Feasibility study of commercial Rhododendron foliage collection in the Beddgelert area

Report for the Beddgelert Rhododendron Management Group

July 2003

Astudiaeth ddichonoldeb ar gasglu tyfiant Rhododendron yn fasnachol yn ardal Beddgelert

Adroddiad ar gyfer Grŵp Rheolaeth Rhododendron Beddgelert

Gorffennaf 2003

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Crynodeb gweithredu

Mae sbrigau gwyrdd rhododendron yn cael eu defnyddio gan werthwyr blodau yn bennaf fel cefndir i drefniadau blodau. Ar hyn o bryd mae o leiaf bedwar o gwmnïau cynaeafu deiliant ym Mhrydain ac Iwerddon a mwy yn Ffrainc a Gwlad Belg. Nid oes unrhyw gwmnïau'n gweithredu yng Nghymru ar hyn o bryd, ond yn ystod yr astudiaeth bresennol dangosodd tri chwmni ddiddordeb mewn defnyddio deiliant rhododendron o Ogledd Cymru.

Yn yr astudiaeth hon ceir manylion am fentrau llwyddiannus gyda deiliant rhododendron ac asesiad p'run a yw'n ymarferol cael menter debyg yn ardal Beddgelert ai peidio. Fe'i comisiynwyd gan Grŵp Rheolaeth Rhododendron Beddgelert fel dilyniant i'r adroddiad blaenorol ar y ffyrdd posibl y gellid defnyddio rhododendron (Wong *et al* 2002).

Cyfwelwyd pedair menter cynaeafu deiliant ac archwiliwyd rhai o'u safleoedd cynaeafu. Roedd y mentrau'n cael eu cynnal mewn amrywiaeth eang o wahanol ffyrdd, yn arbennig o ran y ffordd y cyflogid llafurwyr ac, i raddau llai, y math o fannau roedd y rhododendron yn cael eu casglu ohonynt.

Mae llawer o'r safleoedd sy'n cael eu cynaeafu yn helaeth (> 250 ha). Gan amlaf maent mewn planhigfeydd coniffer, weithiau mewn safleoedd agored, ond byth bron o goetiroedd dail llydan. Mae'n rhaid i'r fynedfa at safleoedd fod yn dda o ran ffyrdd a thirwedd a safleoedd gwastad sydd orau. Fel rheol ceir contractau â pherchenogion mawr, unigol, yn cynnwys coedwigoedd gwladol a phreifat. Caiff y coesynnau eu casglu o blanhigion aeddfed ac wedi eu tocio, a'r hyn sydd orau yw ail-dyfiant yn tyfu o stympiau mewn safleoedd cysgodol. Ni fydd cynaeafu deiliant ynddo ei hun yn rheoli rhododendronau mewn unrhyw ffordd sylweddol. Fodd bynnag, gallai torri'r llwyni i'r ddaear a chynaeafu'r aildyfiant o dan y drefn reoli iawn gyfyngu'r planhigyn rhag ymledu ymhellach drwy ei rwystro rhag blodeuo.

Ym Mai a Mehefin 2003 gwnaed arolwg ar droed yn ardal Beddgelert o rhododendron y gellid eu cynaeafu, gan ddefnyddio arolwg cynharach fel arweiniad (SNP 1986). Mapiwyd blociau o rhododendron trwchus mwy na 0.125 ha a mesurwyd y llecynnau. I gyd nodwyd 174 o bolygonau neu lecynnau'n cynnwys rhododendron. Cafodd pob polygon ei godio i nodi gwahanol nodweddion y rhododendron (dwysedd y llwyni yr hectar yn fras a p'run a oeddent yn tyfu mewn safleoedd cysgodol neu agored), pa mor serth oedd y tirwedd a hwylustod mynediad o ran gweithgareddau cynaeafu.

O gyfanswm o 476 hectar o rhododendron a nodwyd, dim ond 105 hectar a ystyrid yn ddigon hygyrch a digon trwchus ar gyfer cynaeafu ymarferol. Amcangyfrif bras o'r deiliant y gellid ei gynhyrchu'n flynyddol oedd tua 0.2 – 0.4 miliwn o goesynnau. I wneud y gwaith byddai angen 2-5 o gasglwyr a threfnydd warws.

Mae'r swm cymharol fychan hwn o rhododendron y gellid ei gynaeafu yn ardal Beddgelert yn golygu ei bod yn annhebygol y gallai menter ar gyfer yr ardal hon yn unig fod yn ymarferol. Fodd bynnag, gall cynnwys ardaloedd eraill cyfagos gynyddu'r tebygolrwydd o lwyddiant. Mae'n ymddangos bod marchnad sefydlog i ddeiliant rhododendron a gall fod yn broffidiol fel rhan o fusnes mwy ac amrywiol, ac mae cyfle i ddatblygu menter o'r fath yng Ngogledd Cymru. Gellid gwneud hyn naill ai ar delerau hawl gwerthu (*franchise)* ag un o'r cwmnïau mwy sy'n bodoli eisoes, neu fel menter fasnachol neu gymdeithasol newydd mewn ardal ehangach, e.e. Parc Cenedlaethol Eryri, Gwynedd neu Ogledd Cymru. Y brif her wrth sefydlu menter o'r fath yw trefnu contractau i gynaeafu planhigion ar dir nifer o wahanol berchenogion, o goedwigoedd gwladol i ffermwyr bychain. Mae cael gafael ar weithwyr tymhorol hefyd yn fater y byddai angen ei ystyried yn ofalus.

Executive summary

Green shoots of rhododendron are used by florists mainly as a backdrop to flower arrangements. At present there are at least four foliage harvesting enterprises in Britain and Ireland and at more in France and Belgium. At present there are no companies operating in Wales but during the present study three companies expressed interest in exploiting rhododendron from north Wales.

This study presents a profile of successful rhododendron foliage enterprises and an assessment of whether there is scope for a similar enterprise in the Beddgelert area. It was commissioned by the BRMG as a follow-up to the previous report on potential uses for rhododendron (Wong *et al* 2002).

Four foliage harvesting enterprises were interviewed and some of their harvesting sites inspected. Enterprises were run in a wide variety of ways, particularly in regards to the employment of labourers, and to a lesser extent, the types of area from which rhododendron was collected.

Many of the sites being harvested are extensive (> 250 ha), most often in conifer plantations, sometimes from open sites, hardly ever from broadleaved woodland. Access to sites has to be good in terms of roads and terrain with level sites being preferred. Contracts are usually with large, single ownerships including state and private forests. The stems are picked from mature and coppiced plants with a preference for re-growth from cut stumps growing in sheltered sites. Foliage harvesting of itself will not control rhododendron in any significant way. However, cutting the bushes to the ground and harvesting regrowth under the right management regime could limit the further spread of the plant by restricting flowering.

