

An Investigation into the Treescape of Hafod Uchtryd
Using Targeted Dendrochronology

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Figure 1: The Treescape of Hafod Uchtryd with the Tyloge Plantation Top Centre.

Statement of Originality

I do hereby declare that this dissertation is an independent work in which all sources of material have been appropriately acknowledged according to convention.

Abstract

The planting schemes of Thomas Johnes of Hafod (1848-1816), numbering over five million trees, have been little researched and contextualized and it has been believed until now that none remain. Through a process of archival research and discussion of such themes as economics and aesthetics this study proposes and successfully completes a targeted dendrochronological survey. This includes trees specific to these plantings and also those which Johnes utilised as mature specimens within his important landscape of the picturesque at Hafod. Important conclusions are reached about the survival of these trees and Johnes' methods and intentions. This is in many ways a unique approach in the application of dendrochronology to a historic landscape and invites further discussion.

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Location of Hafod Uchtryd



Figure 2: The approximate location of the Hafod Uchtryd Estate in central Wales, highlighted yellow.

The Hafod Uchtryd estate is in North Ceredigion, Wales, situated twenty kilometres South-East from the town of Aberystwyth and occupying a five kilometre stretch of the Ystwyth valley between the villages of Ponthrydygroes in the West and Cwmystwyth in the East. The demesne of the estate through which the Ystwyth flows rises from around 100m at valley bottom to over 300m on the surrounding hills to the North and South.

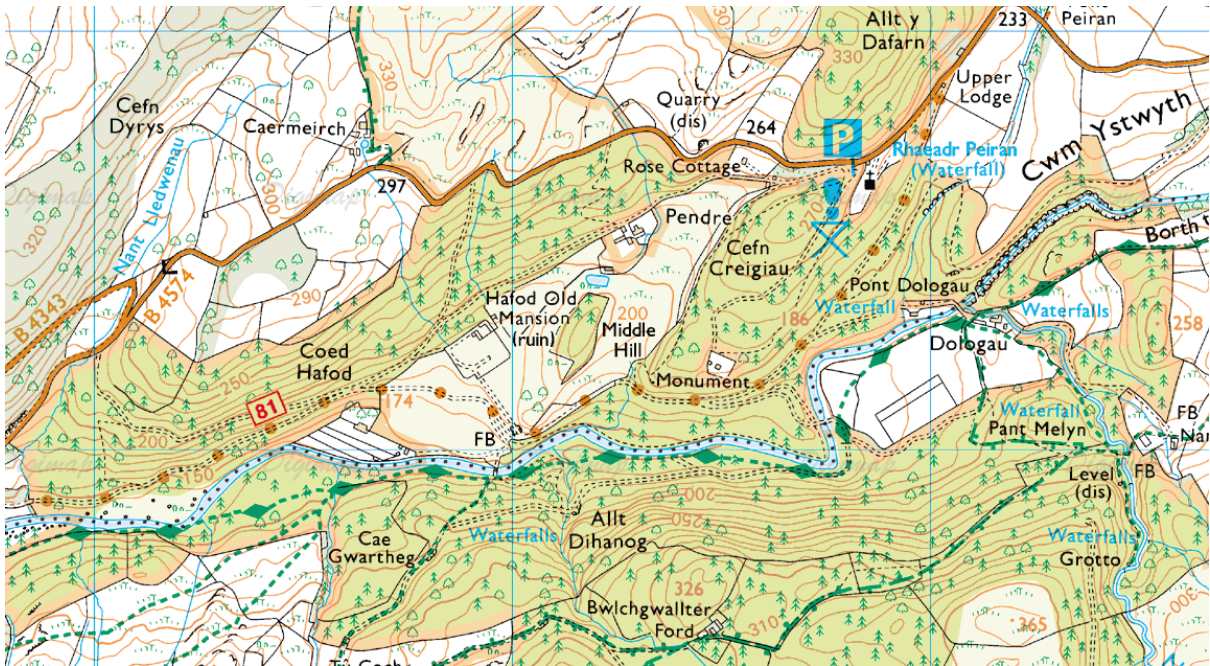


Figure 3: The location of Hafod Uchtryd. Note the Mansion, centre.

It is an upland landscape of outstanding natural beauty:



Figure 4: The Ystwyth running through the estate demesne, looking East.

Introduction

The Hafod Uchtryd Grange formed part of the extensive landholdings of the Cistercian abbey of Strata Florida and was purchased by the Herbert family at the Dissolution. Subsequently acquired by the Johnes family of Dolaucauthi and Llanfair Clydogau by marriage in 1704, Thomas Johnes (1748-1816) inherited the estate in 1780 and forsaking his Herefordshire home of Croft Castle decided to take up permanent residence at Hafod in 1783, constructing a new mansion in the gothic style set within a landscape of the picturesque. He carried out improvements to the estate and embarked upon projects such as model farming, publishing and forestry. On this latter Linnard has described him (1970 p.309) as “The Pioneer of Upland Afforestation in Wales.” Linnard bases Johnes’ reputation upon his planting of approximately five million trees by “*progressive*” methods within the context of large scale plantings by “*most estates*” in Wales from 1780 onwards (2000 p.153). Even by modern standards this would be a significant number and no other Welsh estate owner remotely came close to such an achievement. Johnes’ own contemporaries praised the transformation of the landscape about Hafod and Johnes has acquired something of a legendary status as a tree planter.



Figure 5: Thomas Johnes c.1795.

During Johnes’ ownership Hafod became the focus of tourists who included influential writers, poets and painters such as Blake, Wordsworth and Turner. Declining health, financial problems and the heartbreaking loss of his only child caused Johnes to leave Hafod in 1815, dying a year later in Dawlish, Devon.

The Hafod estate would continue to attract successive wealthy owners such as Henry Pelham, Fourth Duke of Newcastle who, as Evans (1995 p.58) states, “[fell] *under its charm and succumbed to the genius loci,*” investing large sums with the unsuccessful aim of making Hafod a self-supporting proposition. The Forestry

Commission obtained significant leaseholds from 1927 and acquired the estate fully in 1950, demolishing the mansion in 1958.

Today the Hafod Trust, a small conservancy charity, manages 200 hectares of the historical Hafod Uchtryd estate (approximately corresponding to the enlarged demesne of Johnes' time) in a conservation partnership with Natural Resources Wales who own the bulk of the estate and operate it on commercial forestry lines. The Hafod Trust's principal objective (as described in the Trustees annual report 2013) is:

"The furtherance of the protection, conservation and restoration of the picturesque working landscape of Hafod and its setting, for the benefit of the public."

The Hafod Trust has, since 1994, commenced the restoration and reconstruction of picturesque landscape elements such as bridges, monuments and gardens created by Johnes and has recreated several of the extensive walks designed by him.

Despite the extensive nature of Johnes' forestry activities, Linnard definitively states that *"none of Johnes' plantings now remain"* (1970, p.309). This study sets out to test that assumption by the use of targeted dendrochronological survey and hopes to contribute to the understanding of the Hafod treescape in the interests of future heritage conservation management.

Kerkham and Briggs (1989 p.191) describe Hafod as:

"....An important eighteenth century house set in an estate formative and central to the development of Picturesque, naturalistic landscapes" and (p.209) *"a landscape unique alike to national and aesthetic values."*

Thomas Johnes' Hafod was widely admired and written about, but the landscape before Johnes is poorly understood, thus the identification of trees that he thought worthy of preserving in his landscape of the picturesque will also receive attention.

This study hopes to place the forestry aspect of Johnes' work into a clearer context. This is partly in terms of his progressiveness or otherwise, but also in evaluating his goals and intentions through the discussion of elements such as economics and aesthetics.

Central Wales is *"...relatively poorly understood in terms of woodland... and archaeological tree-ring data"*. Bale (2005, p.45) and this study also hopes to make some contribution to this area for discussion.

Aims and Objectives

Aims:

1. To ascertain the possible existence of trees dating from the late eighteenth and early nineteenth century plantations of Thomas Johnes and earlier within the context of the historical and archaeological landscape of Hafod Uchtryd.
2. To better understand the characteristics of the woodland heritage within the Hafod demesne with a view toward implications for future conservation and management.

Objectives:

1. To carry out extensive research into the historical woodlands of the Hafod estate in order to locate and identify specific areas of trees, living and dead, which may have originated as part of the original planting schemes of Thomas Johnes of Hafod in the period 1783-1815.
2. As part of this research to identify individual trees, living and dead, which may originate from an earlier period than the estate ownership of Thomas Johnes and which may have either formed an integral part of his remodelling of the estate upon picturesque principles or which may reflect upon other aspects of the history of the estate.
3. As part of this research to contextualize the woodlands of the Hafod estate in terms of the aims, motivations and practice of Thomas Johnes by evaluating such elements as economics and aesthetics, location and management.
4. Upon full evaluation of the evidence, written, pictorial, cartographic and photographic, to select specific target trees upon which to perform a targeted dendrochronological sampling survey in order to prove specific age ranges where possible. On completion of which to consolidate these results into report form, extrapolating conclusions with a review of techniques used and suggestions for further research.

The Hafod Treescap Before Thomas Johnes.

Modern writers on Hafod, (with the exception of Linnard), have tended to avoid any kind of in-depth discussion of Johnes' forestry work, only making generalisations about the existence of trees within the picturesque setting of the demesne.

Macve (2004 p.23) refers to the misconception that has arisen over time that Hafod was “*devoid of woodland when Johnes acquired it*”, this appears to have been created from the descriptions of Hafod by Johnes' contemporaries who noted the contrast between the estate and the bleakness of its surrounding hills and credited this to Johnes' endeavours. Benjamin Malkin (1804 p.339) describes the effect of seeing Hafod after travelling from Plymlimon as:

“..so unexpected a circumstance, that we rather start, as at the withdrawing of a curtain before a picture , than believe it a reality...Endless woods, hanging on the mountain sides in long array, some rising to the top , but oftener contrasted by the naked ridge; some planted there by nature ...yet more that owe their luxuriance to the novel and well-directed efforts of their owner...”



Figure 6: Bodcoll. Even today the site of Thomas Johnes' upland plantations suddenly make a sharp contrast on the approach to Hafod from Devil's Bridge.

The tradition continued, by 1870 the Hafod estate sale catalogue declaring that;

“The brows and banks in all directions are clothed with beautiful plantations , chiefly planted by the late Colonel Johnes early in this century, by the which the

character of the country around Hafod is entirely changed, and made much more attractive than the surrounding neighbourhood.”

Linnard (1970 p.309) does not enter into any investigation of the extent of existing woodlands on the Hafod estate at the time of Johnes’ inheritance and seems content to rely upon the evidence of the antiquary John Leland (c.1536-39) that lead mining and smelting had destroyed the woodlands of the Ystwyth valley and thus Johnes’ Hafod was “*remote and desolate*”, waiting to be transformed into “*a showpiece of elegance, beauty and industry...*” Moore-Colyer continues the theme (1977 p.257) by stating that Johnes found on his first visit to Hafod in 1780 an estate “*denuded of timber*”. Leland mentions (Toulmin-Smith 1906 p.123) “*Comeustwith a vi. myles from Stratefleur, wher is a graunge longing to Stratefleur*” where there was “*in times paste a greate mine digging for leade*” and adds “*But somme menne suppose that it sesid , becawse the wood is sore wasted.*” But things may have been different two centuries later.

Cartographic evidence appears conflicting. Early maps by Llwyd (1580), Saxton (1587) and Speed (1610) stylistically show most woodland concentrated in the South of the county of Cardiganshire around Lampeter and in the Bishop’s Forest in the South-East. None of these indicate an area of woodland in the approximate location of Hafod, with the exception of the Saxton-Kip map of 1637:



Figure 7: The Saxton-Kip Map of 1637 at a scale of ten miles to three inches approximately.(National library of Wales, NLW)

Later maps by Bleau (1645) and Morden (1695) revert to the earlier distribution. In 1759 Thomas Kitchin produced a county map at a scale of ten

miles to four inches which shows a redistribution of woodlands throughout the county (especially along the Teifi) but again none are indicated at Hafod:

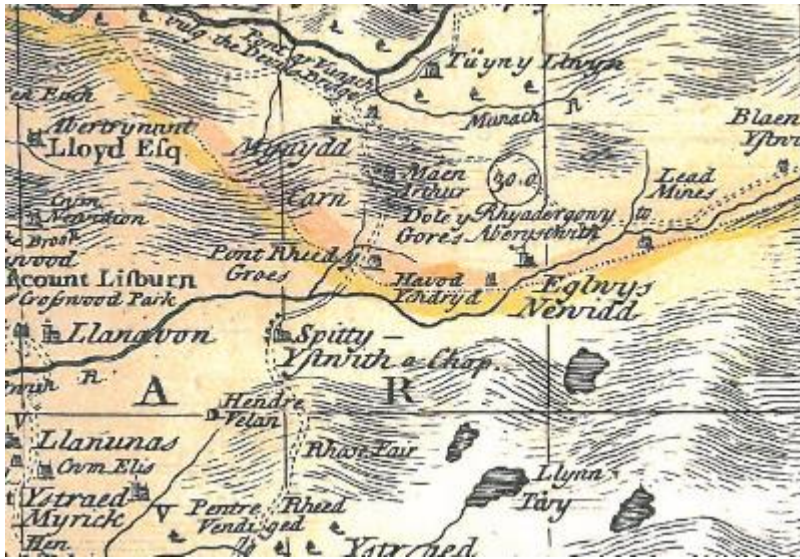


Figure 8: Thomas Kitchin's important county map of 1754. (NLW)

This is contradicted by a second map produced by Kitchin at a smaller scale which shows woodland in the area of the Hafod estate, both North and South of the Ystwyth:



Figure 9: Thomas Kitchin's 1764 map at a scale of eight miles to seven-eighths inches. (NLW)

Johnes' plantations may have commenced as early as 1782 and planting accelerated in the 1790s to a figure of around three hundred thousand per annum (Johnes' own returns to the Society of Arts) but most would still be in the stages of early growth around 1800 with over half of eventual plantings still to come. Therefore Singer's 1803 map (one inch= one mile) probably gives a

good indication of the extent of mature woodlands at Hafod:



Figure 10: Joseph Singer's county map of 1803, dedicated to the generous patronage of Johnes himself. (NLW)

During the mid- eighteenth century the “farm” of Hafod was let to John Paynter, the mining agent of Lord Powis (at Cwmystwyth) who informs him in 1756:

“The article of timber is beyond measure expensive; the carriage alone in this quarter has cost upwards of sixty pounds” So expensive indeed that during survey work Paynter says *“I did not agree to let any strange miners rummage among those costly timberings.”* (20th September 1756, NLW Powis 1203)

Correspondence between Paynter and Thomas Johnes’ father indicates the possibility at least that timber was being sourced at Hafod. Under the terms of surviving leases Paynter did not have direct access to the Hafod woodlands but was on friendly terms with his landlord and kept him informed of developments. In a revealing response Thomas Johnes the elder states (February 27th 1769):

“I am obliged to you for the notice about my woods, but almost every account I gain out the country acquaints me with the great destruction there is constantly made among the woods of Hafod.” (NLW Powis 3245)

This does not indicate whether the destruction was legitimately authorised - it could have resulted by way of commercial transaction- but it shows the anxiety of an absentee landlord about woods which were considerable enough to suffer constant “*great destruction*”.

Pictorial evidence exists in the form of paintings or sketches by visitors to Hafod, for example the 1786 sketchbook of Thomas Jones of Pencerrig:



Figure 11: Thomas Jones of Pencerrig's sketch of the Ystwyth Valley looking East with Allt Dihanog to the right. (NLW)

Within a series of forty pencil sketches Jones provides views of the Hafod estate, several of which are discernible today. Jones depicts a well wooded landscape containing deciduous trees of different ages (including some ancient looking specimens, some with evidence of coppicing) which extend up the steep slopes North and South of the Ystwyth.



Figure 12: Thomas Johnes of Pencerrig's 1786 sketch of the Yswyth valley looking West. (NLW)



Figure 13: "The Woods of Hafod", aquatint after John "Warwick Smith" c. 1795.(NLW)

Works by such artists as John "Warwick" Smith (above) show an extensive, mature, woodland landscape at Hafod in the late eighteenth century.

