year the same site had been partly converted for use as a copper mill and a deed of 1667 describes it as 'one corn mill and the other now, or lately, a coppermill, heretofore a powdermill'.[25]

A new development which was to have considerable importance in the valley of the Tillingbourne was the advent of the East India Company, founded by Royal Charter in 1600 and licensed in 1626 to make explosives for its own use. Plagued as it was by a series of financial crises at this time, this decision to make a regular supply of its own powder was to prove extremely troublesome to the Company[26] and it brought the autonomous communities of the valley for the first time into contact with the management control of a joint-stock company firmly in the hands of City merchants and this had its own distinguishing features in terms of landscape and social relations. At Chilworth, the Company's operations began badly, progressed uncertainly and ended dismally. Some of the difficulties were outside the Company's control. Its first choice of a manufacturing site – on the river Thames at Thorpe near Staines – had been vetoed by the king for its closeness to Windsor.[27] In their ten years of operation at Chilworth the Company was accident-prone even by the standards of contemporary powder making. Within a few months of commencing operations the powder-maker suffered the loss of his three mills by an explosion.[28] Two of the mills were subsequently rebuilt but shortly afterwards a serious breach in the mill-dam stopped production and flooded the fields of the Company's landlord. Again in 1633 another defect at the pond-head was responsible for further flooding.[29] These operating mishaps involved the Company in protracted disputes with highly litigious landlords, Baron Southerton, a leading law judge, and the Randalls to whom the property passed by marriage. The landlords repeatedly made allegations that the Company had infringed various restrictive covenants in their lease and neither the offer of spices or a velvet gown purchased peace.[30] After the second breach at the pond-head Sir Morgan Randall threatened to destroy the mills. The Company were driven to the point of resigning the lease altogether, a resolution strengthened by the temporary suspension by the Crown of Edward Collins, the Company's powdermaker.[31] In 1641 Sir Morgan Randall was pronounced insane.[32] It would be interesting to know whether the Company had driven him to insanity or whether it was simply a victim of his mental disorder. The East India Company's operations at Chilworth would certainly have impeded Randall's recovery for it gave good cause for

apprehension that Chilworth as a place was being environmentally damaged by gunpowder manufacture. It is not surprising that the Earl of Arundel was opposing the expansion of the Chilworth mills in 1636.[33] Fundamentally the Company's management of water was at variance with the traditional use by the previous operators of the corn and fulling mill. In operating the latter, the water driving the mill had passed as waste along a lade to drain fields and hop grounds lower down its course.[34] This kind of operation was standard practice and goes far to explain why the principal milling counties such as Surrey also took the lead in drainage projects and others involving water. In order to supply the three powder mills from one pond bay, however, the Company had raised the head of water in the mill-pond and pen-troughs to a level that prevented the back-flow of water, so causing, it was alleged, a dam-breach. This mismanagement of water symbolised the new needs created by a more competitive ethos which was characterising seventeenth-century industry. It introduced a more hustling, grasping, use of water by immigrant industrialists, unfamiliar with, and less caring for, the wider needs of the neighbourhood than were the traditional 'folk' users of water-power who were necessarily modulated to the total environment of their small-scale, local and non-bureaucratic existence.

In the event the Company did not finally dispose of the least at the Chilworth works until 1636 when John Evelyn's patent was granted by the Crown to his competitors Samuel Cordwell and George Collins who erected new premises at Chilworth on the site of the mills relinquished by the Company.[35] Production then rose so rapidly that carts had to be specially comandeered to convey powder from the works to New Haw.[36] When Aubrey was compiling his history of Surrey (c. 1675–80), Morgan Randall owned eighteen powder mills at Chilworth and a boiling-, corning-, separating-, and finishing-house are mentioned together with a brimstone mill. These various buildings, strung along the river to minimise explosion, mark the beginning of the modern chapter in powder making at Chilworth. They appear to have been the creation of Sir Polycarpus Wharton who had taken a lease of the mills in 1677.[37]

Brass and wire manufacture

Joan Thirsk has observed that nearly all Tudor and Stuart 'projects', 'settled themselves in a district having some connection with the new enterprise'.[38] This is well illustrated by the history of brass manufacture in the Tillingbourne valley. Apart from the general experience in

milling acquired from powder making, the brass industry supplied products required for, or associated with, gunpowder, such as ordnance, tools and receptacles used in the powder mills. Another link between powder and brass mills arose over Richard Evelyn's need to recoup rents lost when the powder mills were closed down. His falling rent roll explains both his move into brass manufacture from the early 1620s and into that of iron from 1631 with his purchase of the Abinger forge founded by Thomas Elrington. It is also notable that the first adventure in brass manufacture in the valley was at Chilworth on land rented from William Morgan who was also a pioneer in powder making at Abinger.[39]

This early brass-making was associated with Thomas Steer of Wotton and Ockley who enticed hammermen, smiths and toolmakers to leave the sole existing wire manufactory at Tintern in defiance of the monopoly of the Mineral and Battery Company. The monopolists, however, were successful defendants in a legal action which led to the closure of the Chilworth works in 1606.[40] Steer had proposed to supply the London market by a water-powered wire-drawing works on the model pioneered by the German Christopher Schultz with a wide range of consumer goods made from wire, including fine wire for weaving (a traditional local industry), and 'mouse traps, cages for birds, lattice-work for windows, buckles, chains, claps for garments, fish-hooks, pack-needles, knitting-needles, rings for curtains' and sundry items. It is significant that the Tintern operators were concerned at Steere's reduced carriage costs to London compared with their own.[41]

A second, and more successful, attempt to infringe the monopoly of the Mineral and Battery Company's brass-plate and wire-drawing operations was put into effect by Richard Evelyn of Wotton who set up brass and wire works at two separate locations on the river Tillingbourne. One site was Elwix mill, formerly a gunpowder mill previously owned by the Morgans and Hills of Chilworth, and the other was the site of Pigeon House pond at Wotton House, possibly the site of earlier gunpowder mills. The Elwix site by 1622 was a complex including a 'batter' mill (producing brass and copper plate for consumer goods such as pans, kettles, ladles, etc. (as well as the requirements of the power industry), a wire-works and a copper mill which treated the imported copper ingots with calamine stone to introduce zinc for making into brass.[42]