A survey of harvestable rhododendron in the Beddgelert area was carried out on foot in May and June 2003, using an earlier survey for guidance (SNP 1986). Blocks of dense rhododendron larger than 0.125 ha were mapped and areas measured. In all 174 polygons or patches containing rhododendron were identified. Each polygon was coded to indicate various features of the rhododendron (approx. density of bushes per hectare and whether growing in shaded or open sites), the steepness of the terrain, and the ease of access in regards to a harvesting operation.

Of a total area of 476 hectares of rhododendron identified, only 105 hectares was finally considered easily accessible and growing at a suitable density for practical harvesting. A crude estimate of the quantities of foliage that could be produced was approximately 0.2 - 0.4 million stems annually, requiring around 2-5 pickers plus a warehouse organiser.

The rather small amount of harvestable rhododendron in the Beddgelert area means that an enterprise for this area alone is unlikely to be viable, however, including other nearby areas could increase the likelihood of success. Markets for rhododendron foliage are apparently stable and can be profitable as part of a larger, diverse business and there is an opportunity to develop such an enterprise in North Wales. This could be done either as a franchise with one of the larger existing companies, as a new commercial or social enterprise covering a larger area, e.g. Snowdonia National Park, Gwynedd or North Wales. The main challenge with establishing such an enterprise is the organisation of contracts to harvest over a number of quite different ownerships from state forest to small farmers. Sourcing seasonal labour is also a major constraint and would need to be carefully considered.

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Abbreviations

BRMG	Beddgelert Rhododendron Management Group
CCW	Countryside Council for Wales
CT	Coillte Teoranta (Irish Forestry Company)
DEFRA	Department for Food and Rural Affairs
FE	Forest Enterprise
ITE	Institute of Terrestrial Ecology (now CEH – Centre for Ecology and Hydrology)
NT	National Trust
NVQ	National Vocational Qualification
SNP	Snowdonia National Park
2WD	Two-wheel drive
4WD	Four-wheel drive

1 Background

Green shoots of *Rhododendron ponticum* are used by florists as a backdrop to flower arrangements and made into wreaths. The foliage is particularly liked because it is long lasting (up to two weeks without water) and the flowers are also used to a lesser extent in commercial flower arrangements. At present there are at least four foliage harvesting enterprises in Britain and Ireland and at least another in France. At present there are no companies operating in Wales, but during a previous study for the BRMG, of potential commercial uses of rhododendron (Wong *et al* 2002) some of these companies were contacted, and two expressed interest in exploiting rhododendron from north Wales. However, before considering how such an enterprise could be established in the area it is necessary to know the scale and type of operations involved. Although at first sight the rhododendron resource in the Beddgelert area would appear large, initial investigations into harvesting for foliage suggested that more information was needed to assess whether such a commercial operation would be viable.

This study presents a profile of successful rhododendron foliage enterprises and an assessment of whether there is scope for a similar enterprise in the Beddgelert area. It was commissioned by the BRMG as a follow-up to the previous report on potential uses for rhododendron (Wong *et al* 2002).

2 Description of rhododendron enterprises in Britain and Ireland

This section describes the characteristics of current commercial rhododendron foliage enterprises in Britain and Ireland. It is based on interviews with four entrepreneurs and visits to a number of collection sites.

An important point to note is that rhododendron foliage collection represents only a part of the income for the businesses interviewed. Everyone interviewed had other products they sold. Some specialised in foliage and also grew as well as collected many species of foliage plants. Others collect and trade a range of products from forested environments such as moss, fungi and herbs. It was not possible to ascertain the level of income from rhododendron trade but it probably forms a significant proportion of the time (since the collecting season is five to nine months long), if not income of the businesses. One company obtains as much as 40% of their income from rhododendron and finds it more profitable than Christmas trees.

2.1 Collection sites

Four foliage harvesting companies were interviewed, and site visits were made to three harvesting areas (two in Ireland and one in Scotland). The harvesting companies varied greatly in the scale of enterprise, methods of operating and the type of foliage products sold (Table 1). All harvesting took place in conifer plantations or on open land with easy access from a motorable road or track. No collection was taking place from broadleaved woodlands. The majority of collection sites are large (greater than 250 ha) and under single owners, either state owned forest land or private estates.

Most collectors work under contracts with the landowners. These are often for a minimum of one year and often for several years. Contract fees vary considerably from token payments (bottle of whisky), cash (£200 - £3000 for a large block) or in exchange for management activities.

The pickers consider rhododendron foliage growing under trees is better for several reasons:

a) the stems growing in shade are straighter and longer,

b) the leaves are darker green (which is preferred by the buyers),

c) the leaves are healthier i.e. they have less 'spotting' and insect attack,

d) there is less wind damage.

The forested sites also provide shelter from the worst of the weather which is important for the pickers when most of the harvesting takes places through the winter months. However, one of the buyers technical staff considered foliage grown beneath trees to suffer more indirect damage from aphids, than foliage from sheltered open sites.

Table 1: Details of British and Irish rhododendron harvesting sites

Operating area	Type of land	Type of product	Annual production (million stems)	Labourers employed
15 sites, at least 1 site of 250ha. Total approx. 1000 ha?	Mainly flat, forested, both state & private owners	Straight 60cm stems (up to 20cm clear of leaves). Also 50 cm flower stems	0.8 foliage 0.04 flower	25-30 locals
1 site is 1200 ha other sites not known	Mainly flat, lower slopes of hills, both forested & open. State owned	Straight 60cm stems	1.0 to 1.4	30-35 mainly Ukrainians
2000 ha	Undulating, both forested & open, private owner:	Straight & branched 60cm stems (up to 40cm clear of leaves)	2.5 to 3	30 mainly Latvian students
access to 14,500 ha	No information	No information	says 7	36

Management of collection sites is minimal with the main preparation for harvesting being cutting the bushes down to encourage coppicing.

2.1.1 Coppiced bushes

Cut stumps of rhododendron produce profuse and strong shoots. After 18 months to two years growth these shoots are long enough to be picked as foliage and repeated cutting does not seem to diminish the vigour of the regrowth. Pickers prefer to harvest shoots from coppice stumps as they are at an easily accessible height, vigorous and can provide assured supplies on a biannual basis. In most situations the bushes had been cut to the ground as part of a clearance exercise by the land owners though there are examples of harvesters undertaking the clearance to prepare stumps for picking.

In one 250 ha site under Scots pine harvesting was from coppice regrowth. The bushes had been cut down about eight years previously and the stumps are rather scattered under the trees (see Plate 1). Approximately 25% of the new shoots from the coppice stumps are harvested every year. This stunts the regrowth and the bushes are less than 2 m tall and are flowering at greatly reduced levels.

Plate 1: Coppice rhododendron harvesting site under mature pines

Plate 2: Open coppice and harvested bushes

Of the few occurrences of collection from open sites it would seem that coppice production is preferred which is not surprising given the height and size of mature open-grown rhododendron. The open site that was most intensively managed was a hillside with occasional trees and the rhododendron was generally over 2 m tall. On small areas of the gentler, accessible slopes the enterprise had cut the bushes to the ground. In these areas the regrowth is being maintained at around 2 m by constant picking. Good quality stems are selected and cut at around 1 m which is easier than at ground level. Despite the cutting, the bushes are flowering but at a reduced level than unmanaged bushes. Interestingly, on this site the arrangement with the owner for the past ten years is for management in lieu of a fee. Management in this case meaning preventing the rhododendron from spreading.