A recently (2013) discovered watercolour of 1784-5 shows Johnes' mansion nearing completion against the dense backdrop of Coed Hafod to the North of the house and the wood on Middle Hill in the foreground :

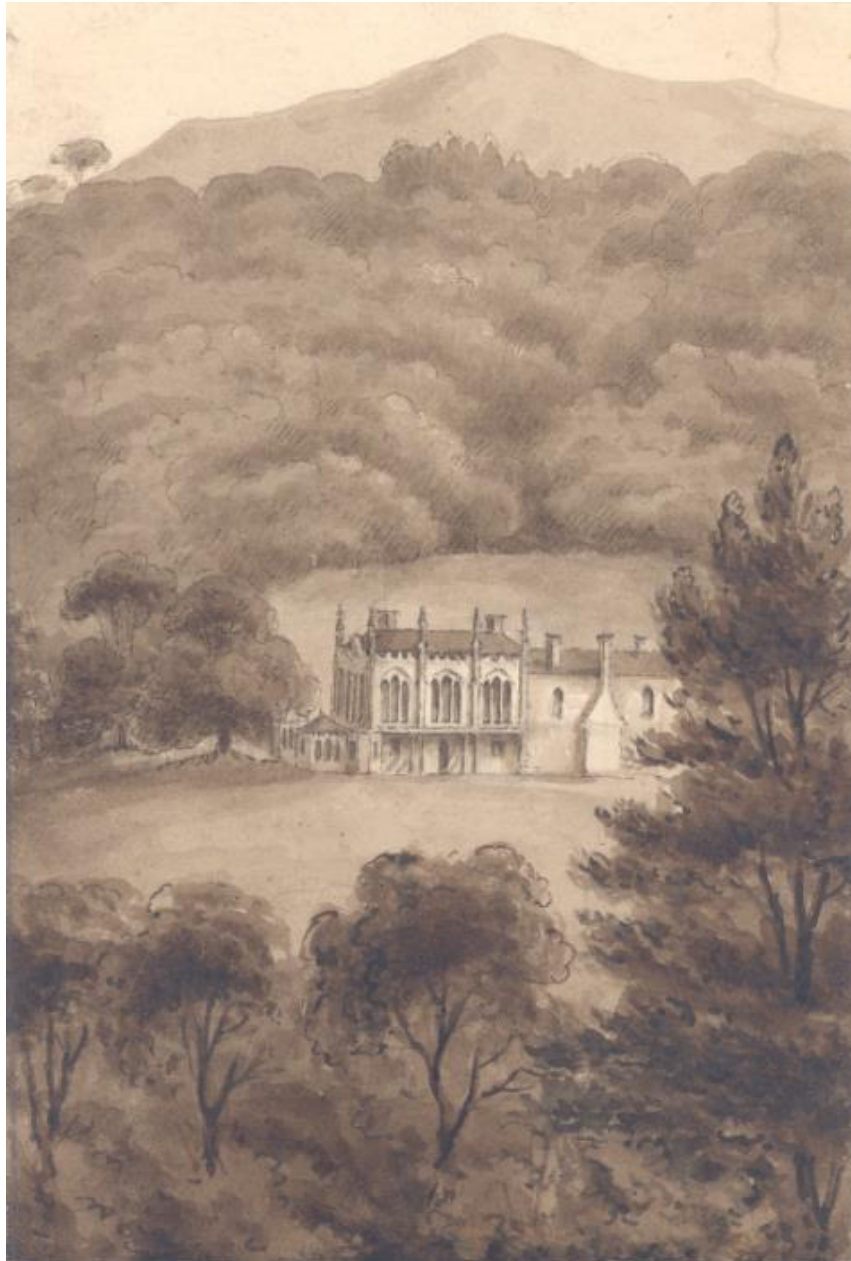


Figure 14: 1784-5 Watercolour by “S.Wilson” Also note the Herbert period mansion, demolished 1787. Hafod Trust Archive, HTA)

From these and visitor accounts it appears that the Hafod demesne was a well wooded and managed landscape at the time of Thomas Johnes’ inheritance.

The Plantings of Thomas Johnes.

The sheer numbers of trees planted by Thomas Johnes are impressive even by present day forestry standards but several points are contentious, including the exact location of these plantings, the acreages involved and the “progressive” nature of the techniques Johnes used.

1. Location.

Johnes’ pre-1807 papers were destroyed in the Hafod mansion fire of that year and his widow, Jane Johnes, disposed of much of his later records leaving no precise indication of planting locations.

Johnes had gradually extended the 7,000 acres of Hafod to around 13,000 by purchase and exchange which consolidated the estate into a continuous unit. He also illegally enclosed 8,000 acres of crown land, mostly sheep walk, over which he was attempting to establish his own freehold, so in theory at least he had plenty of space within which to grow five million trees. Using Johnes’ own numeric returns (which were confirmed by independent witnesses such as Walter Davies) to the Royal Society of Arts, Linnard (2000 p.152) suggests a figure of around five million trees in one thousand to twelve hundred acres on “*mostly difficult upland sites*”.

Macve describes Johnes’ new plantations as being established “*on the higher slopes to the North and East of Hafod, with the most extensive areas lying on both sides of the turnpike road to Devil’s Bridge*” (2004, p.23).

These correspond to an area known as Bodcoll after the farm of that name. A comparison with Singer (1803) and Dawson (Ordnance Survey drawing, 1820) shows the extent of the maturing plantations in 1834:



Figure 15: Singer, 1803. Note absence of plantations above Eglwys Newydd.(NLW)



Figure 16: Dawson 1820, note plantations and shelterbelts becoming established North and South of the road, two inches=1mile. (British Library, BL)

Dawson shows that plantations South of the road are becoming established as are shelterbelts in the vicinity of New Farm, by the 1834 estate survey the bulk of plantations between New farm and Bodcoll are visible:



Figure 17: 1834 Estate map showing plantations around Johnes' monumental Arch, indicated by the blue dot. (NLW)

These are further evidenced by the 1849 Tithe Map:



Figure 18: 1849 Tithe Map, blue dot indicates Johnes' Arch. (NLW)

Most of these areas are now coniferous forestry plantations and by reference to later maps can be shown to have been successively cropped and replanted. Field walking suggested a scarcity of deciduous targets.



Figure 19: Coed Yr Arch, site of one of Johnes' plantations looking North-East.



Figure 20: Johnes' 1810 monumental arch, successive cropping in evidence.

Bodcoll was one of Johnes' parcels of new purchase, perhaps with the deliberate aim of afforestation to raise its value. There are other such areas closer to the demesne where he may have the same intention. The following 1834 map has been amended as litigation evidence in 1846 to show the areas of purchase and exchange by Johnes:



Figure 21: Amended map of 1846, green areas show the original estate with the demesne centred on the mansion astride the Ystwyth. New acquisitions are indicated by different colours, Bodcoll is yellow, top right. (Ceredigion Archives, CA)

Areas like Lledwene (pink above mansion) and Tyloge (brown, below mansion), adjacent to the demesne, could have been purchased for this purpose and considerable planting could have occurred within the demesne itself. Linnard does not consider these possibilities.

Johnes himself reports that larch was habitually planted on “*the tops of the hills*”- which he believed it preferred- and hardwoods upon the sides “*and lower parts*” (to the Royal Society of Arts, 1802, quoted in Linnard, 1970 p.312). Much of the demesne was given over to pasture but a comparison of Singer’s 1803 map with the survey drawing produced by Robert Dawson (1820) indicates a substantial increase in the size of Coed Hafod and wooded areas such as Allt Dihanog, borne out by reference to the detailed 1833 and 1834 estate maps:



Figure 22: Robert Dawson's 1820 surveyor's drawing. (BL)

Johnes would have used a substantial number of trees for restocking purposes. This was partly because Johnes would have had to successively replace trees lost to the “*depredations of sheep*” of which he frequently complained—disposing of his own flock in 1812 as a consequence. Moreover, Johnes was forced to sell a considerable amount of timber to relieve financial pressure following the disastrous Hafod Fire of 1807. In that year he was offered £100,000 for the whole of the Hafod timber and wrote to George Cumberland:

“I shudder at disfiguring a county and a place that I have brought to light and which I love...supposing I cut down the whole and instantly replant with beech and oak four feet high, it will have a horrid look for longer than I can expect to live. I must therefore look out for some other residence...” (Dec.23rd 1807, Moore Colyer 1992 p.17).

Johnes declined but by January 1808, following his failure to sell Cardigan Priory, made a substantial felling and sale of timber, some eighty acres:

“It is I assure you with great regret and heartburning, but as that article [timber] and bark now fetches a higher price than presumably it ever will, I think I do an injury to myself and family if I do abstain” (Johnes to George Cumberland April 1808, quoted Moore- Colyer 1992 p.219).

Elsewhere Johnes takes a more pragmatic view, indicating that management is an issue as well as economy:

“I shall cut down a large fall of wood, for when I plant so much yearly I think I have a right to fall what is in a decaying state, and instantly replant it. At no

time can timber and bark sell for such sums as now when the whole continent is shut against us.” (Johnes to Robert Anderson, December 20th 1807 Quoted in Moore-Colyer 1992 p.226).

Here Johnes refers to the felling of old or decayed stock- possibly as a regular system of management- but these would be mature trees which pre-dated his own planting schemes. The 80 acre bulk felling of timber also included these and mention of replanting with oak and beech leads to the conclusion that these were hardwoods and thus on the sides of the valley. I suggest that much of this bulk felling may have been away from the immediate sight of the mansion and the scenic paths, but a substantial amount of harvesting and replanting must have occurred within or directly adjacent to the demesne as this where the mature Hafod trees were. A number of Johnes’ five million trees may have been replacement stock to existing woodland in these areas.

2. Planting Methods

Linnard notes (1970 p.311) that planting density varied between ten thousand trees per acre in the early years and four thousand trees per acre (1806/07 onwards) and states that these estimates agree with those of the Forestry Commission- he does not specify how he (or they) arrive at the area calculation. Presumably it is derived from the stocking rates indicated by Johnes’ returns to the Society of Arts.

Macve (2004 p.23) points out the extremely high proportion of trees to a relatively small acreage. The 1832 sale catalogue for example only designates 473 acres as “plantation.” It does, however, give totals of 331 acres of “woodland” and 103 acres of “woodland with pasture” which appear to include areas of the six hundred acre demesne.

Linnard (1970) makes some incorrect assertions with regard to the planting techniques employed by Johnes, concluding (p.318) that:

“Johnes used what were, in his day, very progressive techniques, in particular his use of small planting stock, and the care taken to protect the roots before planting. Indeed, some of the techniques have scarcely been improved upon...”

Linnard is referring to Johnes’ use of two year old stock raised in his own nursery, the dense direct sowing of acorns, the very close plantings of young trees and the technique of coating the roots of small trees with a “thin mud” before planting. Published works that would have been available to Johnes show

that these were recommended good practice from at least the seventeenth century. John Evelyn (1662) and Moses Cook (1675) both advocate a high planting density, either from acorns (Evelyn suggests that six bushels of acorns will plant an acre) or young stock, being two or three year old trees. Evelyn seems to be repeating the advice of classical authors such as Pliny but consistently cites working examples and later authors such as Boutcher (1775) echo these. A very important author to consider is William Pontey. Pontey was Nurseryman and Ornamental Gardener to Francis Russell, Fifth Duke of Bedford (d.1802), an important agricultural improver and a close friend of Thomas Johnes who erected a monument to him at the entrance to Mariamne's garden. It would be very unlikely that Johnes was unaware of Pontey's work, perhaps a key influence upon his thinking, which included (1809):

“A Treatise on the Theory and Practice of Planting Forest Trees, in Every Description of Soil and Situation; Most Particularly on Elevated Sites, Barren Heaths, Rocky Soils Etc.”

Pontey mentions the techniques of “*puddling*” (which Linnard considers “*progressive*”) as (p.182) “*...an old invention, and hence it is truly astonishing that it is not more frequently practiced*”.

Planting density is frequently discussed by different authors including Pontey. Taking trees planted in the winter of 1797/98 as an example from Johnes' own returns, planting spacing was ‘*betwixt four and five feet asunder*’ for oaks, depending upon the height of the plants. Pontey gives a figure (1809 p.172) of a three foot plant spacing producing a density of 4840 trees per acre and at a distance of four feet 2722 trees per acre. From this might be calculated that in 1797/98 the 10,000 oak trees planted by Johnes would have covered a mere four to five acres (At this ratio the eighty acres felled in 1808 would require around a quarter of a million hardwood trees to replace it, and post 1807 Johnes concentrated upon larch).



Figure 23: What a three-foot (one metre) spacing looks like: a young plantation believed to be potential Christmas trees at Ponthrydygroes facing North, June 2015.

This high planting density was not necessarily a precaution against failure rates. Evelyn describes how close planting was commonly practiced and then trees were to be successively thinned. Pontey (1809 p.171) sums up the position:

“ In general cases, a distance of four feet is certainly close enough [for the planting of forest trees] as at that space the trees may all remain till they become saleable; as timber, rails, spars &c. are of considerable value everywhere; firewood only in some places...”

Firewood was of specific importance to the mines at Cymystwyth and Evans (1995 p.51) notes that in 1838 the then owner of Hafod, the Duke of Newcastle (1834-36) was informed that the Cefyn-Dyrys plantation was at that time being thinned and proceeds from mining timber and firewood were good. The 1864 Hafod Estate sale catalogue makes the point that of the then 1400 acres of woods and plantations (some increase being due to The Duke):

“The mere annual thinnings produce a considerable fall and this sold either in its rough or converted form has for many years commanded good prices and materially augmented the income arising from the estate” (NLW).

Johnes’ high planting density had a sound economic base as repeated thinnings of young trees would bring in capital whilst gradually reducing the number of

standing trees per acre as they reached maturity. Eventually the trees would be reduced in numbers per acre to what Evelyn (1662 p.35) recommends as;

“Such distances as they may least uncommode one another; for timber trees I would have none nearer than 40 foot where they stand closest; especially of the spreading kind”.

Langley (1728 p.122) advises:

“The proper distances as oaks should be planted from one another, in woods, groves, parks etc. should never be less than thirty five feet”.

This would give an approximate density of thirty to forty mature trees per acre.

3. Summary

Johnes used tried and tested methods in his planting and much of this took place on newly acquired parcels of land which in some cases may have been adjacent to the demesne. As these latter were on valley sides they were possibly primarily hardwoods and a significant number may have been replacement stock, including parts of the demesne itself. The initial high planting density (common practice) accounts for the ability of five million trees to squeeze into what appears to be a relatively small acreage.

Economics and Aesthetics, Beauty and Utility

Dobres (2000, p.9) characterises “agency” in one sense as *“The strategic carrying out of intentional plans for purposive goals”* in accordance with *“... a specific culturally constructed idea of personhood.”* This section attempts to contextualise Thomas Johnes’ “purposive goals” in relationship to the Hafod treescape.

1. Economics

Johnes was acutely aware of the appreciating value of the Hafod timber resource. At the end of his life he believed that anyone purchasing the reversion of title to the estate would have the purchase price recouped in the value of the woodlands alone within twenty years (Moore-Colyer 1992 p.282).

Tree planting was a sound investment and as Walter Davies (1814 p.44-45) could report most estates in South and mid- Wales were engaging in it wholeheartedly including Crosswood, Peterwell and Derry Ormond. The price of timber and bark had risen dramatically due to the French wars, but also the growing industrial demands of the eighteenth century had other effects on commodities such as charcoal. Johnson (1951 p.53) concludes that charcoal accounted for 70 per cent of operating costs in “most furnaces” in the early eighteenth century and King (2003 p.54) shows that whilst smelting by the use of coke was technologically possible from the 1740’s onwards it was slow to catch on- charcoal over the course of the eighteenth century at least doubled its price in real terms. Wheeler (2011, p.34) suggests that in the early modern period deliberate planting of stocks of timber to maintain local charcoal supplies became commonplace. Her analysis of industrial fuelwood from sites in North Yorkshire shows a dominance of oak, predominantly small calibre branchwood or stemwood and the “proactive” increase in planting of fast growing ash which Johnes increasingly engaged in. A charcoal platform has been tentatively identified on Allt Dihanog (Sambrook & Hall, 2003) and another at Bodcoll. It would be unlikely that the on-site processing of charcoal at Hafod did not take place.

Johnes knew the importance of economics. As Moore Colyer (1998 p.55) says:

“The Hafod romance... was only made possible by extensive mortgaging of the Hafod estate and the sale of unsettled properties elsewhere”.

Howell (1986 p.9) has tried to estimate the yearly relative incomes of South-West Wales gentry in the eighteenth century and gives figures for Wilmot Vaughn of Crosswood (1797-8 at £4,306) and Thomas Powell of Nanteos (1789-90 at £3,000). He notes that Thomas Johnes’ income “*can’t be produced*” but was on a par with these “*great landlords*”, who in terms of their English counterparts were in the region of a third less income at least. Howell notes that rents had begun to rise from around 1760 but were still sluggish. Williamson (2007 p.2) has remarked that the term “estate” is problematic (a standard typology of estates has yet to be produced) and an estate’s actual wealth might be in terms of activities carried out on it (such as mining or forestry) as opposed to rental in acres.

Johnes had the foresight to realise that any long term security for Hafod required a practical investment that would raise the worth of the acreage to a

level that if it might not guarantee financial self-sufficiency would at least improve the prospects of affordable credit. Johnes would be succeeded by other owners of the estate who, as Evans states (1996 p.58) about Newcastle's involvement, would inevitably struggle with the prospect of making Hafod pay.

Johnes' own financial problems are well referenced. By the time he left Hafod in 1815 his income was about £1500 per annum, still reasonable for Welsh gentry but far diminished from his previous stature. Yet Johnes may have agreed with Williamson (2008 P.6) that it is important to avoid the view of some Economic Historians that maximisation of profit is the key to understanding a landowner's motivations:

"Owners evidently had attitudes to land which were at once more complex and more subtle, than those of a contemporary agribusiness farmer".

Johnes' aversion to affecting the views of the estate is shown in 1813 when financial problems were even more pressing than in 1807:

"I am too fond of the place even to think of hurting it by cutting down its great ornament, Trees." (Johnes to John Fitchett December 14th 1813, Moore Colyer 1992, p.286).

Evans (1996 p.46) observes that upon purchase of the estate in 1834 Newcastle was obliged to build a saw-mill, Johnes not having had one on site. Evans remarks how strange that someone so engaged in forestry should have paid so little heed to the requirements of processing. Perhaps Johnes was taking a long term view- firstly that his own newly established plantations would not be felled within his lifetime and secondly that he had little intention of felling any of the standing timber which he had inherited. It was only the disastrous fire of 1807 which overrode this. This suggests that Johnes believed economics were important but in the end aesthetics were more so.

2. Aesthetics- Improvement for Posterity

Aesthetics and their meaning for Johnes are more difficult to discuss as they bring in several themes. Daniels (1988, p.44-45) has attempted to describe attitudes towards tree planting around 1800, pointing out the escalating enthusiasm for woodland:

“The interests of planters, land agents, landowners, landscape gardeners, painters, poets and political theorists overlapped in a large and often contentious literature”.

This is inescapably linked to ideas of property and its display:

“Planting accentuated the impression of power in the land... Here trees confirmed the power of property.”

In recent work on several East Yorkshire estates Hazel Williams (2013 p.41) shows that after rentals woodland was seen as the most lucrative form of income available to a landowner, especially in the profitable conversion of marginal land, but;

“Improvement was not just for beauty and profit but a patriotic duty; planting trees was an investment for future generations and a statement about the anticipated longevity of the family”.