The Wotton site comprised both a coppermill and a wire-works. By the precise details of a lease of these works they can be identified with Pigeon House pond.[43] John Evelyn's sketch of 1644 gives a good impression of the existing wire-works (Plate One) and for the

technical process of making brass wire there we are also indebted to his own account in Aubrey's *Surrey*.[44] Evelyn refers to a water-driven 'ingenio' brought from Sweden. This was probably a considerable technical advance on the water-driven machinery erected by the German Schultz at Tintern some sixty years before which had in turn superseded the primitive method of hand-made wire previously adopted in England. The 'ingenio' was probably similar in operation to that seventeenth century machine described by John Ray which involved a water-driven tree-axle operating pairs of pincers alternately closing and shutting against the drawing plate.[45] By 1675 the Wotton wire works had been removed farther from the house as part of the Evelyn brothers' landscaping projects.[46]

Richard Evelyn's principal lessee of the brass and wire works was Pe(e)ter Brocklesby, described as a pewterer and citizen of London, but possibly originally of alien extraction. This manufacturer has been previously identified as one of the leading infringers of the monopoly of the Mineral and Battery works[47] but his association with the Evelyn's works at Wotton has escaped notice. Brocklesby's lease of the Wotton and copper and wire works dates from 1628, in succession to short-lived tenances by Joseph Mulford and William Cowes als. Standish.[48] Brocklesby also made battery goods at Elwix mill for a brief period.[49] It appears that he began brass production under a privilege granted by the Mineral and Battery Company but violated its conditions and thereafter engaged in persistent defiance of its monopoly. Lawyers engaged by the Crown to arbitrate between the two parties reported Brocklesby as 'obstinate and wilful' and a man who has had 'no breeding or hath any skill (in brass manufacture) being himself now a pewterer and keeping a pewterer's shop, using only strangers in his employment'.[50] The London pewterer did not contest this description but by 1639, at which date his opposition to the Company had extended over more than twelve years, he claimed to be able to undersell the Mineral and Battery Company's products by a wide margin and that the foreigners he had introduced at great expense had taught the craft of wire-making to Englishmen.[51] Nevertheless, the output of his works on the Tillingbourne doubtless remained small for he was unable to export his products to the rich market of the Guinea Coast and the Indies, which was the right of the monopolists, who were themselves at the disadvantage of merchants from Aachen and Lunenberg who exported more cheaply finished products of continental origin to London.[52]

The floating of water meadows

In the first half of the seventeenth century the direct demand for water resources was thus increasing in the Tillingbourne valley. This was not confined to industry. A striking example of this was the new technique of floating water meadows, a seventeenth-century water resource development. The practice of floating required a skilfully managed sheet of running water, about one inch deep, to flow periodically over water meadows for the sake of the feed of grass in spring or hay crop produced by its fertilising properties. Ingenuity lay in the accuracy with which the necessary amount of water was drawn from a catch-water system of drains which conducted flowing water along the upper edge of meadows by means of master feeders dropping down on to the meadows by means of subsidiary feeders and gutters controlled by sluices. The Tillingbourne valley was ideal for floating on account of numerous springs which broke along the valley sides at the conjunction of the sandstones and clays.

In England generally such systems were introduced from the early seventeenth century and became common by 1700[53] but their early existence in the Tillingbourne valley has not been recorded. The first newly established system of floating which is documented relates to land at Crossways farm, Abinger, in 1622.[54] The agreement which was the basis of this is couched in such precise technical terms by Richard Evelyn that it leaves no doubt that he had already considerable experience of the technique of floating. By the terms of the agreement William Leigh sold to Evelyn a parcel of land bordering the pond by at Elwix mill (doubtless for an extension of the mill pond) and gained the right to make a trench through Evelyn's land to convey one half the quantity of water in the Tillingbourne on Sunday and holyday-nights during the months of April and May, the most critical period for watering meadows. Leigh was also permitted to draw off water throughout the year by a trunk of lead or wood not exceeding three inches square, presumably for a domestic water supply. This system is still partly traceable in the present landscape. By the early eighteenth century the floating of water meadows in the upper part of the Tillingbourne valley was a complex organisation requiring the coordination of a specialist. Sir John Evelyn's bailiff reported in April 1743: 'I have now employed Mason of Sutton to flow the meadows, he being allowed to be the most experienced man in that business in this part of the country, having made it his chief employment for these several years past, to flow the meadows from the Elwix mill to Shere.'[55]

Beyond Shere the floating of meadows came into conflict with other uses of water. The most fiercely contested natural resource in the whole of the Tillingbourne valley was the water which flowed copiously from the Shireburn springs (Silent Pool) in Albury except in the driest seasons, as in 1741, from the Upper and Middle Ponds. Much ingenuity was employed in conducting water from the Shireburn Spring which issued from the Chalk and thus possessed fertilising power to an astonishing degree. The different levels of the two natural ponds facilitated the construction of a tier of master feeders and a third pond, the Lower Pond, was artificially constructed by feeding water into it by means of a trench served by the Middle Pond. This pond is not recorded in a survey of the Albury estate in 1638[56] at which date the first floating of meadows at Weston in Albury began. It owes its origin to a bitter dispute over the Shireburn water which developed between the family of Finch, later Lords Aylesfords, the owners of Albury house and park, and the Risbridgers, freeholders on their estate. This dispute continued intermittently for more than one hundred years and was not finally ended until Lord Aylesford bought Risbridger's property for the large sum of £3,000 in 1749.[57] The essential limiting factor to water supply in the locality of Albury was the Shireburn spring itself. In broad terms the feed arose from four different and often incompatible uses of water – for domestic water supply to Albury house and Cooke place, residence of the Risbridgers; for the supply to the fountains at Albury Park alleged to 'continually fly or throw up water night and day' even in the driest summers; for milling and for floating. The Risbridgers alleged that the owners of Albury Park had diverted so much water from the Shireburn spring to serve their own purposes that the feeder to Weston was dried up. This led to their digging of the lower pond to serve their meadows.[58]

Garden-making

Although the art of manipulating water for industrial purposes was pioneered and perfected in the Tillingbourne valley, the opportunies for new industrial applications of inherited skills and experience in the management of water declined in the second half of the seventeenth century with the rise of the coal- and ore-fields of the Midlands and elsewhere.[59] It was in these circumstances that the art of exploiting water as a resource was extended more and more into garden-making which brought additional lustre to the district. The rich woods, above a valley lying fertile between two ranges of