2.1.2 Uncut bushes

There were two sites, in Scots pine plantations where the picking was from uncut bushes. These growths were of dense bushes around 3-5 m tall. On such sites the pickers are left to choose where to go and this together with the height of the bushes means that picking is extensive and difficult to manage.

Several enterprises who only have access to uncut rhododendron are considering whether they would be better off changing to coppice bushes. Their ideas are rather similar and both have done a few trials of the best coppice methods. One manager thinks that leaving stumps around 1 m tall would give a greater number of stems as the whole stump will produce side-shoots (epicormics) and he is comparing this with stumps cut at ground level. The intention is to cut the bushes down to the ground with a chainsaw and to collect good quality stems from the cut tops. They then hope to collect the regrowth as it becomes long enough. However, it is expensive to clear large areas and they are not sure of the timing or cost effectiveness of doing the coppicing. An important point with this type of managed exploitation is that it requires longer contracts (not less than five years) to make it worthwhile.

2.1.3 Access

All the commercial collection sites visited as part of this study were on level or gently undulating ground with easy access from a motorable road or track. Vans and minibuses seem to be the preferred mode of transporting the pickers and foliage to and from sites so access roads have to be of good quality. Picking is normally done within 300 m of vehicle access. However, at some sites, picking can be done up to 800 m away from a road where walking is easy.

In plantations, the forest roads provide reasonable quality motorable access to the sites. Access on foot is often further improved if the trees have been thinned and brashed. In all of the plantation sites visited the trees were mature and had been brashed.

For open sites there are often few suitable tracks to access the site and one enterprise had put in roads at their own (considerable) expense. In this case the cost of the road was offset by free access to the site.

2.2 Logistics

The business of collecting and trading rhododendron foliage is made up of a few activities each with its associated logistical implications and costs. Each of the enterprises has unique solutions to the main logistical issues with trade in rhododendron foliage.

2.2.1 Labour

Each of the harvesting companies had different methods of employing pickers and managers, and pay their staff in different ways.

Picking is seasonal, often in inclement weather through the winter. All the enterprises interviewed complained that sourcing local labour prepared to work in these conditions is problematic. Payment is often at piece rate (a fixed rate for a specified number of good-quality stems) and without contracts. Some arrangements are in what is termed the 'grey economy' while others are of a more formal nature e.g. contracts for managers. Daily wage rates ranged from below £45 to up to £90 for the most efficient pickers. The price paid per bunch of stems also varied, making comparisons difficult. If an average wage rate of £65 per day, and an average price of £0.80 for a 20 stem bunch is used, then the number of bunches that a reasonable picker can pick in a day can be calculated, and hence how many pickers might be needed. To earn £60 per day at 80 p per bunch, a picker would need to pick approximately 75 bunches per day. This converts to approx 450 bunches in a six day week. Therefore, production of 1000-2000 bunches per week would require two to five pickers. In addition a warehouse manager may get 20 p per bunch for sorting and loading. Thus the warehouse door labour price would be £ 1 per bunch.

Two enterprises have recruited labour from eastern Europe (Ukraine and Latvia) to make up for a shortfall of local labour. However, this brings a whole host of problems of its own. There are strict rules about employing overseas labour, work permits have to be provided, everyone must be paid at least the minimum wage even if they are not collecting sufficient stems to clear this on a piece work basis. However, these same companies have found that a piece rate system is not the best form of payment. The more stems picked the more is paid to each individual, which can lead to problems of division between the groups (for instance if one person can pick faster than the others) and decreased quality. Last year one company found that an entire batch of 1000 bunches were rejected by the buyers due to poor quality, this has been put down to the harvesters working too fast and not giving time to ensure that every stem picked meets the strict quality controls. One suggestion is to pay people a minimum wage to cover the hours they work, and then offer a bonus scheme to encourage higher picking levels. Giving a daily wage also means that people are available to do work other than picking such as grading, packing and rhododendron cutting.

2.2.2 Grading, storage and transport

The buyers of rhododendron (and indeed any foliage) are as a rule extremely quality conscious. Generally if more than 5% of a shipment does not meet the standard, a financial penalty is imposed, or the whole shipment rejected.

The standards require that all stems are straight with dark green, unblemished leaves. There appears to be three main product types that buyers are interested in:

a) 60cm stems, unbranched, with the lower 20cm stripped of leaves for ease of handling. Possibly used for backdrops to flower arrangements or wreaths.

b) 60cm stems but with branching permitted at the top only, and lower 40cm stripped of leaves. Possibly used as 'bouquets' of foliage.

c) 50cm stems with unopened flower buds, with lower 20cm leaves stripped. Used in individual flower arrangements. Buds must be at correct stage so as to open when stems are placed in water.

Plate 3: Bunches prepared for sale

Plate 4: Spotting of leaves on open site

In many cases the pickers do the initial grading and pick only those stems which meet the standards. The stems are snapped or cut off the bush, leaves at the bottom of the stem and any damaged leaves are removed. They are then tied into bundles of 20 or 50 stems and made up into loads to be carried back to the road. However, a few companies have found too many problems with selecting and grading on the hill and are considering a system which does the final grading where the stems are collected at roadside or at the warehouse.

All harvesting companies had some form of central warehouse where foliage is brought each day and stored until it is ready to move out. This does not need to be particularly large (possibly a barn, approx. 300 sq ft floor area) but would require reasonable road access, electricity and running water. Bunches of foliage are checked as they come in, and damaged leaves removed. Bunches of stems are then measured and guillotined to size. They are then stored either as they are, in wire trolleys, or placed in buckets of water until they are ready to be moved on. Cut rhododendron stays fresh looking for 2-3 weeks provided it is kept damp (hosing down once a week may be sufficient), so water is essential.

The foliage is generally transported by the buyers in large trucks (40 tonne refrigerated containers) from the warehouses or other central collection sites. Loads are often dispatched once a week and there is often a rush to complete orders in time for collection. Trucks taking loads to the Netherlands are generally making return trips after dropping off cut flowers.

2.2.3 Phytosanitory regulations

Sudden Oak Death is a disease caused by a microscopic fungus – *Phytophthora ramorum* – it is highly contagious and causes the death of susceptible species notably oaks in California. A slightly different variety of *Phytophthora* (a different mating strain) is causing the death of rhododendrons and viburnums in the Netherlands and Germany. In response new statutory instruments have been issued by the British government to govern the movement of *Phytophthora* susceptible materials for sale.