Johnes himself makes a bitter remark on this latter notion when he writes a year after the death of his only child Mariamne :

“I shall continue to plant & improve just the same as if we were not the miserable branchless trunks we are.”(Moore Colyer 1992 p.274).

Improvement was an important theme as Johnes shows in his own work *“A Cardiganshire Landlord’s Advice to his Tenants”* and Jones (2001 p.88) describes him as *“perhaps the county’s most illustrious improver.”* To Johnes improvement was about aesthetics as much as economics and in this he was following contemporary patterns.

Tarlow sees the notion of improvement in the eighteenth century as an all-pervasive *“cross-cutting ethic that affected many spheres of practice in Britain after 1750”* (2007 p.31). She notes that (p.74):

“The distinction between farming improvements relating to the management of crops and animals and landscape improvements relating to aesthetics is not one that eighteenth century landowners would recognise.”

Johnes’ Hafod enjoyed excellent publicity and attracted distinguished visitors (Andrews, 1989 p.145, suggests that Hafod was *“deliberately set up to attract the tourists”*). Whilst Johnes was creating his treescape he was responding to a common theme, an approved national aesthetic. Helsinger (1994 p.104) quotes

William Gilpin, an important Picturesque movement figure who himself visited Hafod and describes his notion of “*The Court of Taste*”, wherein the monuments (and thereby created aesthetics of the landscape) belong not in truth to the landowner but the ponderings and amusement of posterity.

Johnes was not merely creating a domestic retreat on the principle of the Homeric Idyll (somewhere to retreat from the world and live in contented simplicity) but was displaying the possibilities of improvement, through the aesthetics of woodland, for posterity to see.

3. Aesthetics-The Hafod Picturesque

These remarks are made by Henry Skrine in 1798:

“A well-formed lawn extends far beneath the house , beyond which the woods rise in great beauty , and through them a number of walks are formed with considerable taste, being conducted by the sides of such cataracts as abound in this hilly region, improved by every addition of art”(p.124).

Johnes is credited with the creation of an important picturesque landscape at Hafod, it is important to consider how trees facilitated this.

Plantations had the ability to enhance the surroundings of Hafod whilst being economically sensible and offered something directly to the visitor. By constructing the various walks Johnes had an inexpensive way of creating views evoking the sublime landscape. Andrews (1989 p.3) shows the paradoxes at the heart of picturesque tourism; firstly in that the tourist wishes to discover nature untouched by man;

“And yet when he finds it he cannot resist the impulse, if only in the imagination, to improve it”

Secondly that the tourist will;

“loudly acclaim the native beauties of British landscape by invoking idealised foreign models.”

The second is related to the first in that the impulse to improve is usually inspired by an educated awareness of what an ideal landscape should consist of:

“Thus a Welsh valley acquired a higher aesthetic value if it looked like a Gaspard Dughet Painting.”

The Hafod estate is often mentioned with reference to the influence of Uvedale Price whose benchmark *Essay on the Picturesque* (1795) caused controversy. It is true that Johnes knew Price well but the extent to which Price may have influenced Johnes, or any of the well-known picturesque commentators of his time such as his own cousin Richard Payne Knight, is debateable. In a revealing private letter Price tells Lord Aberdeen concerning Hafod:

“There are some picturesque scenes and a very pretty cascade, but I think the place has been over-rated.”(Boydell & Brewer 2012 p.89).

Taste had changed in the late eighteenth century away from ideas of the beautiful and pastoral to the excitement and exultation of the sublime. Confusion exists about what “picturesque”, a catch-all term, actually meant by this period.

Andrews points out changing tastes away from popular artists such as Poussin and Lorrain (1999 p.129). The picturesque had always to an extent embraced the dramatic and dreadful prospect of landscape but the shift towards depictions of the sublime following the increasing popularity of the works of Salvator Rosa (several Rosa landscapes were in fact owned by Johnes at Hafod) seems to move forward post 1750. Rosa expresses a darker side to nature and his art fulfils Edmund Burke’s *“A Philisophical Enquiry into the Origin of our ideas of the Sublime and Beautiful* (1757) when Burke states:

“When danger or pain press too nearly they are incapable of giving any delight and are simply terrible, but at certain distances and with certain modifications ...they are delightful”.

Chambers (1993 p.188) notes that Burke’s essay essentially codified an interest in the sublime and gave it a vocabulary to respond to such created “wild” landscapes as Hawkestone Park in Shropshire. Chambers notes that Hawkstone, with its woodlands, monuments, tunnels, rock outcrops etc, along with Hagley and Hackfall *“represented the acme of taste after 1750 for at least three decades”*.



Figure 24: Not quite the Ystwyth. Salvator Rosa's "River landscape with Apollo and the Cumaean Sibyl", 1657-58

Visitors to Hafod such as Thomas Martyn in 1804, often continued on to Hawkestone and compared the two favourably. The suggestion is that Johnes recognised and promoted the notion of the landscape of exhilaration, of sublimity, rather than the classically picturesque as espoused by Price (this is reflected in his development of the Devil's Bridge section of the estate as a tourist attraction). Chambers says of the sublime landscape:

"Like Gothicism its grace was beyond the reach of art and certainly beyond that of the horticulturalist."(p.188)

And concludes; *"... trees became the vocabulary for translating the wild sublimity of mountain scenery."*

Johnes could never hope to match the resources of Richard Hill of Hawkestone Park, but an advantage of wild landscapes is that they are economically cost effective to create and maintain.

Turner's *Hafod* (1799) indicates the way in which Hafod could work upon the imagination once the visitor became fully engaged. The house depicted in reality is a much more modest affair but with the interaction of the sublime landscape it becomes more than the sum total of its parts:



Figure 25: Turner's Hafod (1799).

There is still a need to identify a working Hafod aesthetic in the context of Johnes' treescape that brings together the elements discussed so far.

William Marshall, in his *A Review of the Landscape*, (1795) makes a scathing response to Price and Payne-Knight's works in defence of Brownian principles. Marshall describes the notions of "*Rural Economy*" and "*Rural Ornament*" and explains that (p.3):

"...In every other part of the environs of a house, ORNAMENT and UTILITY become blended, and ought to go hand in hand. Agriculture it is true, may be carried on without the assistance of [ornamental gardening] ...but in the immediate neighbourhood of the country residence of a man of fortune, they are inseperable". "

Marshall's views are interesting because, like Johnes, he appreciates practical economic farming and forestry set within an ornamental landscape- but the Picturesque, says Marshall, is:

"The child of deformity...from the definitions of picturesk , a face pitted with the smallpox is picturesk."

The Sublime landscape is different:

"Sublimity must rouse some extraordinary emotion in the mind, it cannot be dwelt on with indifference."(p.274)

He advances the notion of different types of beauty and including “*Adorned Ugliness*” which has a particular resonance for Hafod:

“Adorned Ugliness- seen in mountainous areas ... But unsightly as such grounds are, while naked and waterless, they are no longer so when covered with luxuriant wood, and divided by foaming torrents rushing down between them.. clothe it suitably with wood and let a copious stream be seen partially among it,-it is viewed with pleasure.(p.269)

Here is a practical working aesthetic, rooted in the sublime but with an economic usefulness referenced through the planting of trees. As Pontey, (1809 p.256) in describing old trees says:

“An object naturally beautiful or grand is doubly so when it is also Useful.”

Summary

Trees and woodlands were economically important to the estate and Johnes’ plantings represent a strategic and well considered venture, especially in terms of the rising timber and fuel prices of his day. However for Johnes and other landowners there were other goals such as improvement and the need to be seen (often by posterity) to visibly change the landscape for the better. This brings in aesthetics (which for Johnes were often the most important factor of all) and these were culturally loaded, by the end of the eighteenth century, towards notions of the sublime landscape which Hafod naturally lent itself to. Uniting all of these is a “working Hafod aesthetic” with practicality, as Marshall puts it; “*Ornament and Utility*” being expressed in terms of trees and forestry.

Methodology

1. Targeted Dendrochronology

The meaning of the term “targeted dendrochronology” means the prior selection of trees for scientific tree-ring dating using available historical sources such as maps and estate accounts as well as archaeological features. This allows for the resource-efficient selection of targets across an extensive landscape. Discussion of the practice of targeting and sampling trees for

dendrochronological analysis within the literature (such as Speer, 2010 p.76) has tended to restrict itself to ecological considerations, for example the reconstruction of climatic data rather than historical landscape investigation.

As Bowden (1999 p.135) discusses, a wood may be regarded as a distinct archaeological entity, whether part of a historic landscape design or having a historical association within the landscape. The study of woodland is therefore “*an ideal interdisciplinary co-operative task*” and as Rackham (1986 p.64) states;

“Woods... result from long-running interactions between human activities and natural processes, to both of which the historian has to give due weight. Their history should never be based on written records alone”.

Several different systems of estimating a tree’s age from girth or crown spread have been proposed, notably by the Forestry Commission (White, 1998) and adapted by such organisations as the Woodland Trust. White (p.1) states, in terms of girth, that:

“Age can only be estimated by external measurement and then by direct comparison with other trees of similar species, size, and known planting date on comparable sites elsewhere.”

This relies upon the assumption that trees on “similar” or “comparable” sites will behave in the same way, that an extensive, pertinent, body of data for comparison actually exists and thirdly that girth is a reliable indicator of age in the first place. Bale (2005, p.53) in a study of oak trees at Allt Lanlas, Ceredigion discusses how the results demonstrate “*the danger of attempting to age trees through girth size*”, noting in particular one tree which whilst only having a girth measurement of 94 cm contained a ring sequence going back to 1779.

Dendrochronology remains by far the most accurate means of dating the age of trees and using extensive research to identify targets is the most cost effective means of employing this, although it is not without its own issues as noted later.

2. Cartographic Sources

This study relies upon cartographic evidence to locate areas that can be shown to have been continuously wooded since the late eighteenth century. Some discussion of this is necessary.

Turner (2006) working on Historic Landscape Characterisation projects have attempted to use cartographic evidence to establish a time trajectory of woodlands or orchards to quantify change and establish principles for future heritage-orientated landscape management decisions. The Ancient Woodlands Inventory (revised 2011) created by the Forestry Commission has followed a similar process. Whilst these projects may have had positive woodland management outcomes a major reliance upon the first and second edition Ordnance Survey six inch to the mile map series (commencing from the 1880s in most cases in Wales) has meant that the usefulness of these projects in establishing eighteenth and early nineteenth century woodland distribution is very limited.

Extreme caution with cartographic evidence is necessary. Rackham (1986 p.18) discusses the problems of using this, noting that estate maps are frequently “*tidied up*” and that the practice of localised map making has no history of progressive improvement:

“It runs in cycles of technical perfection and decline.”

Maps have their own agendas. Johnson (1996, p.114) considering the “*common technique*” of lining up a series of maps and charting landscape change says:

“[This] needs to be complemented by a questioning of the internal discourse of maps... maps are monuments, artefacts of the very change they act as ‘sources’ for.”

Tithe maps frequently do not indicate woodland at all, as in the case of the Hafod estate South of the Ystwyth, when other contemporaneous maps do (the estate maps of 1833-70). Tithe maps were created for the specific purpose of identifying acreage for taxation purposes, not woodland assets specifically.

The Hafod map of 1796, (the Cumberland map) is another example. This shows the walks and other picturesque features established by Johnes by that point, it does not show trees. Perhaps trees in the demesne were too common to merit detailed recording, but of course that was never George Cumberland’s intention in the first place:

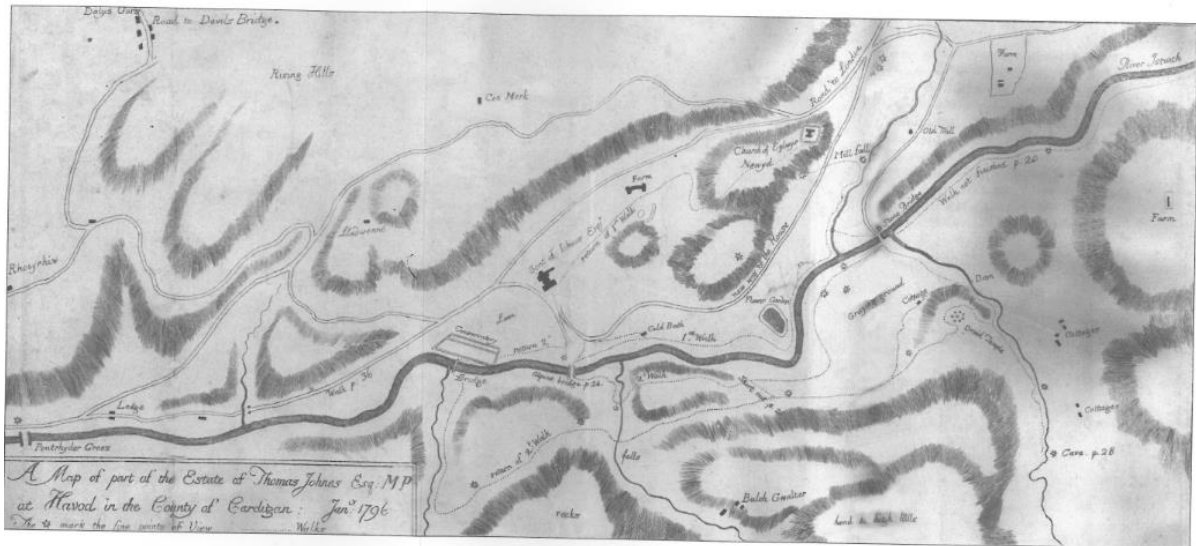


Figure 26: The Cumberland map of 1796

Likewise the 1834, 1855 & 1870 estate maps are increasingly aesthetically stylized and as these were associated with sales catalogues their agenda is about getting the estate sold for the best price. The beautiful 1833 Hitchcock map, (9 chains= 1 inch) the first to show trees, was produced at a point when the estate had been released from chancery (1832) and Johns' executors were free to sell it. Clearly it seeks to promote the woodland asset of Hafod to its maximum potential to attract a buyer:

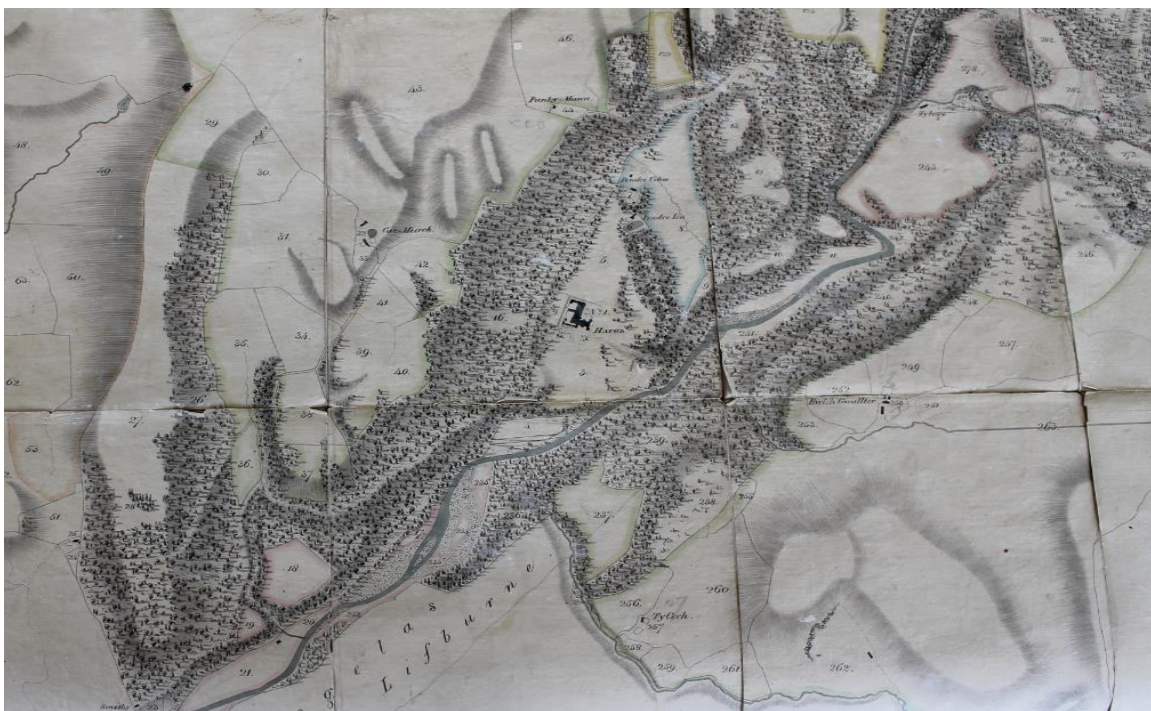


Figure 27: The Hitchcock estate map of 1833.

Not enough is yet known about the historical woodland management of Hafod to make definitive judgements about the accuracy of the maps at any given point. A replanted area of clear-felling, or a new plantation, may not be indicated as woodland for example because of the immaturity of the trees present, and as in the case of the Hitchcock map the reverse may be true with some areas less well stocked in 1833 than they are shown to be. Cartographic evidence for this study (and pictorial evidence too) was assessed on a balance of probability and caution.

3. Ground Survey

Having become acquainted with the cartographic evidence I attempted to systematically survey the demesne and adjacent areas which were possibly indicative of older woodlands and to try to establish locations within these where timber extraction was obviously difficult.

Borron states (1992 p.399) that Hafod was able to capitalise upon its reserves of timber to such an extent that the Waddinghams (owners 1872-1940) survived the agricultural depression “unscathed”. Borron concludes that after the Great War Hafod’s prosperity had ceased and “*all easily extractable timber must, by then, have been sold*”. Clearly this does not mean that *all* standing timber had been felled. There would be economic reasons to allow some trees to remain standing (as well their picturesque disposition).

The felling and extracting of timber was a time consuming process that cost money and the consequence of rot in living trees (as was discovered during the collection of the core samples for this survey) is impossible to estimate beforehand. Trees, notably oaks, on difficult sites could have been left standing because they were costly to remove and because as they aged (and crown and trunk rot increased) there was no guarantee that the return would justify this expense. Pontey (1809, p.116) repeats the old adage that:

“An old tree is like a merchant; you never know his real worth till he be dead.”