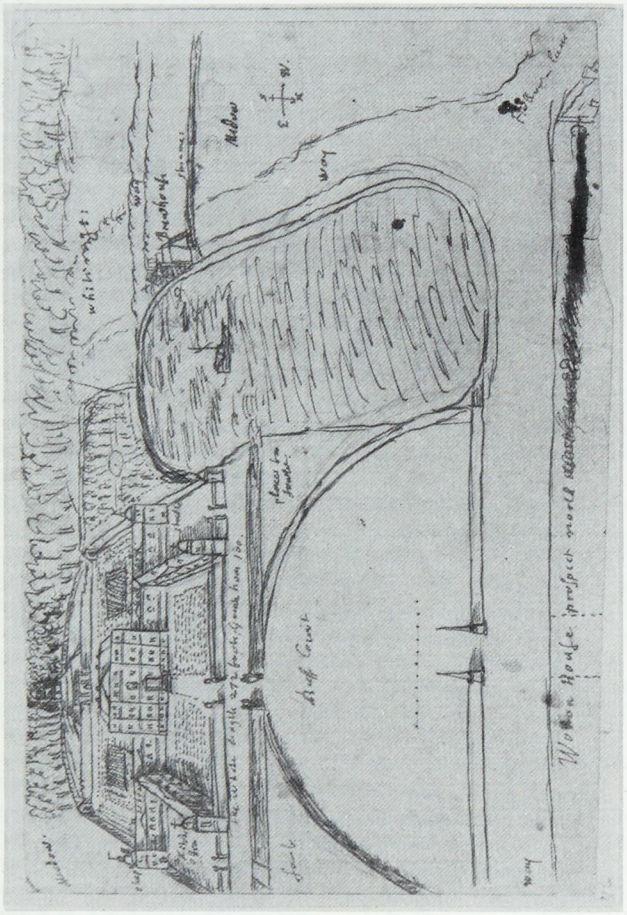


Plate Two Wenceslaus Hollar's recollection of Albury in the 1630's

diversified, soft, hills, together with its rocks, springs and streams, gave ample scope for attractive landscaping suited to the initiative of amateur gentlemen-gardeners. No element of these early garden layouts in the valley was to be as pervasive as that of water. In this the Tillingbourne valley gardens can be regarded as amongst the turning points in the development of English landscape style both in the period 1640–60 and again between 1725–40.

One of the earliest examples of the seventeenth-century landscape gardener's art was at the Earl of Arundel's favourite country retreat of Albury in the 1630s.[60] Hollar's skilfully-composed etchings of terraced gardens opposite to the Earl's 'poor cottage' sloping to the lakeside are brilliantly suggestive of the shimmering light reflected from trees and a 'ruined' casino or grotto to a wide surface of still water (Plate Two). This sheet of tranquil water had an all-pervading presence in the 'collector' Earl's nostalgic recollection of Albury during his final years at Padua.[61] Hollar's etchings depicting a vista of the curving tree-lined walk along a naturally serpentine lake-edge were evidently intended to heighten the dream-like illusion of Albury in the Earl's mind. The water-features were a minimally modified working landscape previously created by the diversion of streams and the building of dams for the purpose of milling and keeping of fish. The almost photographic truth of Hollar's drawings of a chain of mill and fish-ponds is authenticated by a contemporary survey of the Earl's estate made in 1638.[62] The replacement of this informal naturalistic setting by the straight canals and long upper terrace added after the Restoration by John Evelyn suggests that the Earl's garden had been abandoned unfinished.

A decade later, in the midst of his cherished streams and woods at Wotton, John Evelyn was able to develop the aesthetic and philosophic use of water in landscape which was to make it one of the most magnificent of the seventeenth-century Italianate canal-water gardens 'that England then afforded and which indeed gave one of the first examples of that elegancy since so much in vogue and followed in the managing of their waters and other elegancies of that nature'.[63] A significant technique was the leat drawn off the river Tillingbourne at a point fifty feet higher than the first parterre which supplied the fountain and circular bason by gravity. It is characteristic of Evelyn that his practical skills in applied hydraulics were employed in remodelling landscape, techniques which he subsequently used at Albury where he laid out canals, a grotto and the famous terrace and its circular bason and fountain for Charles Howard, later Duke of Norfolk. Writing of this work at Albury Aubrey writes: 'They have command of a spring in this park (the Shireburn) which they bring in

a channel to the place where they would have the sand taken away;/ then they did a convenient part of the sand under which the water is to come and there the water (as it were) dissolves into the sand as you see sugar dissolved in wine. . .'. In this manner Evelyn removed sand to lay out his straight canals and terraced gardens.[64]

John Evelyn's grandson, Sir John Evelyn, was the pioneer at Wotton between 1735–41 of some of the earliest recorded naturalistic landscapes involving water. It is not only one of the earliest gardens in this tradition but also one escaping major modification by any later artist. For no good reason his garden architecture has been neglected. Sir John's 'serpentining' of the Tillingbourne brooks in full view of the house and creation of miniature waterfalls with artificial rockwork was a masterly management of water which deserved to rank with Kent's famour naturalistic achievements at Rousham, Oxfordshire, with which it is slightly anterior, where the serpentined form also took over from the straight line.[65] Whilst his tree plantings composed on a great scale with sweeping open views diversified with loosely grouped coppices and avenues of fir would have fulfilled John Evelyn's own highest wishes and mark the new attention being directed outwards towards the broader landscape beyond the home grounds advocated by Stephen Switzer and other originators of extensive 'forest' gardening. The singular affinity of the woodland and water components to local environmental circumstances was in the truest traditions of exploiting the natural conditions in the Tillingbourne valley and that Sir John was breaking right away from some of the last constraints of the formal landscaping school marks his work as a major milestone in the history of the romantic movement.[66] It revealed him as a practical artist the equal of his famous grandfather and in his far-sightedness as possessing more originality and adventure.

Another illustrous early eighteenth century landscape garden in the Tillingbourne valley was that of Lonesome Lodge on the Broadmoor headwater of the river.[67] Numerous small islands within the 'small purling rills' of the river's meanders were clumped with firs and a 'Gothic' pavilion. The adjoining meadows were adorned with leaden vases and stone statues. Numerous ornamental basons and cascades and '*jets d'eau*' diversified the home grounds. A hilltop overlooking the house was crowned with Cedars of Lebanon and beautiful plantations of oak and fir spread outwards to complete the noble picture of the Tillingbourne near one of its sources above the house which created a fine ornamental cascade falling nearly eighty feet through a hanging wood.