Companies that engage in commercial sales of rhododendron are required to have a plant passport system in place. The plant passport has to accompany every foliage shipment and contain details of the species, quantities, source and destination. The producer of the foliage registers with DEFRA (for free) and applies for the authority to issue a plant passport. A DEFRA plant passport inspector then visits all the sites from which rhododendron will be cut and if the sites are found to be free of the disease, delegates the issuing of plant passports to a nominated employee who is then responsible to ensure each bundle of stems has the correct information on it. The inspections charge £81 per hour. When the inspectors are satisfied that the sites are free from *P. ramorum*, each site is given an identification number and any foliage cut from that area need to have a label with the site number and a code which assigns the produce to the company. This process is to ensure that should an outbreak occur, products can quickly be traced back to the site, and measures to prevent the spread are imposed. At present if a site is found to be infected the rule is that all collection must be stopped immediately and the site is put under a three month quarantine.

A working group on plant passports has been formed to review the situation at the end of the 2003. Key questions they are reviewing are: 1) Should the plant passport requirement just be limited to Rhododendron as it has been found on other species and 2) Does cut foliage need to be included in Pant Passport system – due to the nature of the product, David Slawson (Chairman of Working group set up by the EC Standing Committee looking at the plant passport systems) feels that "Rhododendron foliage is probably a lower risk that potted plants, as cut flowers and foliage often end up in land fill and may not pose a spreading threat, although the risk is still not zero".

Some of the harvesters believe that the European markets are demanding less rhododendron due to the concerns over spreading the disease, but this has not been confirmed. One buyer felt that the disease was unlikely to affect sales. All the foliage collectors we spoke with are aware of the new requirements on the movement of rhododendron foliage, and have the appropriate systems in operation.

2.3 Markets

There are two distinct markets for rhododendron foliage; the UK and European markets. The UK trade is mainly to supply the large supermarkets, Tesco, Safeway and Marks and Spencer, with smaller amounts going through wholesalers to florists shops. Rhododendron for the supermarkets usually goes through a trading company such as Van Geest which has warehouses in the UK and the Netherlands. Van Geest state that in the last year they bought 1.2 million stems from harvesting companies in Britain and Ireland. They felt that the quality and quantity of rhododendron is likely to rise as the production and management of coppiced rhododendron improves. The other large market is the Netherlands, either with intermediate buyers or with the Dutch flower auction houses. These dominate the international trade in flowers, plants and foliage in Europe and have a steady demand

for large amounts of rhododendron. These two markets require a different product and relationships within the trade network have to be carefully established and are usually jealously guarded.

There is obviously scope for some expansion in rhododendron trade as our investigation suggest that demand for rhododendron is not being met. Indeed most of the companies we interviewed including Van Geest were interested to know that there might be a harvestable resource in Wales and expressed, sometimes keen interest in involvement with any Welsh enterprise.

Rhododendron is bought from the harvesting companies for around 10 p per stem. This appears to be a fairly consistent price, but each collector informed us that the price is negotiated every season with the buyers. It is comparable to the costs of other bulk foliage.

3 Quantity of rhododendron resource in Beddgelert area

One important consideration for a potential rhododendron foliage enterprise in Beddgelert would be the quantity of the resource that could be harvested. It is obvious from existing enterprises that the site conditions for commercial picking are very restricted. In order to estimate the quantity of harvestable foliage it was first necessary to map the area of rhododendron in the area of interest to BRMG and then to determine how much of this was in areas suitable for rhododendron harvesting.

3.1 Field mapping of rhododendron

A survey of the harvestable rhododendron in the Beddgelert area was carried out on foot, using as a guide, maps from an earlier (horseback) survey for guidance (SNP 1986). Given the short period available for mapping (approx. 6 days) it was impossible to repeat the detail of this earlier survey. Therefore, only larger blocks (more than 0.125 ha) of dense rhododendron were included, and individual bushes or less dense, small stands were ignored. Consequently, this survey cannot be taken to represent the full picture of rhododendron coverage in the area. In all 174 polygons or patches containing rhododendron were mapped, see Maps 1-8, 2. Each polygon was coded to indicate various features of the rhododendron or topography as indicated in Table 2.

Table 2: Site characteristics used for mapping of rhododendron in Beddgelert area

Characteristic of patch	Code	Interpretation
Density	D	Dense - Continuous cover of mature rhododendron (>800 bushes per ha)
	S	Scattered - mature (>1m high) bushes, (between 500 and 800 bushes per ha)
Site type	F	Forest
	O	Open
Terrain	S	Steep (likely to cause problems to pickers)
	M	Moderate (sloping, but not too difficult to work on)
	F	Flat (more or less level)
Access	Good	Close to a public highway or to a track accessible by 2WD vehicles
	Moderate	Close to a track requiring a 4WD vehicle
	Poor	No close access, or accessible only by tractor/quadbike

In each case the classes were determined visually with the intention of distinguishing areas more and less suitable for foliage harvesting. Obviously this is rather subjective but was done as consistently as possible.

The polygons were drawn onto 1:12,500 scale maps (enlarged photocopies of 1:25,000 scale OS Explorer OL18 & OL17 maps) in the field. The areas of each polygon was measured using a dot grid and summed to estimate the total area suitable for rhododendron harvesting.

The estimated areas of harvestable rhododendron are given in Table 3. In all, 476 ha of rhododendron was mapped in the Beddgelert area. This compares with an estimate of 810 ha in the Nant Gwynant / Aberglaslyn area (Oliver, undated), the discrepancy may be due to areas of extremely scattered rhododendron, individual bushes, and small isolated patches being ignored.

The initial total area identified can be split into 'Dense' and 'Scattered' areas. It is unlikely that harvesting of scattered rhododendron would be of interest to foliage pickers due to the greater effort required. 'Dense' rhododendron may be found growing under forest canopy ('F') or in the open ('O'). These figures are separated because some harvesting companies prefer stems grown under shade, and the growth form of rhododendron is known to be different for different habitats (Wong et al 2002).

These figures must then be reduced further by ignoring any rhododendron growing on unsuitably steep terrain (the 'Steep Terrain' category ~ 12 ha), and again for any areas which are too far or too difficult to reach easily (the 'Poor Access' category ~ 67 ha). Harvesting companies in other parts of the UK rely solely on standard 2 wheel-drive vehicles to reach sites. For Nant Gwynant, sites which require tractor access have been ignored, but sites requiring some form of 4WD vehicle have been included. If no 4WD vehicle is available then the final area of harvestable rhododendron would be reduced still further.

Table 3: Estimated size of harvestable area

Total Potential Area	476 Hectares					
Density	**Dense**					**Scattered**
	181					295
Site type	**Forest**			Open		
	58			126		
Terrain – exclude 'Steep'	51			121		
Access	Good	Mod.	Poor	Good	Mod.	Poor
	28	15	8	7	55	59
– exclude 'Poor'	43		-	62		-
Total suitable area	105 Hectares					

These 105 hectares potentially available are shared between many different landowners, some of whom may not wish this sort of harvesting operation to take place. A summary of the five main areas that are potentially suitable for harvesting is given in Table 4.