It is known that Johnes constructed banks and stone walls of five feet in height to protect his plantations from the incursions of sheep and employed at least one labourer all year round for the maintenance of them (Linnard 1970 p.313). Evidence of these in difficult locations could indicate the possible presence of Thomas Johnes era trees and were concentrated on.

A difficulty was that new post- 1950 forestry sub-compartments do not conform to many boundary features on the historical estate and have their own access tracks which cut across these. Initially it proved difficult to obtain dated information from NRW of Forestry Commission restocking after 1950. After the commencement of the survey a 1966 Forestry Commission map was discovered in the Hafod Trust’s archive which shows compartments, species and planting dates up to 1963:

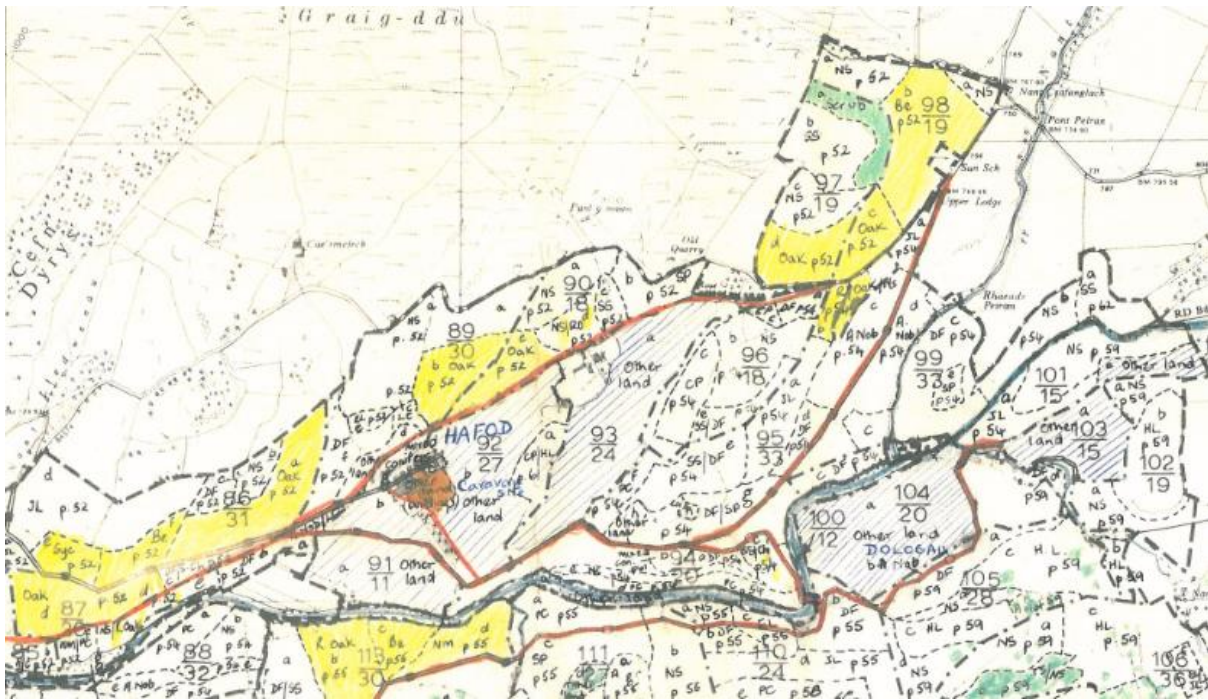


Figure 28: The Forestry Commission Map of 1966

The winter storms of 2013/14 had brought down a large number of trees and this allowed 100 ring counts across the estate with GPS positioning. None of these indicated a pre- 1950 date. Their prime usefulness was that they proved the accuracy of the 1966 FC map and evidenced that relatively little felling or replanting in the demesne has taken place since the early 1960’s. The Hafod Forest Design Plans of 1996 and 2004(revised) mention that felling works are in fact long overdue.



Figure 29: Ring counts with GPS in progress.

As previously mentioned land parcels added to the estate by Johnes were particularly investigated such as Lledwenne, Ty Coch, Tyloge and Bodcoll. Most proved to contain coniferous trees or (Ledwenne) young hardwoods such as beech.



Figure 30: Young Beech and Johnes' Walls at Lledwenne.

Tyloge proved to be of most interest and is discussed fully in the results section.

With reference to the aesthetic principles discussed above, several trees were studied in close proximity either to the mansion or features such as Mariamne's garden with pictorial evidence being referred to where appropriate. It was important to represent both trees that were obviously part of woods or plantations and trees that could be considered part of the aesthetic landscape. 28 separate targets were identified consisting of 21 living trees (one fallen), two standing dead and five tree stumps from different areas of the estate.

Permission was obtained from NRW's area officer for the sampling of the living trees to take place.

The field sampling of the living and standing dead trees was carried out with the use of a 5mm Haglof increment corer with all trees being cored at around 1.2m height above ground. The stump samples were taken by chainsaw section (as was the sample from the fallen tree).

All samples were carefully packaged and transported for preparation and analysis.

The core samples were surfaced by hand using razor blades and the stump samples were reduced in size by using splitting wedges and surfaced by orbital sander using progressively fine grades of sandpaper. This allowed the ring sequences to be discerned and measured using a micro-computer based travelling stage (Tyers, 2004) which measured the complete sequence of growth rings in each sample to an accuracy of 0.01mm.

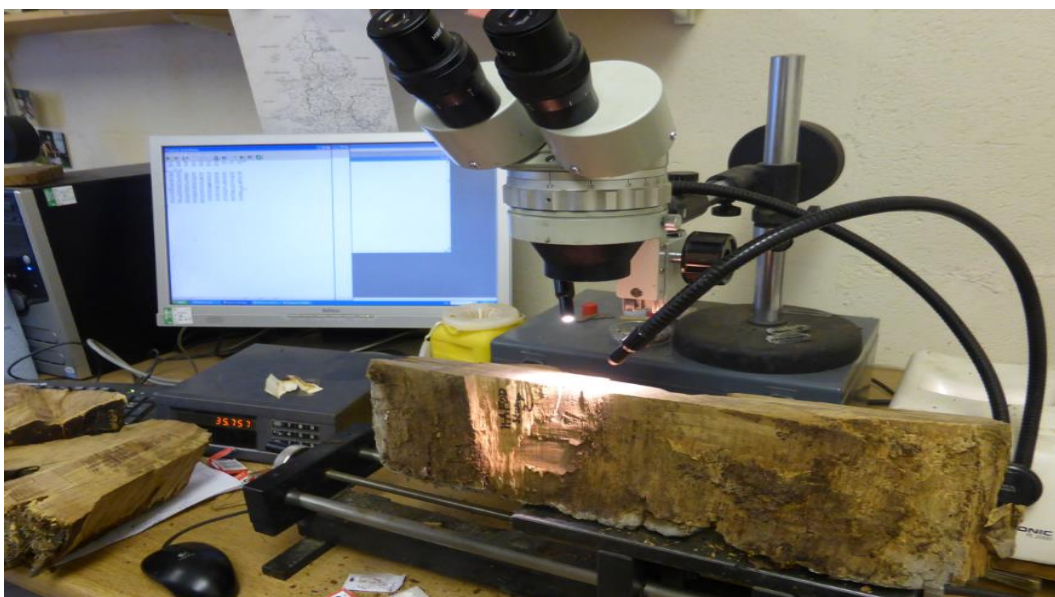


Figure 31: Hafod Stump 05 on the travelling stage, ring width measurements in progress.

The methods used for the direct sampling, analysis and recording of each tree followed those described in the English Heritage Guidelines For Dendrochronology (1998) with all collected samples being processed at the University of Wales Trinity St. David Dendrochronology Laboratory under the direct supervision of Dr Roderick Bale.

Results and Discussion

The following shows details of each individual tree as sampled. Each tree has a specific reference number on the left along with GPS co-ordinates and a descriptor. All trees are living or dead oaks with the exception of **Hafod Stump 01** which has been analysed as Sycamore. Findings are discussed below each one and where appropriate trees are grouped together for this purpose (because of a close geographical relationship). It is important to note that there are two categories of tree for results purposes, those for which cross dating has been successfully achieved by reference to established chronologies and those which did not date successfully. In the case of these latter trees it has been decided that their ring –counts are important and these are included where appropriate.



Figure 32: The green dots on this 1855 estate map indicate the positions of all trees sampled. The Bodcoll plantations are edged yellow to the right.

1.Hafod Mansion Environs

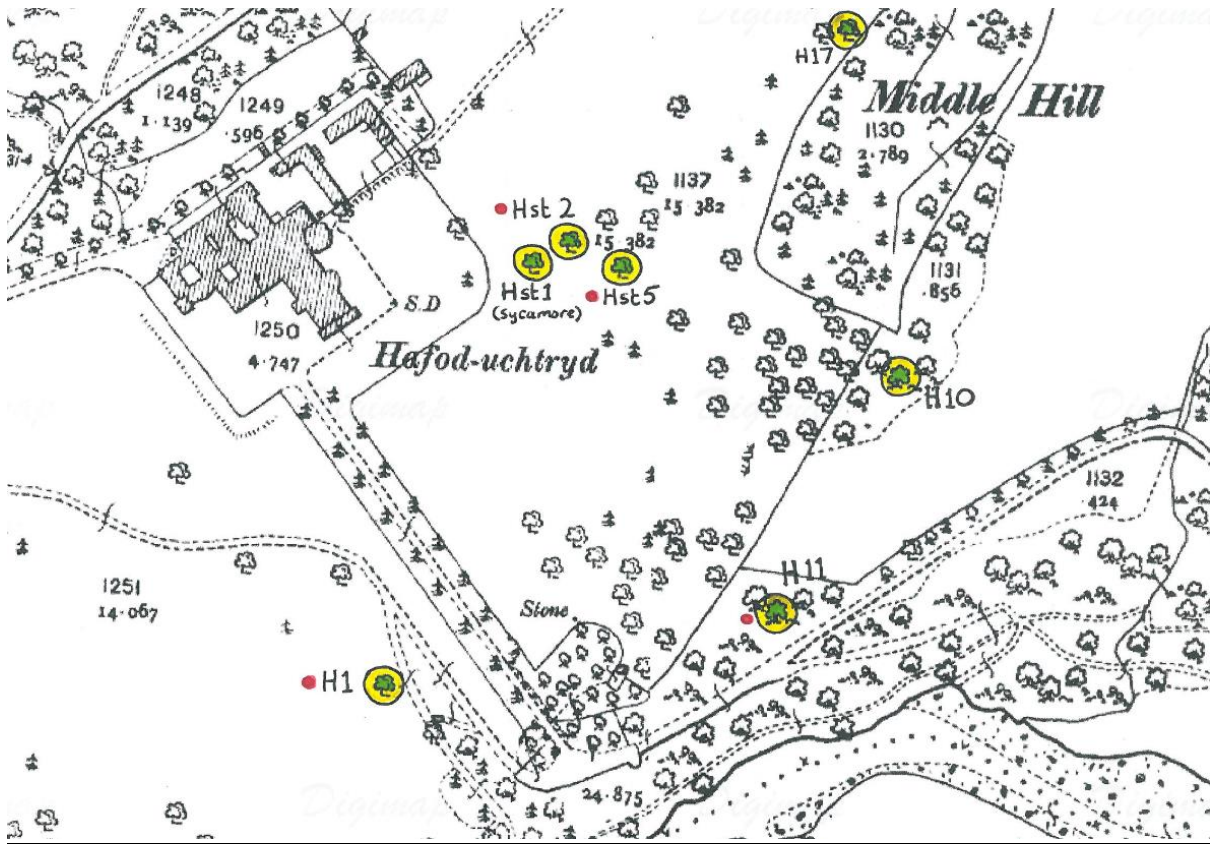


Figure 33: Trees sampled in the immediate vicinity of the Mansion.

This section includes sample trees close to or within a short walking distance of the Hafod mansion, often visible to its views. **NB:** On the above map (1887-88 O/S) and others following I have coloured tree symbols to indicate the approximate positions of the trees sampled and where appropriate have provided a red dot to indicate trees of a pre-1780 date (before Thomas Johnes' ownership) and blue to indicate a strong possibility of a planting date during the period 1780-1816. Other trees not so indicated may still belong to this period and the evidence for this is discussed individually. In colouring a specific map tree symbol I am **NOT** suggesting that the survey has identified a specific tree as shown by the map (it is merely a convenient device). Individual standing trees such as in hedgerows or gardens were, on the first O/S series at least, often recorded by surveyors accurately, but this was variable, did not apply to trees within woodlands and was eventually discontinued (Hindle 1998 p.130).

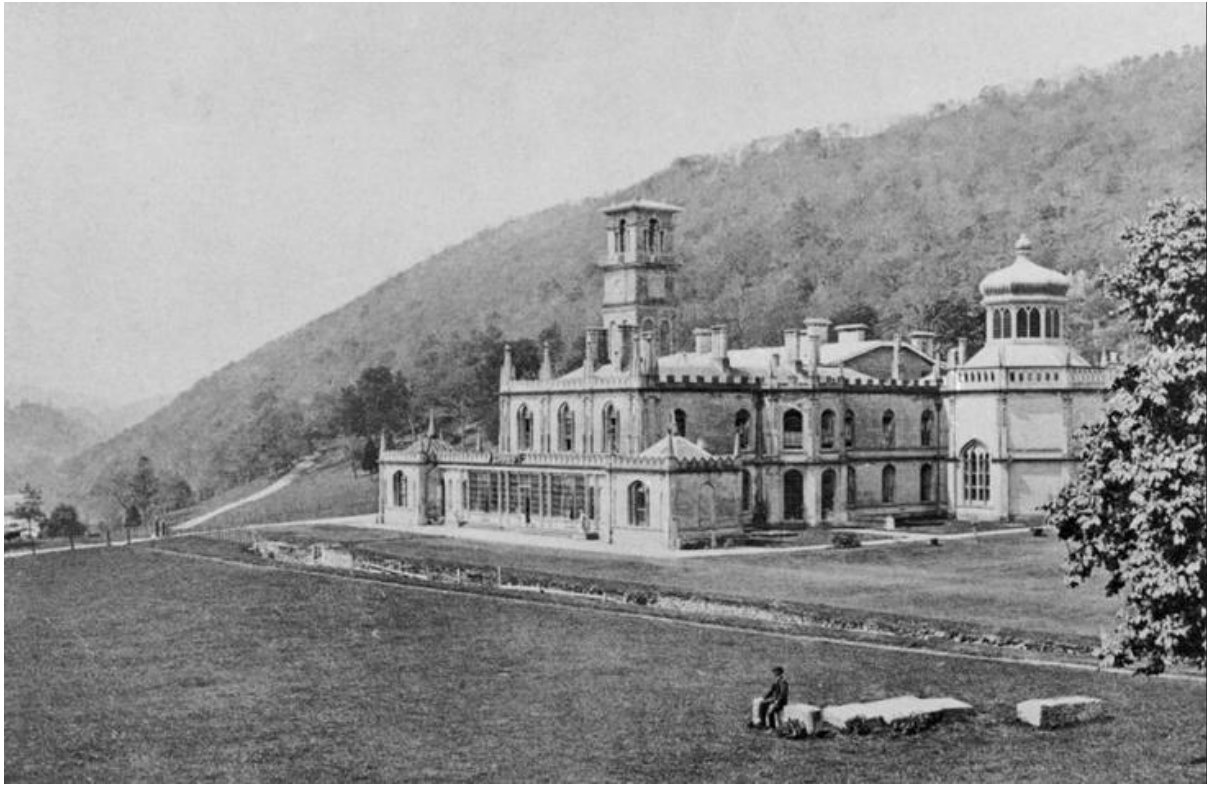


Figure 34: The Hafod Mansion 1873 from the South-East, shortly after its acquisition by John Waddingham. Hafod Stump 01, the Sycamore, may be the tree just in view on the right.

Hafod 01 SN595173070 Mansion Drive



Figure 35: Hafod 01

Hafod 01 is short statured spreading oak on the downward Eastern slope off Johnes' original driveway (which was subsequently straightened and replaced). A considerable amount of inner rot caused difficulties in coring but eventually an inner ring (cross matchable) date of 1762 plus over ten years to centre was achieved (it was felt that this latter figure of ten years plus was on the conservative side). The conclusion is that this tree would have been a mature specimen at the time of Thomas Johnes' ownership and deliberately left standing. Visitors would have passed it en route to the Mansion or when walking down to the Alpine Bridge on the Gentleman's Walk. It may have even been depicted as one of a group in John Warwick Smith's *Woods of Hafod* (1795) mentioned earlier:



Figure 36: "Woods of Hafod" detail. Hafod 01 may be represented on the far right.

Immediately next to **Hafod 01** (South) an oak stump indicates that for a while **Hafod 01** was part of a pair of trees, possibly shown on an intaglio print of c.1810:



Figure 37 1800: Hafod 01 may be represented as one of a pair on the left.

There is some map evidence to suggest that a field boundary may have existed in this location which **Hafod 01** could have been adjacent to, if not part of. This line of trees extending East -West (centre- lower in 1833 map extract below) may represent survivals of such a boundary hedge. If **Hafod 01** was part of this (or an outlier as may be suggested) then it may give an indication of the planting date of that feature. The position of this group would have affected the view from the mansion to the South-East in Johnes' time and may have been included deliberately in the picturesque landscape:



Figure 38: Hitchcock 1833, possible boundary survivals, centre to bottom.

The Hafod Stump Group SN 76044 73247



Figure 39: The Hafod Stump Group. In the immediate foreground can be seen Stump 01 with its trunk section lying to the left. Stump 02 can be seen to the left of the trunk section and Hafod 05 is discernible in the mid right hand side of the image towards the top of the rising ground. Note the pathway of the Ladies Walk to the left of the image.