The exploitation of woodland

The most lasting effects of early industry in the Tillingbourne valley were on the woodland for this was the natural resource with the highest potential. A number of detailed studies of wood-using industries have shown that in the Weald, as in England, generally, although initially leading to much destruction of woodland, they had in the end an opposite effect by providing a stimulus to the regular cultivation of coppices for charcoal.[68] In terms of the broad economic argument this is doubtless correct. Nevertheless, although a rational policy of woodland management prevailed on privately-owned woodlands, a continuance of an exploitive strategy is apparent on the remaining commonlands. In the Tillingbourne valley, as in other parts of Surrey, the commons were of sufficient extent for the progressive depletion of their tree cover to have profoundly altered the visual appearance of the landscape. Moreover, these destructive efforts brought in train ecological consequences which have proved long-lasting and pernicious. Finally, the effects of wood scarcity had deleterious social effects. They sundered the traditions of centuries and obliged the poorer classes, in conditions of some hardship, to seek alternative domestic fuels even in such a district as the Tillingbourne valley where woodlands had long been part of the life, thought and sentiment of the people. We can also be certain, though this is unverifiable, that the unskilfully stripped wood cover from naturally wooded commons would have provided a living for fewer persons. Consequently, a focus solely on the economic aspects of timber production which has hitherto dominated the debate on the exploitation of woodland by the fuel-using industries can conceal the effects of an ecological decline more or less immutable in character on the newly-bared commonlands presenting a distressing picture of poverty, squalor and misery in desolate terrains so despaired of by William Cobbett[69] and which still leave a legible record of austerity on the face of rural Surrey. These landscape, ecological and social consequences of the woodland clearances will now be examined in relation to the Tillingbourne valley.

In broad terms, the landscape on the poorer soils of the Tillingbourne valley was transformed by sixteenth and seventeenth century industry from once virtually continuous woodland to that of a series of self-protected 'islands' of systematic encoppicing and plantations planted specially for the use of various mills in a sea of newly-created heaths on which the continual impact of various fuel-cutting pressure made it difficult for regeneration to take place. These two new

landscape elements could not have been more contrasting in visual and in economic terms. In John Evelyn's words, the heaths were 'cold and starving places, neglected and despaired of . . . hopeless grounds, barren hills as any in England that lately have borne woods, groves and coppices. . .', lands subject to 'too much indulgence to a few clamorous and rude commoners'.[70] The woods managed privately for fuel and timber production were mainly coppices with and without standards. These did not necessarily represent a store of long-term national wealth. The trees planted by one generation were often sold off by the next as immature timber to pay off debts or other personal settlements. It is one of the great ironies in the history of afforestation that John Evelyn, whose proud boast it was that he had cultivated a universal tree sense and encouraged all to plant, protect and cherish trees everywhere, only saved the estate of Wotton for the Evelyn name at the expense of its woods. In a moving passage in his book, written for the fourth edition when in his eighty-fourth year, he illustrated how much new planting in England was still necessary by reference to the recent history of his own estate: 'in a word, to give an instance of what store of woods and timber of prodigious size there were growing in our little county of Surrey (with sufficient grief and reluctancy I speak it) my own grandfather had standing at Wotton and about that estate timber that now were worth £100,000. Since of what was left my father (who was a great preserver of wood) there has been £30,000 of timber fallen by the axe and the fury of the late hurricane and storm. Now no more Wotton [i.e. wood-town], stripped and naked, and ashamed almost to own its name'.[71]

The surviving documentary history of the Tillingbourne valley provides a body of data for several key sites which may be monitored over a sufficiently extended period of time to reveal the changing character of its woodlands. The process of woodland clearance and rehabilitation followed a similar broad sequence of ecological change. The first phase was marked by the reckless cutting of extensive common woodlands then supporting so great a crop of previously unexploited trees that there was no immediate incentive to replenish it. The second phase witnessed the first steps in the economical management of enclosed parts of the commons shut off against commoners' cattle to produce a steady crop of coppice timber for the various local mills. Meanwhile the 'plundering' of the dwindling woodland resources on the unenclosed commonlands continued at a rate of consumption greatly exceeding that of the yield, especially that on the dry, slower-growing, sandy, soils. This over-use of woodland for industrial purposes put increasing pressure

on supplies of domestic fire-wood traditionally drawn from the commons by the poorer classes, a process exacerbated by considerable population growth. These exploitive processes in combination discouraged the regeneration of trees to the extent that once open woodland deteriorated to typical heathland flora. In the third stage, the virtual destruction of the principal sources of fuel over those parts of the commons within convenient cutting pressure over the entire area of the commonlands. At the same time, contracting fuelwood stocks left some districts without accessible sources of wood fuel and this posed an urgent need to find realistic alternative non-commercial fuels. These could only be derived from the products of the heath – peat, turves, furze, heather and bracken – which had tended to replace woodland on the poorer soils. Additionally new industries using large quantities of fire-wood as the primary fuel, such as lime-burning and brick-making had also to find alternatives to wood. This fuel-cutting pressure was the final contributory factor to the degradation of the commons leading to a further progressive deterioration of the environment with irreversible consequences. This transition of a countryside of woodlands to that of heathland created amongst the poor an energy and ecological crisis of considerable proportions, which brought with it unfamiliar problems.

In discussion of the chronology of each of three phases of woodland exploitation it is a widely held belief that the 'plundering' phase involving widespread clearances of timber in common woodlands was peculiar to a relentlessly Tudor and Stuart agrarian and industrial capitalism representing the disturbance of a formerly untouched ancient woodland. For want of the examination of medieval sources of evidence, this is not a wholly true picture. The pre-industrial land-use history of the Tillingbourne valley suggests that greedy and reckless sixteenth-century predators had medieval forerunners. This is evident, for example, in the sale of all the trees and underwood on 250 acres of the eastern part of the Churt common woodland (now known as the Hurtmore) which lay within the several manors of Gomshall, Shere and Ockley and was sold off by Robert Savage, lord of Gomshall manor.[72] Similar episodes in a long history of repeated exploitation of extensive and relatively inaccessible woodlands will probably emerge with a greater emphasis on medieval studies. Nevertheless, it is beyond dispute that this kind of speculative activity reached its heights in the Tillingbourne valley before 1579 when George Evelyn bought the Wotton estate. The most famous of these sixteenth century clearances were Thomas Elrington's whose specially licensed cutting of 300 loads of wood fuel annually from commons on the Manwood in Wotton and Abinger

supplied his iron forge at Abinger Hammer. Earlier, Owen Tudor as lord of Wotton manor had supplied William Comber, a London pewterer, with large supplies of wood fuel and from the same source other supplies reached Christopher Darell's iron furnace at Iwood in Newdigate at the low rate of 6d. a cord.[73]