Table 4: Potential areas for rhododendron foliage harvesting

Location	Approx area (ha)	Comments	Access	Owner
Sygun	53	Large NE facing slope of dense open-grown mature rhododendron	Most within 500m of road, but on scree slope between 100-200m alt.	NT (in near future)
Bryn Gwynant area, Coed Eryr and adjacent land to SE	32	Mostly dense rhododendron in woodland.	Area behind Coed Eryr and Bryn Gwynant would require 4WD along track for 1km to reach within 300m walking	Mostly privately owned. Coed Eryr by FE
Dolfriog Wood & Coed Cae Dafydd	10	Dolfriog –dense, shaded rhododendron on flat land Cae Dafydd- dense shaded rhododendron by road	Dolfriog- within 300m of road, more available if tractor used. Cae Dafydd- close to road, but on 50m high slope	Mostly FE, some privately owned
Craflwyn	3	Mix of densely growing open and shaded rhododendron. Open areas currently being cleared (coppiced) by volunteers.	Most over 200m to road. Possibly quad bike could assist access.	NT
Plas Oerddwr	1+ (but much more available if tractor used)	Dense shaded and open grown.	Access along 500m 4WD track. More dense, open-grown rhody available if tractor used.	Privately owned

3.2 Potential harvest from Beddgelert area

Clearly, the area potentially available in the Beddgelert area is very small compared to those being exploited by harvesting companies in other parts of Britain and Ireland (see Section 2.2.2). This would suggest that Beddgelert by itself, would not sustain a comparable commercial harvesting operation. However, one harvesting company has expressed interest in developing additional sites simply to provide additional 'topping-up' foliage to even out his supply problems. Alternatively, the Nant Gwynant rhododendron resource could be exploited alongside the much larger resource that could be drawn from larger areas such as Snowdonia National Park, Gwynedd or North Wales.

Given that some form of harvesting could take place, an estimate can be calculated for the quantity of stems that could be produced. Unfortunately, little data is available on the average number of rhododendron bushes growing on a given area, the number of shoots that each bush might produce, or the proportion of these shoots that would be acceptable for floristry use.

3.2.1 Number of bushes per ha

Research by Moroney (1997) at Craflwyn suggested that densely growing rhododendron on an open site could reach 1200 bushes per hectare. A similar figure was confirmed (1190 bushes ha^{-1}, from one sample, also at Craflwyn) by Wong *et al* (2002). In this present study, three samples were measured from an area of open-grown rhododendron NE of Bryn Bedd. Again, a similar figure of 1200 bushes ha^{-1} was estimated from the 'dense' site, and a typical 'scattered' area gave estimates of 600-840 bushes ha^{-1}. Average figures of a maximum of 1200 bushes ha-1 for 'dense' open sites and an average of 750 bushes ha-1 for 'scattered' open sites are used in the following harvest estimates. Bushes growing under trees may not reach the high densities seen at open sites, and some bushes will not be reached by pickers due to fallen branches etc. Lower densities of 1100 bushes ha^{-1} and 600 bushes ha^{-1} therefore used for 'dense' shaded and 'scattered' shaded sites respectively.

3.2.2 Number of harvestable stems per bush

The average number of acceptable stems that are produced from a single bush is extremely difficult to estimate and is dependent on many factors. A small sample of young coppice at Craflwyn (Wong *et al*. 2002) gave an estimate of 31 stems per bush, whilst repeated samples at the same site gave estimates of 15.5 to 16.5, possibly due to the persistence of the stronger shoots to the detriment of the others. Research by one of the harvesting companies suggests that coppicing the rhododendron at approx 1 m rather than at ground level, can produce a greater number of acceptable shoots. A crude figure of 16 shoots per *coppiced* bush was used in harvest estimates. These calculations are based on an annual harvest from coppiced stems. Of course, very little of the rhododendron in the BRMG area (mostly on the Craflwyn site) has been coppiced. Foliage and flower stems can be harvested from mature bushes, but reaching the tops of bushes is extremely difficult, and only the ones at the edges of dense areas are physically accessible. It is possible that when bushes are first cut many more stems can be harvested than from coppice stumps. Regrowth from coppiced stumps cannot be harvested for at least 18 months as it seems to take that long to produce stems of acceptable length. No figures are available for the number of harvestable stems for mature (uncoppiced) bushes, and all harvest estimates are based on an annual production from coppiced stems more than 18 months old. This is in any case the preferred type of material for repeated harvesting.

3.2.3 Grading of stems

Given all the standards required for commercial rhododendron foliage (see Section 2.2.2), only a fraction of stems from an individual bush will be accepted by the market. Without further research, or advice from experienced pickers, it is very difficult to estimate what proportion of stems might be rejected, or indeed whether rhododendron from any of the open upland sites would produce acceptable stems. A subjective figure of 25% of stems being acceptable from shaded sites and 20% from open sites is used for harvest estimates. Calculation of the potential annual harvest is based on the assumption that all the relevant landowners allow access for harvesting, and all the open sites are acceptable to harvesters. It is unlikely that this will be the case, so these estimates represent the probable upper limit of what might be produced. The estimated yields of stems are given in Table 5.

Table 5. Estimated annual production of marketable stems

Site type	Ha	Bushes Per ha	Stems per ha	Max stems	% picked	Marketable stems	weeks work at	
							1000 bunches per week	2000 bunches per week
DF	43	1,100	17,600	756,800	25	189,200	9.5	5.0
DO	65	1,200	19,200	1,248,000	20	249,600	12.5	6.0
Total D	108			2,004,800		438,800	**22.0**	**11.0**
SF	37	600	9,600	355,200	25	88,800	4.5	2.0
SO	23	750	12,000	276,000	20	55,200	3.0	1.5
Total S	60			631,200		144,000	7.0	3.5
Total D+S	168			2,636,000		582,800	29.0	14.5

As mentioned previously, it is unlikely that pickers will wish to harvest stems from areas with only scattered rhododendron bushes, and it would appear that these areas would only provide an additional three to seven weeks work if they did. The most important figures are the totals for the potential annual output for areas of 'Dense' rhododendron. One harvesting company insisted that a minimum of 2000 bunches per week needed to be harvested for the operation to be commercially viable. Another company appeared to be harvesting an equivalent of 2500 bunches per week, but was interested in the production of smaller quantities. Estimates working on the production of 1000 and 2000 bunches per week are given for comparison. It would appear that the Beddgelert area could potentially produce 1000 bunches per week for around 22 weeks from coppiced bushes from 'dense' sites. If production was raised to 2000 bunches per week, then this output could only be sustained for 11 weeks. Given the many assumptions needed to generate these estimates (amount of land available for harvest, number of bushes per ha, number of stems per bush, and the percentage of stems considered acceptable) they can only be considered as the 'best guess' given the data available at the time and are likely to represent the upper limit of what is possible.