The Hafod Stump Group are a discernible group of five stumps lying on the rising ground of Middle Hill towards the immediate South-East of the Mansion ruins. Three of these were judged to be suitable for testing and were sampled by chainsaw section. There are trees present in this position on the 1833 estate map, extending Eastwards along the slope of Middle Hill, which are further evidenced on successive maps up to 1906. Further stumps are visible farther along this line which follows the course of the Ladies Walk, set out by Thomas Johnes.



Figure 40: The stump group on the 1834 estate map (centre) between the mansion and the enclosed green area of Middle Hill.



Figure 41: Hafod Mansion by Waltham (1795).

Trees belonging to this group may be visible behind the early mansion outbuildings in a 1795 watercolour by James Waltham. The possible field boundary feature previously mentioned (**Hafod 01**) is shown here, end-on, right.

Hafod Stump 01

Hafod Stump 01 has been analysed as a Sycamore.

This tree consists of two elements, the remains of the tree stump itself which at its severed edge has a diameter of 2.5 m x 2.2 m and a 3m long x 1.5m trunk section lying close by.



Figure 42: Hafod Stump 01

The stump itself was too rotten to attempt dating but the trunk section was more promising:



Figure 43: Hafod Stump 01 Trunk Section.

The resulting tangential section could not be cross-matched and therefore was only of interest for its ring-count which numbered 109. Its centre was missing so one would expect several more rings. Also the stump was wider than the tested trunk section by a considerable amount (trunk section and stump were probably not continuous) so the stump itself probably contained more rings.

A reasonable felling date for the group was needed. For reasons explained below it is known that Coed Hafod was bulk felled before 1947 but aerial photographs of that year show the stump group as living trees (See Coed Hafod). A 1951 photograph shows the rear of the house shell with tree wreckage and a c.1952 winter image shows that at least some of the group have been felled by this point:



Figure 44: Pre-demolition 1951, note tree sections.



Figure 45: Winter 1952, Felled group left above house.

1955 aerial photographs also show the group as felled:



Figure 46: 1955, Group felled centre. Note trunk section visible.

I would estimate that the group were felled immediately after the Forestry Commission takeover of 1950. If 1950 is taken as a rough felling date then Hafod Stump would have been around from 1841 at least, suggesting that it was planted sometime in the ownership period of the Duke of Newcastle (1834-46) however as mentioned above it is a number of years older. I consider it safe to

assume that no significant planting occurred between 1815 when Johnes left Hafod and 1834 when the estate was purchased by Newcastle. If it is a Johnes tree why plant sycamore anyway?

John Evelyn (1662 p.78) says:

“Sycamor..some commend them to thicken copp’ces especially in parks..And if the trees be tall and handsome are more tolerable for Distant Walks especially where other trees prosper not so well, or where a sudden shade is expected.”

Sycamores, as Cook also relates, then give deep shade. This tree is planted at the exact return point of the Ladies Walk where a shady spot overlooking the rear of the mansion with its garden conservatory would be very attractive.

Hafod Stump 02

Hafod Stump 02, at a distance of 20m from **Stump 01** along the Ladies Walk, on analysis produced an inner cross-matchable ring date of 1735 whilst its final ring was matchable to 1909, which was also its sapwood boundary (the rest of the sapwood has gone). If this tree had its full complement of 46 sapwood rings (as per British oaks) this would mean a felling date of around 1955. As oaks frequently do not have the full complement of rings (sometimes numbers can differ on different sides of the tree) a felling date of 1950, as in **Stump 01**, would still be acceptable.



Figure 47: Hafod Stump 2 being sampled by chainsaw.



Figure 48: Hafod Stump 2 being surfaced prior to dating.

Hafod Stump 05

Hafod Stump 05 is 13m South of **Hafod Stump 01** on the rising ground of Middle Hill. This tree unfortunately had some centre rot and hence an absolute inner ring date was not possible, however it did show a dateable, cross-matching range of 1742-1896 (without a sapwood boundary). This brings it into line with **Stump 2**, possibly the same age with the same felling date.

These trees would have been mature examples in Thomas Johnes' day. Having created his Ladies Walk he may have planted the sycamore (**stump 01**) on the edge of them to terminate it.



Figure 49: Hafod 05 before sampling.

A final point to make about these trees is that Johnes may have preferred to keep the pleasing shape of the group of which the stumps formed the lower part. Moses Cook (1675 p.142) discusses to how to create walks and how to terminate them in squares, ovals or triangles of trees “*to be most pleasing to the most noble sense*”, oaks and beech being the recommended species. It may well

be that here Johnes used a standing feature of oaks to end the ladies walk in accordance with these principles:



Figure 50: 1833, The pleasing shape of the oaks at the end of the Ladies Walk.



Figure 51: The end of the Ladies Walk. Stump group to the left with sycamore trunk (Stump 01) visible centre. Mansion ruins are visible to the right.

Hafod 17 SN 76171 73368

Hafod 17 is a substantial oak on the edge of the Middle Hill enclosure close to Hawthorn Cottage which in Thomas Johnes' time was used as "Menagerie" housing exotic poultry and ducks on its pond. This tree may be part of the original continuous belt of which the Hafod Stump group formed part alongside the ladies walk. Unfortunately inner rot meant that many inner rings were missing and only a sequence of 1913-2014 could be positively identified. This was cross-matchable with other trees, however, and so has been useful in compiling the Tree Mean results table shown later.



Figure 52 Hafod 17

Hafod 10 SN 76121 73184 & **Hafod 11** SN 76161 73124

Middle Hill

The area of Middle Hill has been continuously wooded since the time of Thomas Johnes as map and picture evidence suggests:



Figure 53: "River above the First Bridge", Stadler after Smith 1810. The darker green tree-covered slope of Middle Hill is seen extending down to the drive by the river on the centre left. Hafod 11 may have been part of this group.

In *River Above the First Bridge* above, trees are seen to be completely covering it all the way down to the driveway by the river which is confirmed by map evidence (1833, 1834). Treecover appears to be progressively reduced to the crest of the hill from 1850 onwards leaving most of the Southern slope clear as it is today.



Figure 54 The Southern slope of Middle Hill above the drive alongside the river from the position of Hafod 10.

This represents a significant change in the treescape from Thomas Johnes' time. Most of the deciduous trees on the South-Western crest of the hill are beeches, but several oaks still stand at the edges of the cleared area, **Hafod 10** at the higher (crest) edge and **Hafod 11** at the lower edge by the driveway.

Unfortunately **Hafod 10** proved to be extremely difficult to core and was abandoned after eventually breaking the Haglof increment corer in the process. A small core of insufficient numbers of rings for dating purposes was extracted.

Hafod 11 fared better but did not produce a cross-dateable sample. It produced 279 rings (including 36 sapwood rings) which would indicate a date potentially around 1735 and possibly one of the trees depicted in Smith's painting. Again, Johnes and visitors would have regularly passed this specimen as a mature tree on approaching and leaving the mansion.



Figure 55: Hafod 10 being cored (Unsuccessfully).



Figure 56: Hafod 11-Note driveway behind, a mature tree in Johnes' time.

2. Mariamne's Garden

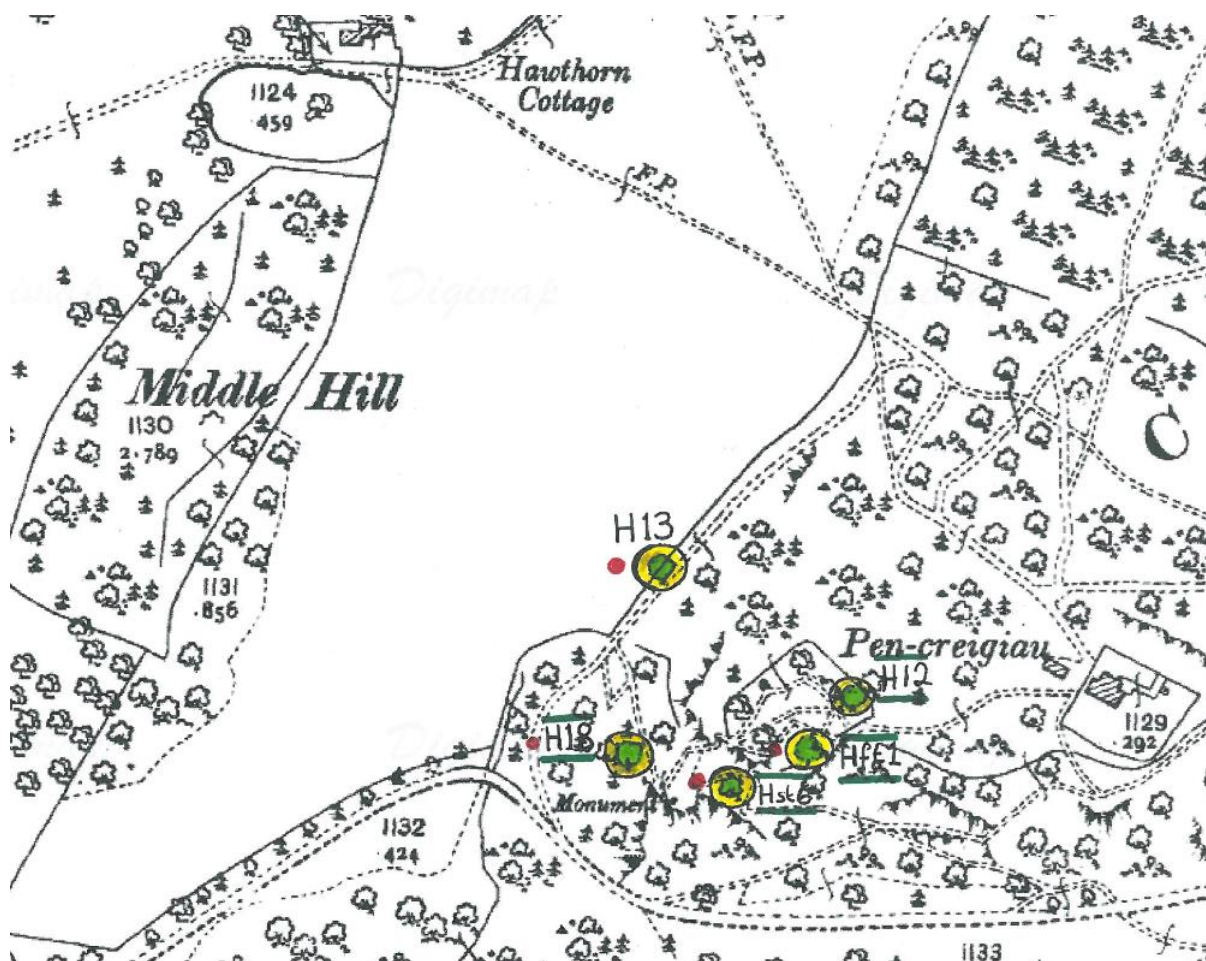


Figure 57: Trees sampled in the vicinity of Mariamne's Garden.

Mariamne Johnes was the only child of Thomas and Jane Johnes, an intelligent child, sadly in poor health and doted on by her parents who had a garden created for her at the top of this rocky outcrop where she was able to indulge her horticultural interests in unusual plants. Johnes explains in a letter of June 11th 1796 to George Cumberland that Dr Anderson:

“...has made, or has begun to make the most singular garden for my little Girl I ever saw. The Pensile gardens of Semiramis [Queen of Assyria] shall be but a farce to it”.



Figure 58: From Mariamne's garden looking South-West.

Here it is possible to see an example of a Hafod feature directly imitating the classical in the creation of a Hanging Garden and the roman *compagna* as depicted in images of the Grand Tour. At the entrance to the garden Johnes would later erect the monument to his late friend the Fourth Duke of Bedford.

Hafod 18 SN 76338 73181 Below the Bedford Monument



Figure 59: Hafod 18 with the Bedford Monument behind.

Hafod 18 is in a prominent position on the path to the monument. It is one of number of oaks which in some places cling precariously to the sides of the outcrop. This tree did not produce a cross dateable result but a ring count showed approximately 272 rings discernible plus possibly more to centre. This would give a date of around 1742 or more.

Hafod Fallen Tree 01 SN7632173111

On the steep South-facing rocky slope beneath the garden a recently fallen oak of medium girth was noted and sampled by chainsaw. This tree then produced an inner ring (cross-matchable) date of 1745-2013. The sample was taken at a point around 2.5 m. above root level, higher than usual (1.5m.) due to safety concerns. It may therefore have contained several more rings at its base which would have pushed the 1745 date further back.



Figure 60: Hafod FT01.



Figure 61: The Path leading up to the entrance to Mariamne's garden from the South-East with the Bedford Monument in sight. FT01 is closely to the right of the path at this point and Hafod Stump7a closely to the left of it.

Hafod Stump 07a SN7604473247

Hafod stump 7a is close to Hafod FT01 on the opposite side of the path. This stump produced a cross- dateable ring sequence of 1732-1851.



Figure 62: Hafod Stump 7a, note monument behind.



Figure 63 Sampling Hafod Stump 7a. Note path.

This tree, along with **Hafod 18** and **Hafod FT01** show that the garden was surrounded by mature trees at the time of its creation and these trees would have been known individually by Thomas Johnes and his daughter Mariamne as they approached it. These would have added to the aesthetic effect of the hanging garden and probably been left in place by Johnes because of this.

Hafod 12 SN 76415 73194



Figure 64: The restored garden of Mariamne, Hafod 12 to the far right.

Hafod 12 was noted because it is a living oak actually located within the garden rather than bounding the edges from outside. A matchable inner ring sequence was confirmed as 1823-2014 plus at least over ten years to centre. The garden was constructed in 1796 and it would seem odd to have planted an oak within it when others were visibly surrounding it from close outside. I suggest that this is a self-seeded tree originating from after Mariamne's death in 1811 (or slightly earlier as her health was failing) and indicates a neglect of the garden at that point. Margaret Martineau, visitor to Hafod in July 1824 laments:

“There is no owner to enjoy it...the estate being in the chancellor's hands” and the paths were just as they *“ought to be amidst such scenery, wild and natural, all the better I dare say for being a little out of order”* (Pitman, L. 2009 p.53).

Hafod 13 SN7631173211 Pendre Field Boundary



Figure 65: Hafod 13.

Hafod 13 is an impressive oak with a girth in excess of 3m. It sits North of Marianne's Garden and beneath it on the Pendre field boundary next to a ruined estate wall. This wall seems to deviate around the tree to enclose it on the garden side. This tree shows a complete cross-dateable ring sequence from

1733-2014 with ten or more years to centre making it the oldest proveable living tree in this study (and one of the very oldest in Ceredigion). The wall deviation may be explained by Johnes deliberately enclosing it and other trees (in the 1780's) away from the animals of his model farm at Pendre.



Figure 66 Hafod 13 and estate wall, note the rising ground on which mariamne's garden is built behind.

3.Coed Hafod

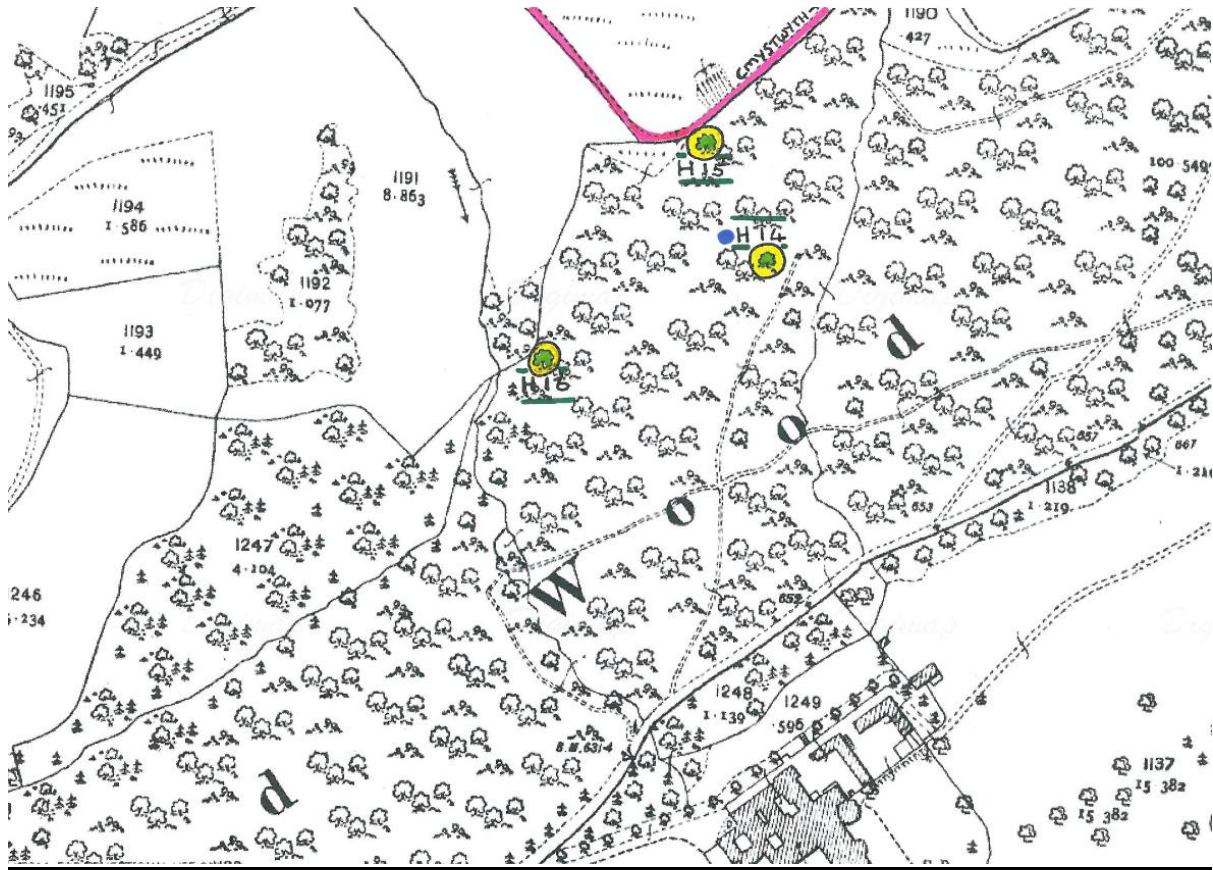


Figure 67: Trees sampled in the area of Coed Hafod.