In the second phase of woodland management considerable enclosures of former common woodland were undertaken with a view to increasing by encoppicing the rapidly depleting wood store. On the Manwood, the extensive commons in Wotton and Abinger parishes, the two major enclosures date from the end of the sixteenth century. About 1584 William Morgan and Richard Hill, Elrington's successors as lords of Abinger, enclosed the New Coppice and adjacent woods in Heathy land and Pasture Wood, a tract of some 400 acres which thereafter was the primary source of fuel to Abinger hammer.[74] At about the same date George Evelyn as lord of Wotton enclosed Brookwick, an enclosure which can still be identified by boundary banks at Broadmoor on the upper Tillingbourne stream.[75] Evelyn's choice of location was evidently designed to cause as little inconvenience to commoners as possible for it was said that before his enclosure a marshy tract lying between it and the adjoining farms 'was then at that time so impassable . . . that is was impossible for any tenant to go over it to extract fuel from the woodland beyond'.[76] Evelyn's probable purpose was to build up a store of alder for his gunpowder works.

Not all the enclosures were intended at this time for coppices for once larger enclosures had been completed for this purpose other poor lands could be improved for agriculture by the growing number of smallholders encouraged by industry or by the greater resulting employment in the woods. Thus part of the waste of Abinger manor known as the Birchetts, a tract of 64 acres, was cleared in 1594 of all trees by Morgan and Hill by an arrangement whereby the local wood dealers sold all the 'offal' of the trees to John Forrest, then working the Abinger forge at the preferential rate of 16d. a cord and levelled and filled their sawpits 'within a convenient time' in readiness for the staking and measuring of the tract into seven new smallholdings let at 4d. an acre rents, no dearer than the assart rents of two centuries earlier.[77] Another successful venture of William Morgan in Abinger which was designed with the dual purpose of securing a regular supply of fuel and enhanced agricultural rents was a lease of 60 acres of scrubby underwood in 1597 which provided for the lessee to 'grub, ridd and cleanse for the bettering of the same be converted into meadows or arable land'. This lease ingeniously brought into being wide shaws round the new fields from the scrub which had previously

encroached over former fields by the simple provision that the lessee was not to grub up wood or bushes standing or growing upon any of the ditches, banks or hedges 'as are within three score feet of assize from any such ditch or hedge'.[78] In this activity we can see shaws being created in the manner of the medieval farmer.

The most thorough improvements of this kind were undertaken during Richard Evelyn's ownership of Wotton from 1603 together with Paddington, Abinger, Westcott and Gosterwood purchased between 1622 and 1636. All his land purchases were made with an eye to their improvement. He observed of Paddington farm in 1625, for example, that it was 'better by £20 per annum for the commodity of the marl, for it is an excellent fat, white marl'.[79] This purchase was soon followed by the enclosure of the demesne strips of arable in the common fields into compact, hedge-lined parcels and the purchase of Abinger Sheep-walk, rough wooded common land on the summit of the North Downs, which was trimmed back and partly denshired and provided with a thick double hedge.[80] Much of the surviving woodland was upgraded to coppice which was grazed between four and seven years after cutting. A similar operation aimed at the more intensified use of agricultural afforested land was performed on the White Downs in Wotton where the lime kilns needed to restore fertility on his own land were expanded to supply lime also to neighbouring owners in the clay Weald at Ockley and southern Wotton.[81] Rushy woods at Milton in Westcott were also grubbed to make way for meadows and hedgerow timber. There is also evidence in Richard's time of greatly increased management of coppices on a 7-year cycle. His tree planting activities also extended to the new dwellings created out of the former wastes. His new copyhold leases prescribed for the planting or grafting of 'forty fruit trees at the least'.[82] His son George's leases in the 1640s made even more specific provisions for the improvement, for the lessee of a newly erected dwelling house at East Horsley was required to enclose it with a double quickset hedge and in the orchard garden of at least one acre in extent was to be planted 'good orchard and garden fruit', 'the best and choicest of all sorts', and to be left on expiry of the long lease 'in good heart, beauty, state and plight'.[83] In these requirements we can trace the dual role of landowners and secure tenants which created and long continued the tradition of the old-fashioned garden of the country cottage and farmhouse which were to be so greatly admired by the urban romantics in the nineteenth century.

It was during this second phase of the exploitation of the commons that manorial documents record with more than usual clearness the depletion of the wood cover and the change from wood-getting to

turf-cutting amongst the small-holdings, cottages and artisans in the cloth-making villages of Wonersh, Bramley and Shere. For the fullest record of this we again turn to the Churt (Hurtmore) in Gomshall and Shere. When the Churt first appears in recorded history in the early fourteenth century it is invariably described as a common wood (*boscus* or *silva*). Although it was improbably continuously wooded by that period there appears to be no question that it was then predominantly covered by trees. The earliest manorial documents certainly indicate that the source of fuel was fire-wood. In the custumal of the manor of Gomshall if 1331 the lord's right to 51 wagon loads of wood for his own use and of certain other tenants was confirmed. In 1454 the cutting of wood was still supervised by annually-appointed wood-reeves who confirmed that all tenants of the manor were entitled to wood and fuel at the rate of seven wagon loads (*bigatas*) for virgate holders down to three cartloads (*carectas*) for holders of a quarter virgate.[84] In the same year an account was rendered of a half-year's wood cutting which, together with the Fermer's share, amounted to 82 loads.[85]

Wood reeves continued to be appointed by the manor until the amount of wood cutting became too little to warrant this traditional procedure. In the early years of Elizabeth's reign the woodhatch court still met and repeated presentments are made of illicit cutting of trees and underwood.[86] But an important change in vegetation is suggested by the prohibition of cutting wood on the commons of the manor, first promulgated in 1582 and its reiteration in 1594 and rapidly receding woodland is also indicated by the term waste (*vastum*) for the Churt in seventeenth century documents and the earliest mention of the court rolls in 1654 of the illegal cutting of heath (*brueria*) which from various attempts to regularise its use was evidently a new problem.[87] So general and damaging did the practice of fern-cutting for barns and brick-making and lime-burning and that of turves and furze for domestic fuel become that a group of leading tenants, including the grandson of John Evelyn the diarist, convenanted in 1708 to defend their rights against the illicit cutting of heath on the east Churt.[88] By this date all the evidence is that the remnants of the old woodland had virtually perished. Late eighteenth century observers reported that the surface of the Churt was 'mostly covered with heath, part of which is pared off in turf for firing' and yet that 'there are to this day evident marks of a great quantity of wood' in the form of decayed roots and stumps of trees.