4 Development of a rhododendron enterprise in the Beddgelert area

The analysis above indicates that there is a marginal resource for commercial exploitation of rhododendron foliage from the Beddgelert area. This suggests there are three options for developing a rhododendron enterprise in the area:

1 Ask one of the existing companies to take a franchise in the area. The established company could do the marketing and employ a local manager to run a Beddgelert based operation. At least three companies have expressed an interest in harvesting on additional sites. They could be invited to Beddgelert to inspect the available resource to see if they would be interested in developing an operation in Beddgelert.

2 Encourage the development of a Welsh company to manage and sell rhododendron (and other foliage) from sites across Snowdonia National Park, Gwynedd or North Wales. A mapping exercise would need to be done of the wider area. Existing Welsh foliage companies could be invited to take up this opportunity or a new enterprise could be developed if a suitable entrepreneur can be found. In both cases some assistance might be required with start up costs.

3 The development of a social/environmental enterprise on a not for profit basis. Such an organisation might be able to provide better salaries for its staff and to plough any profits into rhododendron clearance. It may also be more inclined to undertake unprofitable clearance with support from existing woodland management grants.

For all options it is necessary to formulate arrangements which mean that rhododendron could be collected across a number of ownerships on the same contract. This is an interesting challenge and would perhaps require some form of co-operative arrangement. Advice on forming a community co-operative and indeed, a social enterprise can be obtained from the Wales Co-Operative Centre at the Vaynol. The economic feasibility of any enterprise requires the determination of the costs of establishing the enterprise, siting of warehouse, collection site for lorries, whether local or imported labour is to be used etc.. More detailed market research to establish the likely future demand for rhododendron from the larger market would also be advisable.

4.1 Management vs clearance

The principal objective of the BRMG is the control, i.e. clearance, of rhododendron. It is first necessary to determine whether foliage collection will contribute to control in any way. The existing rhododendron collectors made it very clear that foliage harvesting alone will not control rhododendron. Although it does restrict the size of the plants and presumably weaken them, it does not prevent flowering (whether it has an impact on seed set is unknown). Although at least one collector provides control services in exchange for a contract, even here it seems unlikely that any significant clearance has been achieved even after ten years.

The best outcome for BRMG would be if the enterprise could be persuaded (and it is cost effective) to coppice the bushes and then prevent them from flowering. This may mean subsidising the initial clearance though it should be possible to harvest and sell stems or flowers from the cut bushes. It may also mean that pickers are encouraged to cut all larger stems even if they are not of harvestable quality. Further work would be required to determine whether this is practical and economic. Even so, foliage harvesting should be considered at best a 'holding strategy' (Shaw 1984) to help limit the spread of rhododendron.

It has been suggested that repeated cutting of coppice regrowth would over time weaken the stump and make it susceptible to pathogen attack (Wong *et al.* 2002). However, several collectors report no loss in vigour with cutting over eight years. Most report that there are no signs that foliage cutting was having any impact on the plant. The attitude from some collectors was that the plant got stronger with coppicing but that cutting down to the ground can limit the spread if the bushes are not allowed to grow on for too long.

4.2 Coppicing costs

Coppiced rhododendron is preferred, so the simplest system would appear to be one where harvesting is done on sites which have previously been coppiced by the land owner/manager so that the harvesting company does not pay for this initial clearance. Where this is not the case, then the harvesting company needs to carry out the coppicing itself. In this case, costs will initially be much higher. Bushes would need to be chainsawed, and the branches piled up after useful foliage is picked. Ideally the branches would be piled up and burnt, or removed from the site to make access easier later on, but this would increase the expense. One harvesting company is investing in a mulching machine to deal with the waste, but this may not be practical on many sites. Costs for chainsawing may be similar to those incurred in rhododendron control, but there is of course, no need to spray the stumps with poison. Such clearance may be expensive (approx. £4000 per ha Wong 2002) and it is difficult to see how these costs can be offset by the sale of additional foliage stems from mature bushes or even by helping to ensure future productivity at a site. Perhaps some costs could be recovered by the sale of firewood or rhododendron mulch, but this would not be straightforward.

4.3 Labour force

Finding a reliable work-force prepared to do hard physical work outdoors consistently through the winter months is probably the most difficult aspect of foliage harvesting operations.

It is difficult to judge what an average picker might earn, with companies claiming that the best pickers can earn up to £100 per day, but others needing to supplement piece-rate earning so that the minimum wage is met. Probably a good wage would be £60 per day. At this rate 2 - 5 pickers would be needed to produce between 1000 and 2000 bunches per week. In addition, a warehouse / operational manager would also be needed, and all companies thought that having an efficient manager in place as being very important.

Where motivated pickers are available locally, the simplest scenario would seem to be where pickers are simply paid 'cash in hand' for the stems they bring in. A warehouse manager is paid in a similar manner for the bunches he grades, guillotines and loads for transport. All labourers are effectively self employed so that the company does not pay national insurance etc., and pays only for the foliage as it arrives at the warehouse. Though there are variations in the way that pickers are paid, for most companies approximately 50% of the price of foliage at point of sale goes to the pickers and local managers. For example, for each bunch of foliage sold for £2.00, £0.80 may go to the picker, £0.20 to the warehouse organiser, and the remainder to the company to cover all other costs and profit.

However, other companies have found difficulty finding local labour at the rates they can offer, and have invested more in attracting workers from eastern Europe (e.g. Ukraine & Latvia). Some companies have helped to arrange work permits for such migrant labour, and have also assisted in providing accommodation and transport to sites.

Establishing a local harvesting enterprise would create local employment, and a local employment agency manager commented that currently 'there is a demand for work, particularly for semi-unskilled labour'. With the New Deal scheme organised by the job centre, an enterprise may be provided with £60 per week to help employ someone registered on that scheme. There is a substantial number of young people (18-24) who are registered on the New Deal scheme in the Bangor/Caernarfon area who would be eligible for this kind of work (semi-unskilled labour) there are two main criteria for employing people from New deal. First the employer must provide training up to NVQ level 2 – training opportunities could include developing team skills, training to supervise teams, working with chainsaws/machinery and secondly, like all employment, wages must meet the minimum standard of £3.60-£4.20 per hour (age dependant). This could work on a system of paying per hour as a basic weekly wage, then offering incentives to increase production.

4.4 Transport

In the simplest scenario, pickers provide their own transport to get to sites, and to bring stems to a central warehouse. Another company using migrant labour (without their own transport) has provided a minibus to get to and from sites. Once the foliage is ready to leave, some form of transport may be needed to move it from the collection point. One company has its own 16 tonne lorry to transfer its weekly shipments of 2000 bunches of foliage onto a container for export. These containers would otherwise be returning empty after delivering other plant material into the UK, and the buyer pays for the transport costs into Europe. Van Geest sends its own 40ft refrigerated lorries on a circuit, bringing cut flowers from Europe, delivering those to the packhouse and collecting the rhododendron foliage when the trucks are empty.