Coed Hafod is the steep, wooded, South facing slope which forms an immediate backdrop to the Hafod Mansion in many surviving images. Except for a brief period after the Second World War it has been continuously wooded from before Thomas Johnes' era and photographic evidence shows that this consisted primarily of deciduous trees.

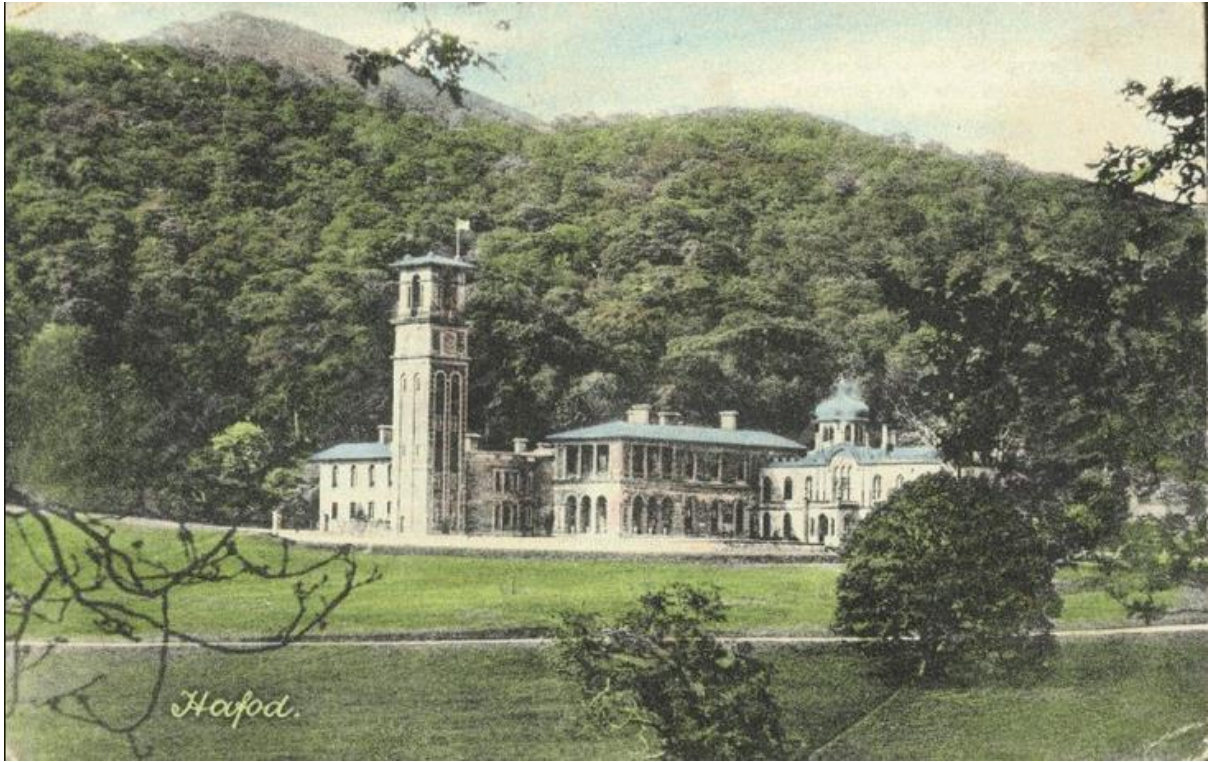


Figure 68: The Mansion with Coed Hafod behind, c.1907. Henry Hoghton's Italianate wing and campanile tower can be seen to dwarf Thomas Johnes' original house.



Figure 69: The Mansion c.1895 with Coed Hafod. The coniferous trees behind the house may have formed part of a two acre "Japanese Garden" created by Thomas Johnes.

Periodical felling must have occurred in Coed Hafod but this accelerated in the 1940's. W.G.Tarrant, the last owner to seriously attempt to invest in the estate and reside there, suffered sudden death in 1942. Tarrant too was experiencing financial difficulties and had begun a process of clear-felling and supplying timber for the war effort. An R.A.F. aerial photograph taken on May 28th 1947 shows the extent of felling in Coed Hafod:



Figure 70: 1947 Aerial Photograph showing the extent of felling in Coed Hafod. (Note that at this point the stump group were living trees).

The estate was sold in 1947 to a series of timber merchants and scrap dealers who asset stripped the estate and continued bulk felling operations. No replanting occurred until the acquisition of the estate by the forestry commission in 1950.

A colour photograph taken by a Mr Golothan in 1958 prior to the demolition of the Mansion later that year shows the extent of the newly planted forestry compartments visible in Coed Hafod and a closer examination shows possible surviving mature trees above the mansion:



Figure 71: The Golothan Photograph, 1958.



Figure 72: As near a comparison to the Golothan Photograph as plantation growth will allow (2014). Several trees close to the West Lawn have disappeared since 1958, however the large beech (centre) and Hafod 01 (foreground) are clearly recognisable.

Hafod 14 SN 75875 735331 Coed Hafod above Mansion



The enlarged extract shows a group of trees (top left hand corner) on the Cae Meirch boundary (including **Hafod 16**). Others are by the Cwmystwyth road in the area of the quarry, top right hand corner (**Hafod 15**). A single standing tree above an access track (**Hafod 14**) is indicated by a blue arrow.

Present day conditions on this slope are extremely difficult in the wake of recent machine extraction and after a good deal of searching it became obvious that a number of surviving trees on the photograph have since been felled and of the remainder most are ash or willow, however **Hafod 14** was located as a living tree.



Figure 73: Hafod 14

Why a single oak would be left standing after the bulk felling is unknown. Several conifers have fallen and landed on top of this tree which is of medium size and of healthy appearance. It appears in other photographs taken during the 1950s:



Figure 74 c.1952, Hafod 14 Is visible directly over the middle upper window of Johnes' house. (RCAHMW).

This tree produced an inner ring cross-dateable sequence of 1809 plus at least ten or more years to centre. This makes it very possibly a Thomas Johnes era tree. Its importance is that it shows some planting was taking place within the demesne, and close to the mansion at this point. As Coed Hafod was well wooded in that period it may represent replanting as part of a regular management cycle as it cannot form part of replanting after the 1808 bulk felling.



Figure 75: Hafod 14 visible as a single tree, middle upper right, 1951. Hafod Stump 01 may be visible right bottom.

Hafod 15 SN 75863 73606 Cwmystwyth Road Boundary

Hafod 15 is next to the main Cwmystwyth road and is visible on several demolition era photographs. This tree produced a cross-matchable inner ring date of 1859 plus ten or more years to centre:



Figure 76: Hafod 15

It is possible that this tree is a hedge survival, bounding the road as it does. However **Hafod 16** may indicate otherwise.

Hafod 16 SN 75771 73514 Caer Meirch Field Boundary

Hafod 16 is one of a group of trees visible on several photographs close to the estate wall at Cae Meirch. This is an area where timber extraction would be difficult:

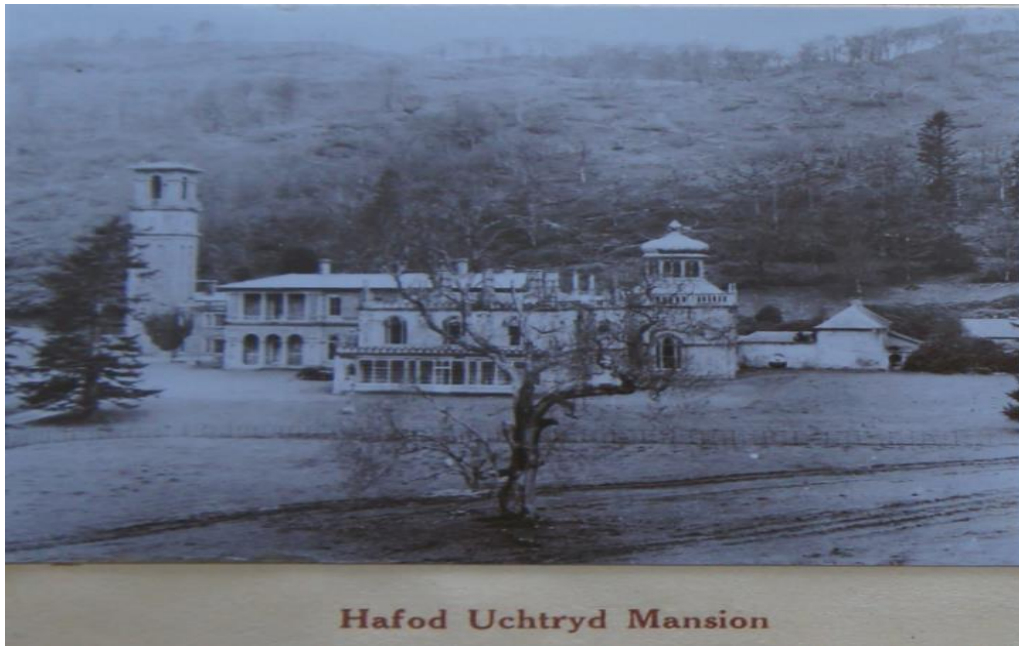


Figure 77: The Hafod estate sale catalogue of 1947 shows the cleared area of Coed Hafod. Hafod 16 is in the group of trees at the top of the slope directly above the domed octagonal library. (NLW)



Figure 78: Hafod 16, centre.



Figure 79 Close neighbours of Hafod 16 extend beyond the estate wall- potentially trees planted in the same period.

Hafod 16 did not produce a cross-dateable result but produced an estimated ring count of 165, suggesting a planting date around 1849. This when compared with **Hafod 15** (1859+>10years) could mean that both trees were planted by Henry Houghton, a wealthy Lancashire landowner (owner 1846-1855). Houghton is known for his construction of the large Italianate West wing of the Mansion and bell tower but few other details are known about his activities on the estate. It is possible that these survivors indicate a restocking of Coed Hafod in this period, perhaps because of timber utilised during the construction of the new wing of the house.

4. The Alpine Meadow (Cae Gwartheg)

Hafod 19 SN 75579 72539 Ty Coch



Figure 80: The Alpine Meadow relative to the Mansion, 1834.

Hafod 19 represents a speculative sampling close to another of Johnes' aesthetic additions, the Alpine Meadow (edged in blue on the 1834 estate map above, East of Ty Coch). This was an attempt to emulate Swiss upland husbandry and landscape aesthetics and was placed within a surround of trees. Planted with conifers during the nineteenth century, the meadow has recently (2014) been restored for grazing animals as Johnes intended. Felling operations restricted a full survey but **Hafod 19** was selected as a representative sample of several mature oaks close to the well preserved boundary wall at the Western extremity of the surrounding tree belt:

“The plantation grounds were all properly inclosed before any of the trees were planted. The greatest part of the plantations is fenced with a stone wall five feet high...” (To The Society of Arts 1800, Xviii, pp.81-82).



Figure 81: Hafod 19 By the estate wall.



Figure 82 Ty Coch from the 1870 sale catalogue. The blue dot represents the approximate position of Hafod 19. Note the Alpine Meadow now planted with coniferous trees, an island within the surrounding deciduous.

Hafod 19 cross-dated to 1816 plus ten or more years to centre. It is therefore very possibly a Thomas Johnes era tree planted as part of the scenic surrounding tree belt of the Alpine meadow.

Here is another evocation of a foreign landscape but, unlike Mariamne's garden, it suggests that Johnes deliberately planted some trees to surround it. Perhaps here we have an example of the principle of Ornament and Utility in action. Other mature oaks stand close by and further work is strongly recommended.

5. The Tyloge Plantation

Tyloge has been previously mentioned as an area of new purchase by Thomas Johnes. In 1846 William Bray of Caemeirch made a sworn statement that Tyloge had been purchased by Thomas Johnes the Younger "fifty or sixty years ago" from Mr Richard Crebar, making the purchase mid-1780s to mid-1790s, relatively early in Johnes' ownership of the estate.



Figure 83: The Tyloge parcel, in brown, 1846.

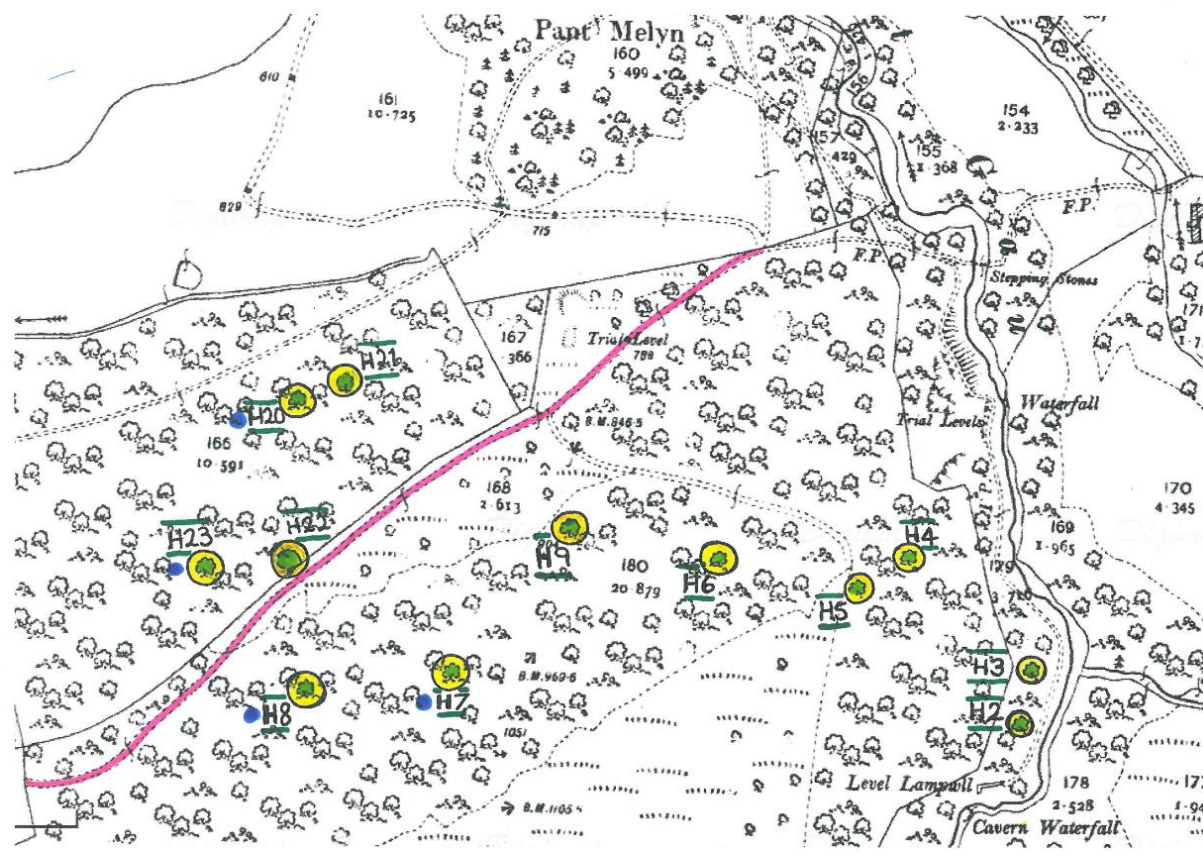


Figure 84 The area of the tyloge plantation showing the sampled trees. The Bwchgwallter track is shown in pink. The loop of paths around the area of Pant Melyn form part of The Gentleman's Walk.

The gorge of the Nant Gau on the Eastern boundary of the Tyloge parcel also contains the cavern cascade, a showpiece of the picturesque landscape of Hafod. This is indicated on the Cumberland map of 1796 with the accompanying walk along the gorge. These, completed prior to Cumberland's visit to Hafod in 1795, indicate that the land purchase was earlier. This pre-dates the bulk of Johnes' plantings (which totalled four million from Oct 1796 to April 1813). Within the Tyloge parcel successive maps show the presence of a large area of deciduous trees, further evidenced by aerial photographs:



Figure 85: Aerial photographs show a continuous area of deciduous trees within the area today. Nant Gau is to the right. (Google Maps).

The 1870 estate map and schedule shows this area as composed of two parcels split by the Bwchgwallter track and listed as woods, 942a (North, below the track) named Gallt Dyhanog and 936 (above the track) as Yrallt Dyhanog:

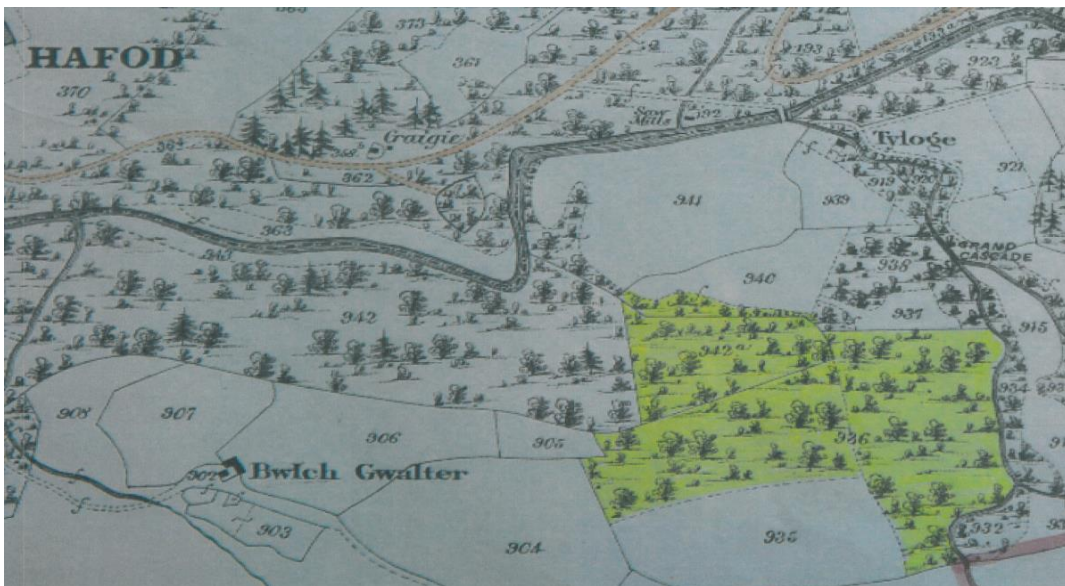


Figure 86: The 1870 estate map. The two areas referred to are highlighted in yellow.