This visual evidence of common woodlands that had degenerated to heaths helps us to fill in gaps where manorial documentation is deficient in the third phase of the land-use of the commonlands in the

Tillingbourne valley and thus providing a link to the written source material for comparative purposes. Thus Arthur Young correctly interprets the change in land use of the Abinger commons from his own observations of human activities and succinctly alludes to the destructive effects of wood scarcity: '. . . The poor burn the scrubs of underwood, oak, etc. as fuel they collect off the commons. This system has the appearance, and certainly is derived from the country originally being a forest: the sprouts of these trees, as soon as ever they become of sufficient size, are cut down'.[89] This destructive activity was not confined to commons on the sandier soil. An early eighteenth century observer of the North and South Commons in Effingham manor noted that 'There hath been upon the same in time past many good timber trees whereupon much spoil was anciently done so that there is not so much as one tree left worth possessing . . . [being] all small growth and short by reason they are kept continually lopped by tenants yearly and have done so for forty or fifty years'.[90]

This suggestion from more than ten places in the Tillingbourne valley that supplies of wood fuel first became seriously short from the first half of the seventeenth century is corroborated by other evidence drawn from Surrey. Emmanual Bowen's elaborate cartouche of his map of *Surrey* (1749) includes amongst other symbolic portraits of the local human activities a peat-digger stacking peats to dry on an open moor and he adds the statement that for the inhabitants of Surrey 'the fuel for firing was formerly mostly wood, but that being now almost destroyed, they burn peat, turf and cole'. This remark appears to have been drawn from a similar one in Cox and Hall's *Magna Britannica* (1728).[91] Still further evidence for the shortage of wood fuel in Surrey is indicated by the high and rising prices of faggots during the second half of the seventeenth century and additional evidence of local wood scarcity comes from late Elizabethan cloth makers of Guildford who reported that their wood supply came from the clay weald of the south, there being no nearer supplies. The impact of wood scarcity is also clearly testified at Witley where an acrimonious dispute broke between the lord of the manor and his tenants 'who had not been obliged to cut peat or turf fuel from the commons until a time some forty or fifty years before 1657 by reason of the great plenty and cheapness of wood'.[92]

The dire shortage of wood fuel and the alternative uses of other non-commercial fuels in the late seventeenth and the eighteenth century is also fully testified by records relating to the Tillingbourne valley itself. John Evelyn continued his conservationist policies to his death. In his *Memoires for my grandson* written in 1704 and intended

as an interim planning strategy for his young successor at Wotton, he urges the avoidance of an unnecessary waste of wood fuel which he considered should be confined to living rooms, leaving the working rooms of kitchen, washhouse and brewhouse supplied with peat or sea-coal.[93]

Further evidence of the use of alternative fuels to that of wood comes from the manors intercommoning on the Churt. Almost the entire surface of the east Churt from Netley Heath as far as Holmbury Hill was used for turf and heath cutting.[94] For turf, land was selected annually and marked out on a rotational basis and its location 'cried' in local churches. On the west Churt turf was cut by commoners after May 1st. Furze was also an important element of fuel. Tenants were expected to pay for the privilege but the poor could cut freely such bushes as they could carry away on their backs.[95]

The terms 'turf' and 'peat' were often used interchangeably but strictly speaking quite different operations were involved in their winning, though both were often cut from the same moor. Turf was pared off the dry heath surface about 5–6″ in thickness and cut into 'bricks', the patches of such land being re-used for cutting again within three to six years. It burned more quickly than peat, being full of roots, and deposited more ash. Turf-cutting was carried out between the end of April and hay-time and it was as much a harvest in the Tillingbourne valley as that of the agricultural crops or that of bracken-cutting which followed in autumn. Cottagers kept their turves in sheds spoken of as turf-houses. Ten thousand turves were normally reckoned as the average need of a cottager with two fires, often kept burning day and night both as a convenience in cooking and heating and for the sake of the ash which was piled in heaps in front of cottages in the early nineteenth century and carted away by local farmers who used it as a dressing for their meadows.[96] Peat extraction, or the right of turbary, was more localised in Surrey, being cut out of the wetlands ('moorish ground'). In the Tillingbourne valley seventeenth century peat cutting can be identified in the Peasmarsh at Shalford, on the Peatmore near High Ashes Farm at Leith Hill and on numerous other sites in the Leith Hill range, as well as locally on the Churt, the corresponding heathland to the west, where many of the ponds have the still jagged edges of peat-cuttings round their edges.

The fragrant aroma of generously stocked peat fires was thus a feature of human life in the valley. Once woodlanders, the country people had become heathmen, for one histoically fashioned environment had given way to a quite different one. 'Man had to manage for himself, according to what he knew of the heaths and the boggy

places and the tracks over them, and when the wind and sun would help him or the rains hinder', wrote George Sturt (Bourne) of the peat and turf winning in the nineteenth century.[97] Numerous mention of turbaries and turbary rights in Norfolk between c.1200 and c.1400 and a large body of custom derived from 'case-law' over this period leave no doubt as to the ancient and extensive use of peat and turves for domestic fuel.[98] It was otherwise in Surrey, where the repeated and haphazard peat and turf-cutting reduced common lands not yet drained to bog indicates that landowners and tenants had little previous experience of these activities. The disputes that broke out in the first half of the seventeenth century over the practice of winning turf and peat and the new attempts to respond to the changed environmental situation by the manorial courts are proof both of a changed landscape and man's different response to it. It is significant that medieval customaries for the Tillingbourne valley have nothing to say of turf- or peat-cutting activities whilst the seventeenth-century ones invariably do. This gives additional weight to the cartographer Bowen's testimony and to the other evidence considered in this paper that peat and turf were not won in Surrey until wood had become scarce enough to stimulate their use as domestic fuel. It is a great loss that we know so little of the nature and scale of the social problems that arose as a consequence.