5 Discussion

Mapping of the rhododendron resource in the Beddgelert area would suggest that the area available for harvest is relatively small compared to harvested sites in other parts of the UK. Additionally, there are problems of access and topography which are not found in other areas. Consequently, developing a commercial rhododendron foliage harvesting operation in the BRMG area is not going to be straightforward, and some harvesting companies may not wish to proceed.

5.1 Problems with rhododendron foliage harvesting in Beddgelert

5.1.1 Small size of resource

Even if all suitable areas are allowed to be harvested, and are managed intensively for foliage production, then the annual output is still likely to be on the low side. Probably the output from the Beddgelert area would need to be combined in some way with the harvest from other regions, either from other sites developed in Gwynedd, or with existing production from companies elsewhere in Britain or Ireland. There are large areas of rhododendron growing in the south of the SNP, on possibly easier terrain. The opportunity for a more viable foliage harvesting industry might well exist there, and be one that the Beddgelert area could contribute to.

5.1.2 Much of area would need coppicing

It is not clear who would be able to cover the costs of coppicing the mature rhododendron bushes, or in what fashion. Although some companies have done this on other sites, the steeper terrain and more difficult access in the BRMG area may make this more difficult.

5.1.3 Foliage harvesting is not a particularly good way of controlling rhododendron

The main objective of the BRMG is the control of rhododendron in its area. Foliage harvesting from managed coppice stumps does not eradicate rhododendron, in fact the harvesting companies want the rhododendron to flourish to permit a regular crop of healthy foliage. After felling, stems would be regularly harvested and the bush would expand in size although at a slower rate than otherwise, and would eventually begin to flower again, probably after 3-4 years. Thus, at best the rhododendron would be knocked-back for a few years, but with little effect overall. Another issue may be the visual appearance of coppiced stems – perhaps cut at waist height rather than ground level. These would produce many bright green leaves, but no flowers which many tourists to the area find attractive.

5.2 Possible benefits

Although, there may be disadvantages to companies developing foliage harvesting in the Beddgelert area, there also some potential benefits locally:

5.2.1 Local employment

A small number of labourers and one manager would be needed, for half a year, through the winter months. However, although local pickers are preferred, most companies have found difficulties in attracting motivated labour and have had to bring pickers in from outside the area.

5.2.2 Harvesting may provide control benefits

Clearing of rhododendron is very expensive, but some foliage companies seem willing to undertake this, provided the future harvest looks worthwhile. Although foliage harvesting does not kill the bushes, it would appear to reduce the number of flowers, particularly in the first few years. This would reduce the seed source from harvested areas and help to reduce its spread. Even if harvesting was later abandoned, provided the coppiced stumps hadn't recovered completely, clearing the sites should be easier.

5.2.3 Might provide a small payment to landowners

Financial benefits may not be large, probably hundreds of pounds annually for productive areas, this is at least something gained from areas which would generate very little income. However, care must be taken that additional administration costs and time taken to sort out problems are taken into account.

6 Conclusions

The case for or against developing a foliage harvesting enterprise in the Beddgelert area is not clear-cut. The quantity of rhododendron appears to be marginal, but if a harvesting company was sufficiently motivated and had the full backing of the relevant landowners, then is there certainly potential for trading foliage from the area. There is a definite demand for rhododendron foliage at the present and it seems feasible to establish a successful business enterprise making use of rhododendron foliage from across North Wales.

7 References

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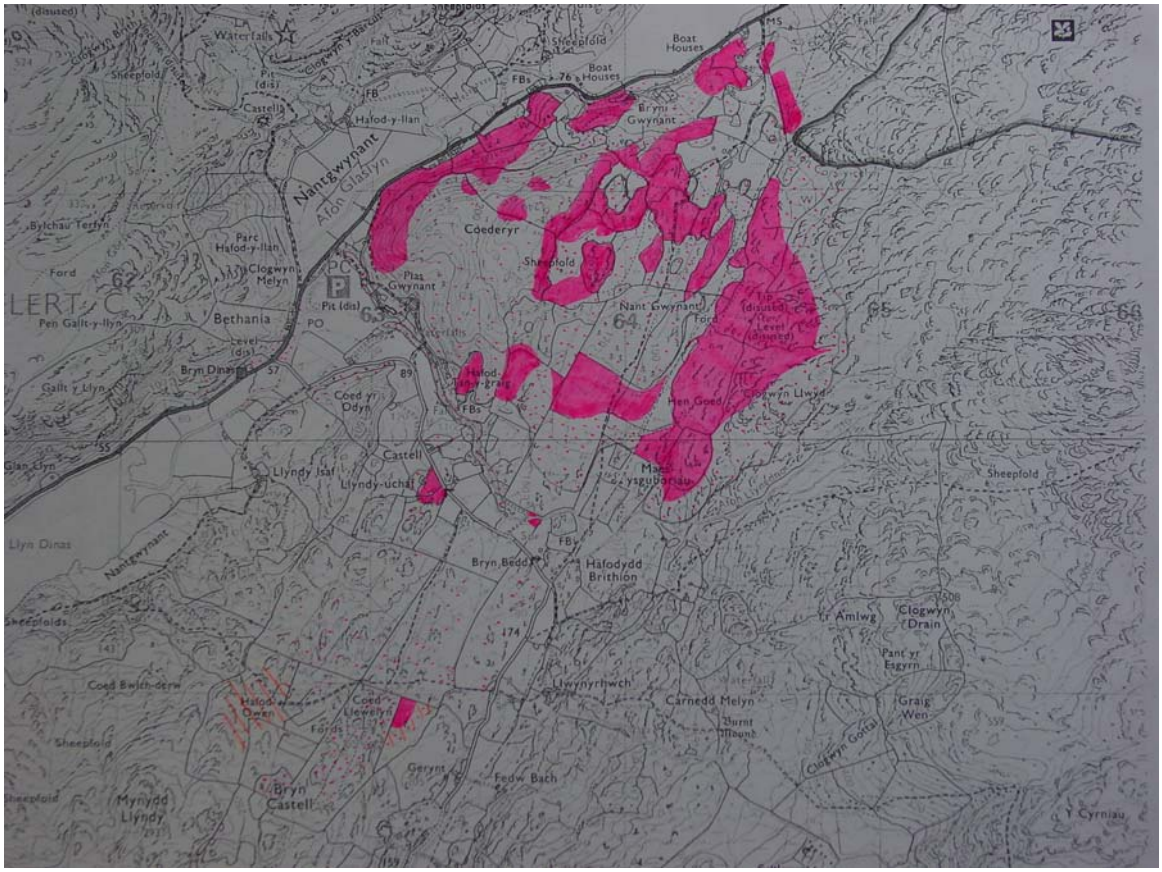
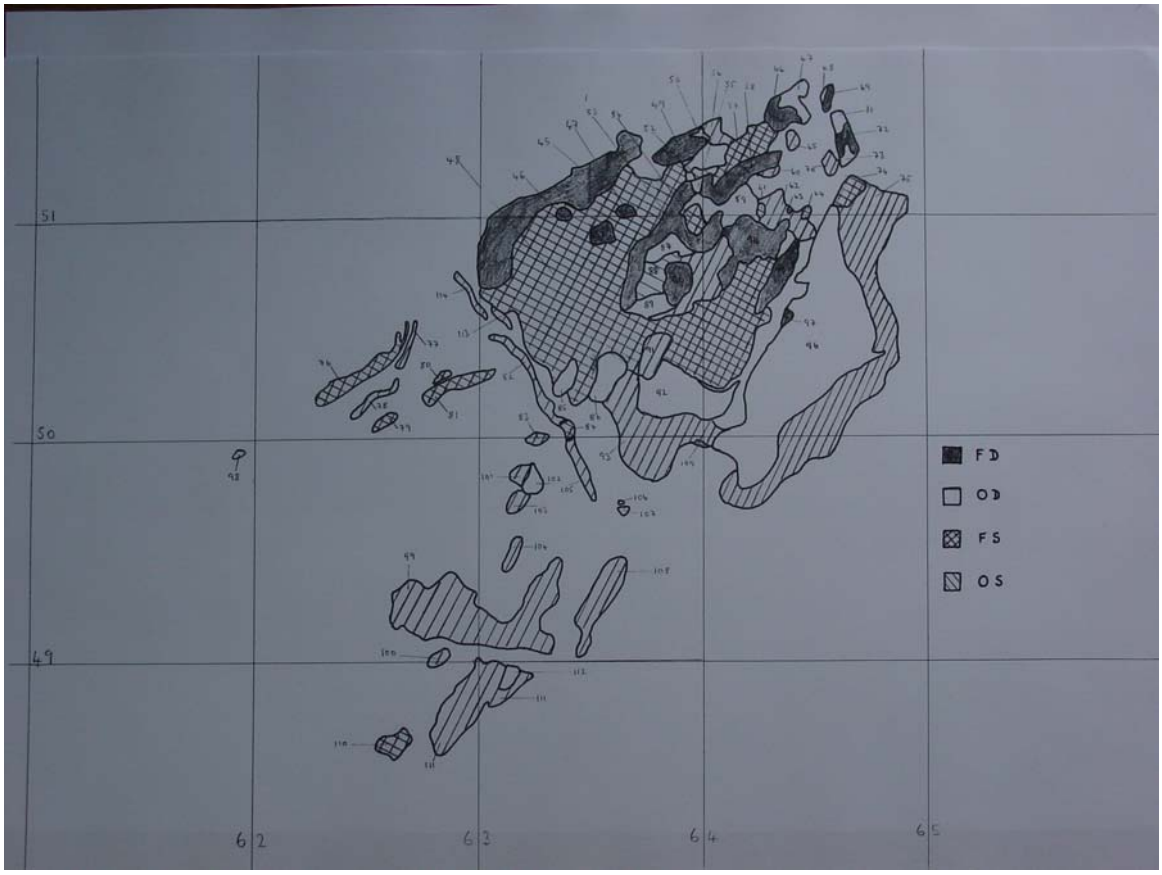
Wong, J., Youde, E., Hale, M., & Dickinson, B. (2002) **Report of the rhododendron feasibility study**. Prepared for the Beddgelert Rhododendron ponticum Management Group by the School of Agricultural & Forest Sciences, University of Wales, Bangor. http://www.wildresources.co.uk/downloads