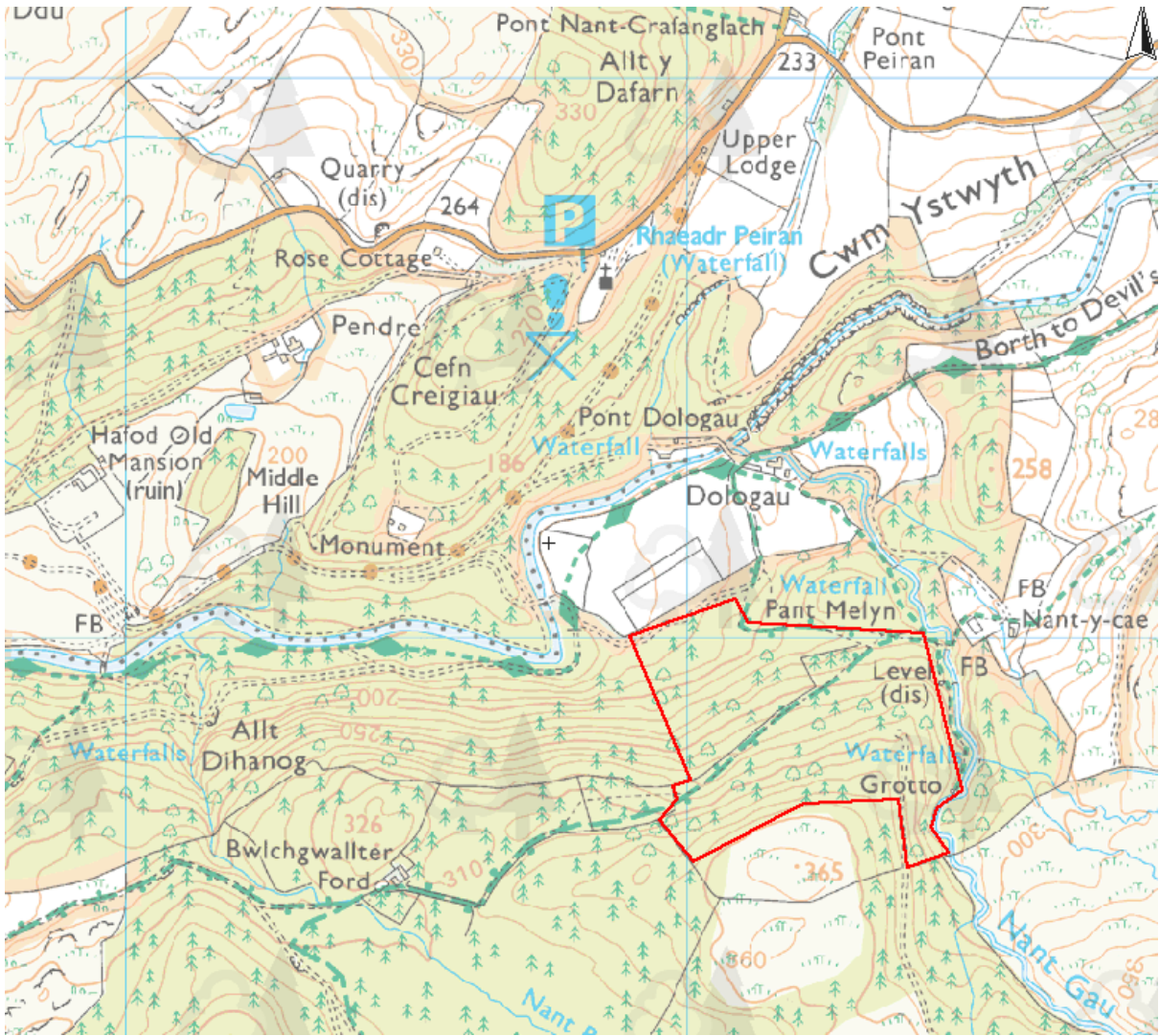


Figure 87 Modern O/S map indicating the area under investigation edged in red.

On the above modern O/S map the area under investigation is edged in red. Note the Bwlchgwallter track (in green) to Pant Melyn which splits the parcel. The “Grotto” is the Cavern Cascade, one of the most celebrated features of the Hafod landscape:



Figure 88: The Cavern Cascade.



Figure 89: After "Warwick Smith" (c.1795) visitors enter the Cavern Cascade. Note the deciduous tree cover.

Hafod 02 SN 77550 72781 Standing Dead Above the Cavern Cascade.

Hafod 02 is one of a number of oaks above the Western bank of the Nant Gau and the Cavern Cascade which have perished due to a poisonous conifer (Western Hemlock) being planted in amongst them. FC records indicate this was done in 1959. Over 30 oaks are visible which have been killed in this way. This tree did not cross-match but produced a ring count of 171. Comparison with Hafod 03 may help suggest a planting date.



Figure 90: Hafod 02

Hafod 03 SN 77401 72782 Standing Dead Above the Cavern Cascade.

Another tree killed by the Western Hemlock Hafod 03, yielded a cross-matchable date of 1847-1986 with over ten years to the centre and also contained a further ten rings of undateable sapwood indicating that death occurred in 1996. Assuming that no serious planting occurred during the Chancery period (1816-1834) then **Hafod 03** is possibly a Thomas Johnes era tree. This is further reinforced by the ring- count of **Hafod 02** above, (171 plus several missing rings) which if it also died around 1996 would have been present earlier than 1825, therefore possibly Johnes era too.



Figure 91 Hafod 03. Note other dead standing oaks behind.

Hafod 04 SN 77412 72816 Yrallt Dehanog

Hafod 04 is one of several trees which have (so far) survived the close proximity of Western Hemlock, 20m further up the slope from **Hafods 02** and **03**. This tree did not cross-match but yielded a ring count of 152. Unfortunately the core when retrieved was incomplete and due to a large amount of sap being lost by the tree it was decided not to attempt further coring. The only conclusion available therefore is that the tree was present and mature in at least 1862.



Figure 92: Hafod 04.

Hafod 05 SN 77412 72816 Yrallt Dehanog

Hafod 05 is situated by an estate wall at the top of the compartment containing the Western Hemlock which it has survived. This tree produced a cross-matchable inner ring date of 1844 plus ten or more years to centre. It therefore may be older than the Newcastle ownership period of 1834-46 as **Hafods 02** and **03** above, and possibly a Thomas Johnes planting.



Figure 93 Hafod 05. Note estate wall to right.

Hafod 06 SN 77411 72806. Yrallt Dehanog

Hafod 06 is situated approximately thirty metres West of **Hafod 5** close to the break in slope at the top of the parcel defined on the 1870 estate map. This tree yielded a cross-matchable inner date of 1855 with an estimation of at least ten years or more to centre. There is therefore a possibility that it might have been planted during the ownership of The Duke of Newcastle (1834-46).



Figure 94Hafod 06

The steepness of the ground is apparent from the above image- it proves difficult to traverse let alone consider extracting timber from.

“My plantations are generally made on such ground as I cannot plough, that my best ground may be reserved for grain or grass.”(Thomas Johnes to the Society of Arts, 11th September 1801).

Hafod 07 SN 77264 72823 Yrallt Dehanog West

Hafod 07 is in the central part of the parcel above the Bwchgwaller track. This parcel, defined as 936, Yrallt Dyhanog,(1870) appears to be split in two- the Eastern side being the slope towards the Nant Gau and the Cavern Cascade and the Western side being the North facing slope descending to the Bwchgwaller track. The following aerial photograph shows a continuous block of deciduous trees within this Western compartment, aerial measurements suggest an approximate coverage of four acres (1.6Ha.). **Hafod 07** is in the centre of this block.



Figure 95: Deciduous parcel aerial measurement.

Estimates on the ground (which is difficult to negotiate due to steepness and undergrowth) suggest that in excess of sixty mature living oaks and twenty or so mature beech trees (towards the Western extremity) stand within this compartment. This disregards the number of fallen oaks and the presence of self-regenerated juvenile trees which indicate that no regular management has taken place for some time:



Figure 96: Trees within the parcel.

Hafod 07 has produced a cross-matchable inner ring date of 1808 plus ten years or more to centre- indicating that it that it very possibly was planted by Thomas Johnes in the 1780's or 90's.



Figure 97: Hafod 07, Believed to be a Thomas Johnes era tree.

Hafod 08 SN 77322 72811 Yrallt Dehanog West

Hafod 8 is farther to the Western edge of the deciduous block, thirty metres from **Hafod 07**. It produced a cross-matchable inner ring date of 1813 plus ten or more years to centre. This brings it fully into the same range as **Hafod 07** and suggests that it too is a Thomas Johnes era tree. This leads to the suggestion that part of the Yrallt Dyhanog deciduous parcel is a substantial living portion of a Thomas Johnes era hardwood plantation of the 1790's.



Figure 98 Hafod 07.

Using **Hafod 07** as a North-West corner point and using tape measure and compass a square acre (4840 square yards) was measured:



Figure 99: Measureing the square acre, with difficulty. Again, note slope.

The number of fallen trees within undergrowth makes any density estimation difficult, but at least 34 could be seen to be present, living and dead. Measurements between trees were taken which indicate an average of 28 feet apart, closer than recommended in the works of Evelyn, Langley and Pontey.

Hafod 09 SN 77400 72955 Gallt Dehanog

Hafod 09 is close towards the Eastern extremity of the deciduous block. It produced an inner ring date (cross-matchable) of 1861 with a further estimate of five to ten rings to centre indicating that it was planted within the ownership of Henry Houghton (1846-55), as were **Hafods 15** and **16** in Coed Hafod. This further suggests that he engaged in tree-planting across the estate.



Figure 100 Hafod 09.

The 1833 estate map shows parts of this Eastern portion having few or no trees at all. It may be that the Western side was planted by Johnes with Newcastle and Houghton filling gaps by underplanting or extending the plantation. Cumberland (1796) mentions decayed oaks in the gorge of the Nant Gau. Perhaps the Eastern side, wooded on Johnes' purchase, was cleared or thinned post 1807 and replanted by later owners. Evans (1995 p.51) refers to Newcastle's woodward in January 1839 reporting extensive damage caused by a hurricane which had felled hundreds of trees- presumably this would have caused some replanting.



Figure 101 The 1833 Hitchcock map shows that tree cover was absent in the Eastern portion of what is now the deciduous belt (shown centre of above extract). This may have been replanted by Newcastle and Houghton as Hafod 06 and Hafod 09 may indicate.

Hafod 20 SN 77053 72960 The Gentleman's Walk near Pant Melyn.



Hafod 20 is located below the Bwlchgwallter track close to a loop of the Gentleman's Walk in the area of Pant Melyn to its North. In this area are a number of conjoined earth banks which give the appearance of a derelict pond.

This may relate to the name of Pant Melyn, (Mill Hollow). This tree did not cross-date but produced a sequence of 207 rings (of which 14 were sapwood) with several outer sapwood rings missing. This again is very possibly a Thomas Johnes era tree of the 1790's.

Hafod 21 SN 77051 72986 Pant Melyn Bank



Hafod 21 is situated 20m to the East of Hafod 20 directly on top of one of the suspected pond banks.

This tree did not cross-match and even ring counting from the core proved extremely problematic. It is therefore only possible to provide a basic estimate of 187-194 rings with a possibility of at least several more to centre. This does however show that the tree is of a similar age range to **Hafod 20**, its near neighbour and therefore possibly a Thomas Johnes era tree.

These trees may indicate that the plantation of Tyloge which Johnes established after his acquisition of the parcel extended fully down the slope to the level ground of the pastures alongside the Ystwyth. The mill or habitation feature was redundant when this was established as **Hafod 21**, post dating the bank, shows.

The establishment of the Gentlemans Walk through what would have been a young oak plantation again shows the Hafod working aesthetic of Beauty and Utility in practice.

Hafod 22 SN 77143 72866 Bwchgwaller-Pant Melyn Track Bank

Hafod 22 was selected to try to reveal something of the date of the boundary bank which runs along the North side of the Bwchgwaller- Pant Melyn track. Jennie Macve (personal communication) has postulated that it is an older feature than the stone estate walls in the area as it once formed part of the Hafod/Tylogue and Gwernpedyll boundary. This tree, growing out of the bank, was suspected to be either evidence of Thomas Johnes planting over existing features or a hedge survivor put in against animals being driven from the sheepwalk above Bwchgwaller. Johnes himself indicates that apart from stone walls he utilised “turf” fences, also five feet high, sometimes with willows and other species such as elder planted on top.



Figure 102Hafod 22 growing out of the boundary bank.

Hafod 22 produced a cross-matching inner ring date (**to centre**) of 1845. This places this tree firmly in the period of ownership of the Duke of Newcastle. He as well as Johnes (Evans 1995, p.50) spent a considerable amount of energy on fencing and hedging so it is possible that it is a hedge survival or a self-seeded tree from oaks in the locality.



Figure 103: Another view of the bank close to Hafod 22.

Hafod 23 SN 77115 72851 Gallt Dehanog

It was decided to sample one of several large oaks from a position around twenty metres below the Bwlchgwaller track bank. This was to see whether the possibility indicated by **Hafods 20** and **21** that the Tyloge plantation extended all the way down to Tyloge field, the meadow by the Ystwyth, could be further evidenced. This again is in the parcel of Gallt Dyhanog relatively (30m) close to **Hafod 08** to its South-East.

Hafod 23 yielded a cross-dateable inner ring date of 1819 with over ten years to centre, again making it very probably a Johnes era tree, part of the same plantation as **Hafods 07** and **08** and showing that the plantation stood astride the Bwlchgwaller track and extended down the slope towards the Ystwyth.



Figure 104: Hafod 23.

Dendrochronology Summary

From the nineteen cross-matching trees the following table has been produced showing the span of ring sequences between them. The yellow areas represent sapwood rings:

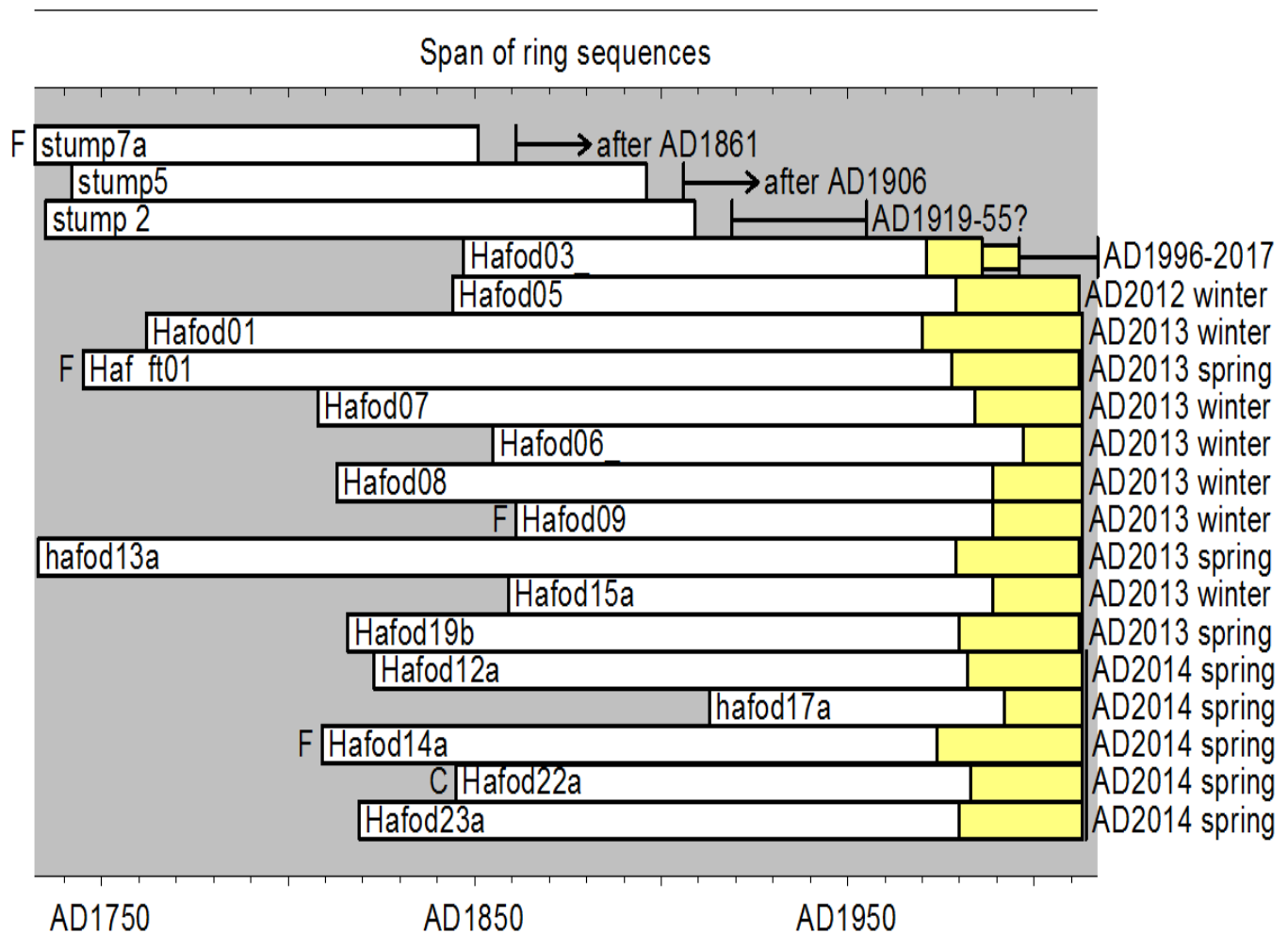


Figure 105: Span of ring sequences produced from the cross matching trees.