No Surrey Clare arose to document the transition from woodland to heathland but we must not on this account dismiss the consequences of ecological change as unimportant for contemporaries. On the contrary, the little evidence we have supports the view that conditions of human life were worsened by the replacement of woodland by heathland as a direct impact of sixteenth and seventeenth century industry. The unamiable face of the hillsides of the Tillingbourne valley to Tudor and Stuart and Georgian eyes was in its way just as potent as the dark satanic mills resulting from nineteenth-century industrialisation conceived by the Victorians.

Hamlet-making

The pattern of rural settlement was altered by the coming of industry to the Tillingbourne valley. The general increase in employment, either directly in industry or in the related woodland activities, created one of the most characteristic forms of rural settlement in Surrey, the hamlet and notably, the mill hamlet. Within the district under view there are numerous examples of this kind: Broadmoor and Friday Street in Wotton; Abinger Bottom, Abinger Hammer

and Sutton in Abinger; Sutton and Pitland Street (now part of Holmbury St. Mary); Chilworth in St. Martha's. Other older centres expanded with milling, notably Weston in Albury. Each of these settlements was in the setting of at least one water-mill and directly related to it for employment. They are distinguishable in the landscape in various ways. They are criss-crossed with defunct leats and flood water channels; they contain a 'mill' farm, numerous drained ponds and traces of spillways. The surrounding fields are of the 'assart' type, small, regular, patchwork closes bounded by quickset hedges. Each mill-hamlet is built in the dominant architectural style of the early seventeenth century which in central Surrey normally took the form of half-timbered 'mud' dwellings, subsequently 'brick-nogged, but also occasionally of stone buildings. From documentary sources it is sometimes possible to date fairly precisely the origin of these mill-hamlets. Thus Abinger Bottom is described as 'six newly erected cottages, enclosures and a mill' (at Friday Street) in 1607;[99] the beginnings of Broadmoor are associated with cottages erected in connection with the *Brookwic (Brookmyl)* enclosure for encoppicing and probable milling in 1579.[100] Shere forge at Abinger Hammer had cottages for the 'iron men' in existence by the last quarter of the sixteenth century.[101] The origin of Pitland Street is linked to William Morgan's improvement of Birchet's previously mentioned.[102] In these now lovable places, the transiently tamed powers of the Tillingbourne stream with its once rush of water in the mill stream, the booming of the mill and the unresting water wheels sending up their jets of water has its permanent record.

Notes

[1] Peter Brandon, 'An early conversion of 'prospect into landscape': Sir John Evelyn at Wotton, Surrey' (forthcoming).

[2] Surrey County Record Office, Guildford (hereafter Sy.C.R.O.), 1322/6/23.

[3] Sy.C.R.O. 1322/7/2. [4] Sy.C.R.O. 1322/8/14.

[5] In John Evelyn's letter printed posthumously at the head of John Aubrey's *Natural history and antiquities of the county of Surrey* (1718–19), following p. xlvii.

[6] Royal Geographical Society, London. See also copy, British Library (hereafter B.L.) Maps ref.8; see also Norden's *Surriae Comitatus*, an almost exact copy of his 1594 map which by the insertion of 'gentlemen's houses' at Wotton and Abinger helps with the identification of the mills.

[7] Sy.C.R.O. Ms. 2,11(2).

[8] Austin Dobson (ed.), *The diary of John Evelyn* (1906), vol.1, p. 2.

[9] Evelyn Mss., Christ Church College, Oxford (hereafter Evelyn Mss.) 131 (uncal.).

[10] W.G. Hiscock, *John Evelyn and his family circle* (1955), p. 160.
[11] I am grateful to Dr. C.P. Moss for this information.
[12] Evelyn Mss. 110.
[13] Evelyn Mss. 197.
[14] B.L. Add. Ch. 44558.
[15] Pers. Comm., Dr. C.P. Moss.
[16] Calendar State papers domestic, Chas.I. vol.14 (1639), pp. 216/7.
[17] Aubrey, op. cit., Evelyn's letter, p. 5.
[18] Evelyn Mss. Box VI, I July, 1625.
[19] Calendar State papers domestic, Jas I., vol.185, p. 9.
[20] Evelyn Mss. drawings by John Evelyn, portfolio 692 YJ.
[21] Evelyn Mss. 15 July 22 Henry VIII (1517).
[22] Evelyn Mss. 27 Oct. 37 Eliz. (1595).
[23] Evelyn Mss. lease of Paddington farm, 35 Hen.8.
[24] Sy.C.R.O. 53/107.
[25] Evelyn Mss. Release Geo. Evelyn, 1667.
[26] K.N. Chaudhauri, *The English East India Company* (1965), p. 103.
[27] E.B. Sainsbury, *A Calendar of the court minutes of the East India Company* (Oxford 1907), p. xxxiii.
[28] Public Record Office (hereafter P.R.O.), E. 134, 7 Chas.I., Mich 5.
[29] W. Noel Sainsbury (ed.), *Calendar of State papers, Colonial series, East Indies* (1630–4), p. 427.
[30] Ibid. (1625–9), p. 738.
[31] Ibid. (1630–4), p. 612.
[32] *Victoria County History of Surrey*, Vol.2 (1905), p. 105.
[33] Mary, F.S. Hervey, *The life, correspondence and collections of Thomas Howard, Earl of Arundel* (Cambridge, 1921), pp. 378, 395.
[34] P.R.O. E. 134, 7 Chas I., mlch 5.
[35] P.R.O. S.P. 16, 241, f.190.
[36] Calendar State papers domestic, Chas.I. (1636–7), p. 458.
[37] Aubrey, op. Cit., Vol.4, pp. 56–65.
[38] Joan Thirsk, *Economic policy and projects: the development of a consumer society in early modern England*, Ford Lecture, 1975, p. 1.
[39] P.R.O. E. 134, 2 Jas. I., Hil.12.
[40] Ibid.
[41] Moses Stringer, *Opera mineralia explicata* (1713), pp. 194–5.
[42] Evelyn Mss. lease to Henry Deane, 1622.
[43] Evelyn Mss. lease 1644.
[44] Evelyn Mss. drawings by John Evelyn, portfolio 692 YJ.
[45] John Ray, *A complete collection of English proverbs* (1768), pp. 140–1.
[46] Aubrey, op. cit., Vol.I. Evelyn's letter, p. 7.
[47] Henry Hamilton, *The English brass and copper industries to 1800* (1976 ex.), pp. 56–7.
[48] Evelyn Mss. lease 1627. For Joseph Mulford and William Cowes see Richard Evelyn's rental book (uncal.).
[49] Ibid.
[50] P.R.O. Sp. 16, 230, f.90.
[51] Calendar State papers domestic, Chas.I. Vol.14 (1639), pp. 216/7.
[52] P.R.O. SP. 16, 284, f.181.
[53] Eric Kerridge, 'The Sheepfold in Wiltshire and the floating of the water-meadows', *Economic History Review*, Ser.2(6), 1953–4, pp. 282–9.