Triangular YR-CROS73 matrix by sr047 t-values over 3.50 started 16:19:50 16/6/2015

\ = overlap < 15 years

- = t-values less than 3.50

* = empty triangle

FileNames	-	-	FN0.0	FN0.1	FN0.2	FN0.3	FN0.4	FN0.5	FN0.6	FN0.7	FN0.8	FN0.9	FN0
-	start	dates	AD1733	AD1808	AD1745	AD1732	AD1762	AD1847	AD1844	AD1855	AD1813	AD1861	AD1
-	dates	end	AD2012	AD2013	AD2012	AD1851	AD2013	AD1986	AD2012	AD2013	AD2013	AD2013	AD2
hafod13a	AD1733	AD2012	*	-	-	-	-	-	-	3.59	-	-	3.9
FN0.1	AD1808	AD2013	*	*	-	-	-	3.80	7.11	7.67	8.72	7.18	4.1
Haf_ft01c	AD1745	AD2012	*	*	*	-	3.86	5.54	6.05	4.62	4.15	3.70	-
Haf_stump7a	AD1732	AD1851	*	*	*	*	3.60	\	\	\	-	\	-
Hafod01_final	AD1762	AD2013	*	*	*	*	*	-	-	-	-	-	-
Hafod03_1	AD1847	AD1986	*	*	*	*	*	*	7.26	6.76	4.35	5.81	6.4
Hafod05_1	AD1844	AD2012	*	*	*	*	*	*	*	7.00	4.48	7.99	4.4
Hafod06_1	AD1855	AD2013	*	*	*	*	*	*	*	*	6.87	9.25	-
Hafod08_1	AD1813	AD2013	*	*	*	*	*	*	*	*	*	6.47	-
Hafod09_1	AD1861	AD2013	*	*	*	*	*	*	*	*	*	*	3.6
Hafod12a	AD1823	AD2013	*	*	*	*	*	*	*	*	*	*	*
Hafod14a	AD1809	AD2013	*	*	*	*	*	*	*	*	*	*	*
Hafod15a	AD1859	AD2013	*	*	*	*	*	*	*	*	*	*	*
hafod17a	AD1913	AD2013	*	*	*	*	*	*	*	*	*	*	*
Hafod19b	AD1816	AD2012	*	*	*	*	*	*	*	*	*	*	*
Hafod22a	AD1845	AD2013	*	*	*	*	*	*	*	*	*	*	*
Hafod23a	AD1819	AD2013	*	*	*	*	*	*	*	*	*	*	*
Hafodstump2	AD1735	AD1909	*	*	*	*	*	*	*	*	*	*	*
Hafodstump5	AD1742	AD1896	*	*	*	*	*	*	*	*	*	*	*

n = 162 min t = -1.86 max t = 9.37 mean t = 3.97 s.d. = 2.03

Completed 16:20:01 16/6/2015

Figure 106: Comparison of t-values.

To each of these trees it was possible to assign a t- value, derived from the original CROS algorithm (Baillie & Pilcher 1973). Essentially this shows how well trees match against each other in terms of ring-widths for each year within a sequence. t- values of 3.5 are notable and over 5.0 should be considered a good match. The matrix above shows an example of several of the nineteen Hafod trees compared with each other. Note that **Hafod 03** shows a high t- value against other trees whereas some (**Hafod 01**) do not correlate. The reasons for major differences can include slope and aspect as well as the age of trees. It was noted that **Hafod 13**, the oldest living tree in the study, did not correlate well but this may have been affected by losing branches which spurred re-growth, between 1948 and 1955 for example.

From the t- values generated it was possible to create an average mean from the 19 trees to compare with other woodlands in Britain:

```

Path U:\dendro\dendato1dF\Means\MODERN\ENG_MIDE
BTSMEAN          AD1747  AD1956  4.77
SHERWD2          AD1426  AD1981  6.01
SHERWOOD         AD1481  AD1974  5.30

Path U:\dendro\dendato1dF\Means\MODERN\ENG_MIDW
CANNOCK          AD1639  AD1979  5.42
LUDLOW           AD1825  AD1978  5.02

Path U:\dendro\dendato1dF\Means\MODERN\ENG_NE
HELESYSD         AD1753  AD1980  4.93
MONKWOOD         AD1748  AD1980  8.38

Path U:\dendro\dendato1dF\Means\MODERN\ENG_NW
LEVENSPK         AD1717  AD1993  4.32
MITERDLE         AD1870  AD1993  5.01
SCORTON          AD1813  AD1978  5.44

Path U:\dendro\dendato1dF\Means\MODERN\ENG_SE
HAMPMOD          AD1635  AD1972  3.60
WINCHSTR         AD1635  AD1972  3.78

Path U:\dendro\dendato1dF\Means\MODERN\ENG_SW
BLACKTOR         AD1898  AD1993  3.60
CLOVELLY         AD1750  AD1981  3.80
DEAN             AD1672  AD1981  4.54
SAVENAKE         AD1651  AD1982  5.39

Path U:\dendro\dendato1dF\Means\MODERN\ENG_YORK
YORKMOD          AD1710  AD1972  4.62
YORKUNIV         AD1777  AD1976  4.00

Path U:\dendro\dendato1dF\Means\MODERN\IRELAND
IRE_BREE         AD1834  AD1988  6.20
IRE_COOL         AD1708  AD1983  5.73
IRE_ROST         AD1750  AD1975  4.58
IRE_SAIN         AD1776  AD1990  4.17
IRE_SHAN         AD1649  AD1983  5.72

Path U:\dendro\dendato1dF\Means\MODERN\SCOTLAND
SC_LLOMO         AD1844  AD1989  4.76
SC_NCADZ         AD1444  AD1984  5.36
SC_NGLEN         AD1798  AD1978  5.92
SC_NLOCK         AD1571  AD1975  5.44
SC_NRAEH         AD1824  AD1975  4.45
SCOT_CAD         AD1444  AD1984  5.38
SCOT_GLE         AD1798  AD1978  5.71
SCOT_LOC         AD1571  AD1975  5.16
SCOT_RAE         AD1824  AD1975  4.55

Path U:\dendro\dendato1dF\Means\MODERN\SCOTLAND\New Folder

Path U:\dendro\dendato1dF\Means\MODERN\WALES
MAENTWRG         AD1710  AD1974  7.92

```

Figure 107: Hafod 19 Tree Mean compared to other woodland tree means in different parts of Britain

These are interesting results. The Hafod trees do not match well against woods at Llanerchaeron, Ceredigion or Dinefwr Park, Carmarthenshire (not shown) but do show much higher values with upland sites in geographically distant places such as Monkwood (Northumbria, 8.38) or Maentwrog in Snowdonia (7.92). Dendrochronologists such as Bridge (2000) and Pilcher & Gray (1982) have observed that oaks growing on similar soils or slopes will often correlate higher than geographically proximate sites. This again suggests future work .

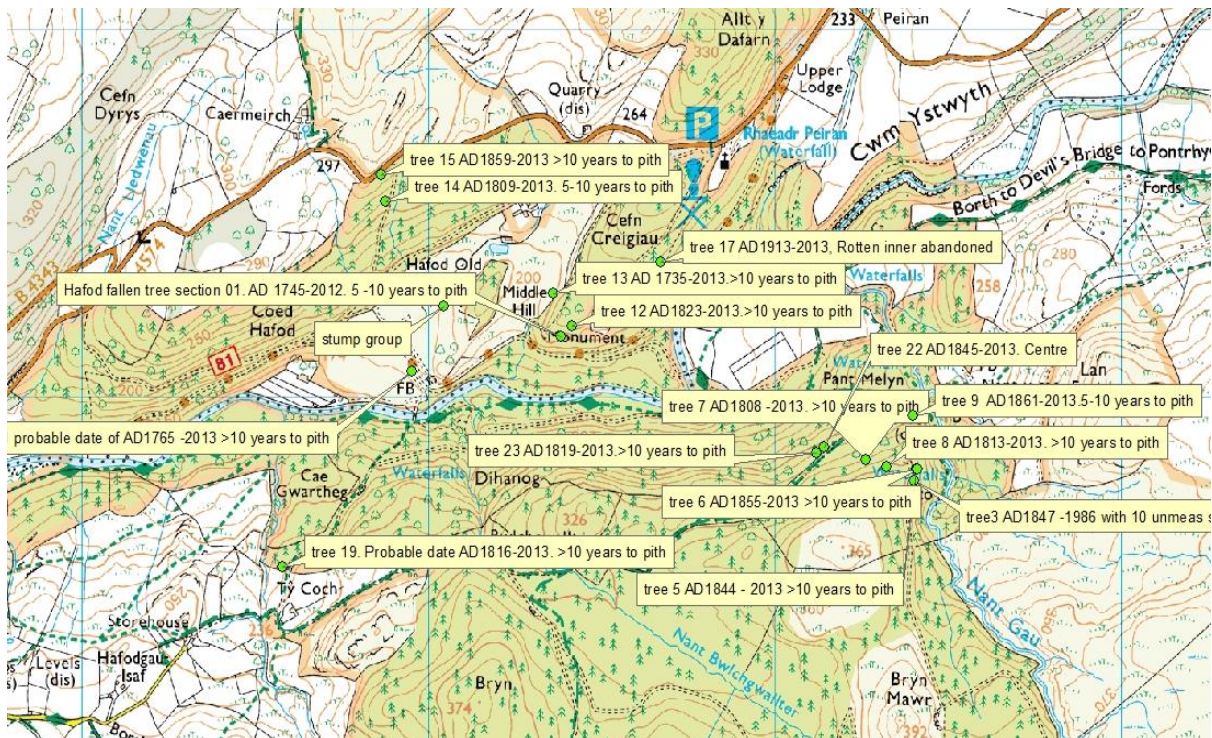


Figure 108 The 19 cross-matched trees shown upon a modern O/S map layer across the estate..

Dendrochronology offers absolute dating but the method of coring, applicable to 21 of the 28 samples can be problematic. In only one tree (**Hafod 22**) was centre of pith achieved. This has necessitated estimates of the distance to the pith from the retrieved core being expressed in terms of additional rings, in one case this was a close 5-10 (**Hafod 09**), in the others ten or more to centre. This was somewhat offset by visual observation of the curvature of the rings which lead to the dating possibilities expressed above and below.

Summary and Conclusions

In the results below I include trees which did not successfully cross-date but produced indicative ring-counts allowing for qualified age estimates. In terms of landscape time-slice reconstruction these are obviously evidential and therefore valid. Only further testing may reveal absolute dates but on the balance of probabilities the following three part summary and conclusion is offered:

1. Trees Existing in the Landscape as Mature Specimens Before the Ownership of Thomas Johnes (1780-1816):

Hafod 01 Cross-matched	Mansion Drive	1762 plus over ten years to centre- (conservative estimate)
Hafod Stump 02 Cross-matched	Behind Mansion (Ladies Walk)	1735
Hafod Stump 05 Cross-matched	Behind Mansion (Ladies Walk)	1742 Centre missing- more rings probably present
Hafod 11	Middle Hill (Drive)	1735 Estimate based upon a count of 279 rings (36 sapwood)
Hafod 18	Mariamne's Garden Below the Bedford Monument	1742 Estimate based upon a count of 272 discernible rings, possibly several more to centre
Hafod 13 Cross-matched	Pendre Field Boundary below Mariamne's Garden	1733 plus over ten years to centre
Hafod Fallen Tree 01	Mariamne's Garden	1745. Possibility of more rings at base
Hafod Stump 07a	Mariamne's Garden	1732

These trees reinforce the view that Hafod was a well wooded landscape at the time of Thomas Johnes' ownership.

They show that he included existing trees in the construction of his picturesque landscape, certainly in relationship to features such as Mariamne’s Garden and the Bedford Monument. He made a deliberate choice to include them within the surroundings and views of the new Mansion and its approaches and set out scenic walks in respect of them.

An unexpected result is that these show a high incidence of being early to mid-eighteenth century. This may indicate a significant re-stocking of the estate in this period, possibly related to the acquisition of the estate by Thomas Johnes of Llanfair Clydogau in 1704 or his brother Thomas Johnes (grandfather of Thomas Johnes of Hafod) who inherited the estate in 1733. This may have been in response to rising timber and charcoal prices and a dramatic increase in mining activity at Cwmystwyth from at least 1731 (Morgan 2005, p.178).

2. Trees Believed to be Planted during the Period of Ownership of Thomas Johnes 1780-1816.

Hafod 02	Standing Dead above the Cavern Cascade	Pre 1825, based on ring count of 171 and assumed death in 1996 as H03, several rings missing
Hafod 03 Cross-matched	Standing Dead above the Cavern Cascade	1847 plus over ten years to centre, death 1996
Hafod 05 Cross-matched	Yrallt Dehanog	1844 plus over ten years to centre. Pre-Newcastle.
Hafod 07 Cross-matched	Yrallt Dehanog West	1808 plus over ten years to centre
Hafod 08 Cross-matched	Yrallt Dehanog West	1813 plus over ten years to centre
Hafod 12 Cross-matched	Mariamne’s Garden	1823 plus over ten years to centre, possibly self-seeded
Hafod 14 Cross-matched	Coed Hafod	1809 plus over ten years to centre

Hafod 19 Cross-matched	The Alpine Meadow	1816 plus over ten years to centre
Hafod 20	The Gentlemans Walk, near Pant Melyn	Pre 1807 based upon a ring count of 207 and several sapwood rings missing
Hafod 21	Pant Melyn Bank	Pre 1820 based upon an estimate of 187-194 rings, several missing
Hafod 23 Cross-matched	Gallt Dehanog	1819 plus ten or more years to centre
Hafod Stump 01 (Sycamore)	Ladies Walk Behind Mansion	Pre-1840 based upon assumed felling date of 1950, ring count of 109 and centre missing

The Primary aim of this study has been to ascertain the existence of trees which may be part of the five million or so planted by Thomas Johnes. On the balance of the evidence above I submit that this aim has been achieved, proving Linnards' 1970 assertion incorrect.

Importantly this study has located the substantial surviving elements of a Thomas Johnes oak plantation which has much potential for further investigation. This is within land (Tyloge) purchased by Johnes for the purposes of afforestation.

Johnes' addition of scenic walks here shows the Hafod working ethic of Ornament and Utility within the aesthetics of the picturesque sublime, such as on the approach to the Cavern Cascade. Trees such as **Hafod 19** show planting to evoke foreign (alpine) scenery. Other trees may indicate replacement stock within the demesne (**Hafod 14**), possibly as part of rotational management practice. **Hafod Stump 01** suggests the addition of trees to existing woodland for practical and aesthetic purposes and these may, such as **Hafod 12**, indicate a specific occurrence in the history of the estate.

3. Trees from a later time period than the ownership of Thomas Johnes.

Hafod 06 Cross-matched	Yrallt Dehanog	1855 plus ten or more years to centre (Newcastle)
Hafod 09 Cross-matched	Gallt Dehanog	1861 plus five to ten years to centre (Hoghton)
Hafod 15 Cross-matched	Coed Hafod, Cmystwyth Road	1859 plus ten or more years to centre (Hoghton)
Hafod 16	Coed Hafod, Cae Mairch Boundary	1849 -Based on ring count of 165 (Hoghton)
Hafod 22 Cross-matched	Bwchgwaller Track Bank	1845

This study has also indicated the existence of trees from later ownership periods such as The Duke of Newcastle and Henry Hoghton and has shown that the latter engaged in some tree planting, a fact hitherto unknown.

The secondary aim of this study was to gain knowledge of the characteristics of the Hafod woodland heritage with a view towards future conservation. **None of the above trees** up to the point of this survey had tree preservation orders in place upon them and several are at risk from close machinery intensive forestry practices by sub-contractors to NRW (**Hafod 14** is a case in point). Others (**Hafod 02** and **04**) have been killed by the reckless planting of Western Hemlock. The Hafod Trust is currently working with NRW to produce a new Hafod Forest Design Plan which will take on board some of the findings of this study to protect the living examples of the eighteenth and nineteenth century woodland heritage at Hafod.

The Hafod treescape still contains much to be revealed about the historical woodlands of Wales from perspectives of scientific dendrochronology, landscape history and archaeology. A study such as this can only hope to scratch the surface, however I believe that it has shown an important potential.

Fleming (2006 p.124) says:

“In our practice we should be observing and absorbing many things, making connections between some of them and not others, never being quite sure of the

limits of observation and deduction. We have to work on the frontier zone of objectivity and subjectivity... ”

In this study I have attempted to place the treescape of Thomas Johnes' Hafod into a more considered context than other writers have thus far engaged with. This has involved a discussion of the practical aspects of Johnes' work alongside intangibles such as aesthetics which has driven an archival research agenda towards the testing of physical targets through the scientific method of dendrochronology. This has provided a proofing tool of varying effectiveness.

As pointed out this is an unusual application for the latter, if not in some respects unique, taking dendrochronology into a newer realm of historical landscape reconstruction. Baillie, highlighting problems, says (1995 p.49):

“In the case of dendrochronology, which holds out the ‘carrot’ of extreme accuracy on the one hand, there is the ‘stick’ of its highly limited applicability on the other.”

I hope that this study has indicated a further field of applicability, but this hybrid approach requires an academic discourse to fully effect a critique of it and to thrash out the guiding principles of what “targeted dendrochronology” in the sense of historical treescape reconstruction means. This is perhaps the most difficult area of suggested future work, but also perhaps the most promising.

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Figure 109: The Tyloge Plantation above the Bwchgwaller Track.

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