[54] Sy. C.R.O. 53/107. See also Sy. C.R.O. 94/4–8 regarding Sir Richard Weston's contemporary floating in the Wey valley near Guildford.

[55] Evelyn Mss. Sir John Evelyn, Estate Letters (1743).

[56] Sy. C.R.O. 1322/4/32–33.

[57] Sy. C.R.O. 1322/6/53.

[58] Sy. C.R.O. 1322/6/23; 1322/6/1. See also Sy. C.R.O., manuscript maps of Albury, 1701 and 1782.

[59] Rhys Jenkins, 'Copper smelting in England: revival at the end of the seventeenth century', Trans. Newomen Soc., Vol.23 (1942–3), p. 00.

[60] Graham Parry, *Hollar's England: a mid-seventeenth century view* (1980), plates 12–17: Antony Griffiths and Gabriela Kesnerova, *Wenceslaus Hollar; prints and drawings* (1983), plates 96b, 96d.

[61] Mary F.S. Hervey, op. cit., pp. 346, 450.

[62] Sy.C.R.O. 1322/4/32.

[63] Austin Dobson (ed.) *Diary of John Evelyn* (1906), Vol.1, p. 4.

[64] Aubrey, op. cit., p. 68.

[65] Peter Brandon, op. cit., (note I).

[66] Ibid.

[67] Sy.C.R.O. 85/2/1(i), No.2; 85/2/1(i), No.144.

[68] C. Hammersley, 'The charcoal iron industry and its fuel', *Econ.Hist.Rev.* Ser.2(26), 1973, pp. 602–13; Idem, 'The crown woods and their exploitation in the sixteenth and seventeenth centuries', *Bulletin of the Institute of Historical Research,* Vol.30(1957), pp. 154–9; M.W. Flinn, 'The growth of the English iron industry, 1660–1760', *Econ.Hist.Rev.* Ser.2(II), 1058, pp. 148–53; H.C. Tomlinson, 'Wealden gun-founding: an analysis of its decline in the eighteenth century', *Econ.Hist.Rev.,* Ser.2, Vol.39(1976), p. 396. For a contemporary assessment which supports the views stated above see B.L.Add.Ms.33058, f.81 (1661).

[69] William Cobbett, *Rural Rides* (1938 ed.), pp. 206–7, 419.

[70] John Evelyn, *Sylva, or a discourse of forest trees* (1776 ed.), p. 15.

[71] Ibid., p. 581; Evelyn Mss.318.

[72] Sy.C.R.O. 85/26/1(5). (1384 A.D.)

[73] Evelyn Mss. 252, June 9, 1578; 23 Feb., 2/3 Phil. Mary; 9 June, 20 Eliz.

[74] Evelyn Mss. Misc.6; Accts., Misc.2, 1609; Box 6, 1609.

[75] Evelyn Mss. Box 6, 1609.

[75] Evelyn Mss. Box 6, 1609.

[76] Ibid.

[77] Evelyn Mss. 28 Oct., 36 Eliz.

[78] Evelyn Mss. Lease of Upfolds, 18 Oct., 32 Eliz.

[79] Evelyn Ms. 131.

[80] Ibid.

[81] Evelyn Mss. 'Danyell Peeter's accomps and recconing of the denshire' 6 Dec. 1634; Richard Evelyn's accounts, 28 April 1623, Ms.131.

[82] Evelyn Mss. lease 22 Oct., 17 Chas.I.

[83] Evelyn Mss.

[84] Sy. C.R.O. 85/26/1(4); 85/8/32.

[85] Sy. C.R.O. 85/8/32.

[86] Sy. C.R.O. Wotton Court Roll, 1701; Bray papers, passim.

[87] Sy. C.R.O. 85/8/6, f.15; repeated frequently, e.g. 85/8/7, f.47(16 Chas.I); 85/8/7, f.22; Ibid. f.62.

[88] Sy. C.R.O. Wotton Court Book, 1701; Bray papers (passim) at Wotton in 1701 the burning of heath on the commons 'for the bettering thereof' and denshiring and

digging without licence were prohibited. For the deterioration of once open woodland to heath in the manaor of Albury during the seventeenth and eighteenth centuries see Sy.C.R.O. 1322/6/87, 1 Jan. 1761; 1322/1/25, f.38(1795); f.99, 4 July 1808; f.115, 30 June 1813; 1322/15/16/17, regarding turf-cutting, 1663–1733; 54/2/1, Manor of Gomshall-Netley, 54/2/1, f.47(27 Oct. 1784). For the West Churt common see Sy. C.R.O. 85/18/7(2). This historical evidence of widespread deterioration of once wooded lands corroborates the statement of Daniel Defoe (1724–5) that in the vale west and east of Boxhill 'there has been large timber. . .but most of it is cut down'. *A tour through the island of Great Britain* (1927 ed.), p. 155.

[89] *Annals of agriculture,* Vol.22(1794), p. 199.

[90] Evelyn Mss. 1702.

[91] Thomas Cox, *Magna Britannia et Hibernia* (1720–31), Vol.V, p. 442.

[92] Sy. C.R.O. 5/4/6; 5/2/244; 5/1/28; 5/2/41.

[93] John Evelyn, *Memoires for my grandson* (1926 ed.), pp. 17, 30–31, 61.

[94] Sy.C.R.O. 85/18/7/12; 85/26/1(16).

[95] Sy.C.R.O. 85/26/5; 1322/6/87.

[96] G. Bourne (Sturt), *William Smith, potter and farmer, 1790–1858* (1920), p. 92–95.

[97] Ibid. p. 94.

[98] J.M. Lambert, J.N. Jennings, C.T. Smith, et.al., *The making of the Broads* (1961), pp. iii, 82–99.

[99] Evelyn Mss., Box 6.

[100] Ibid. (1609).

[101] Evelyn Mss., 19 Nov., 1592.

[102] Evelyn Mss., 28 Oct., 36 Eliz.