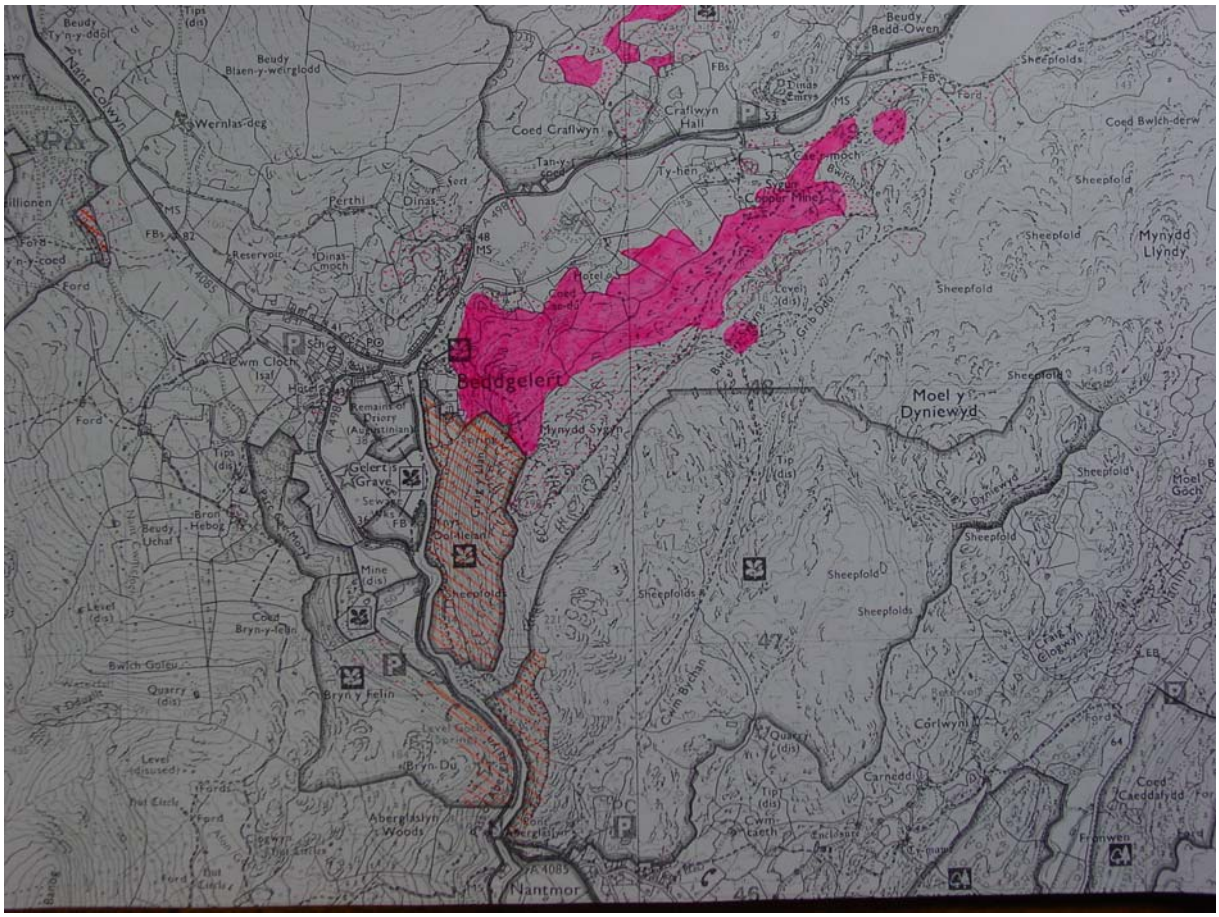
Appendix 1 Maps and overlays of rhododendron coverage

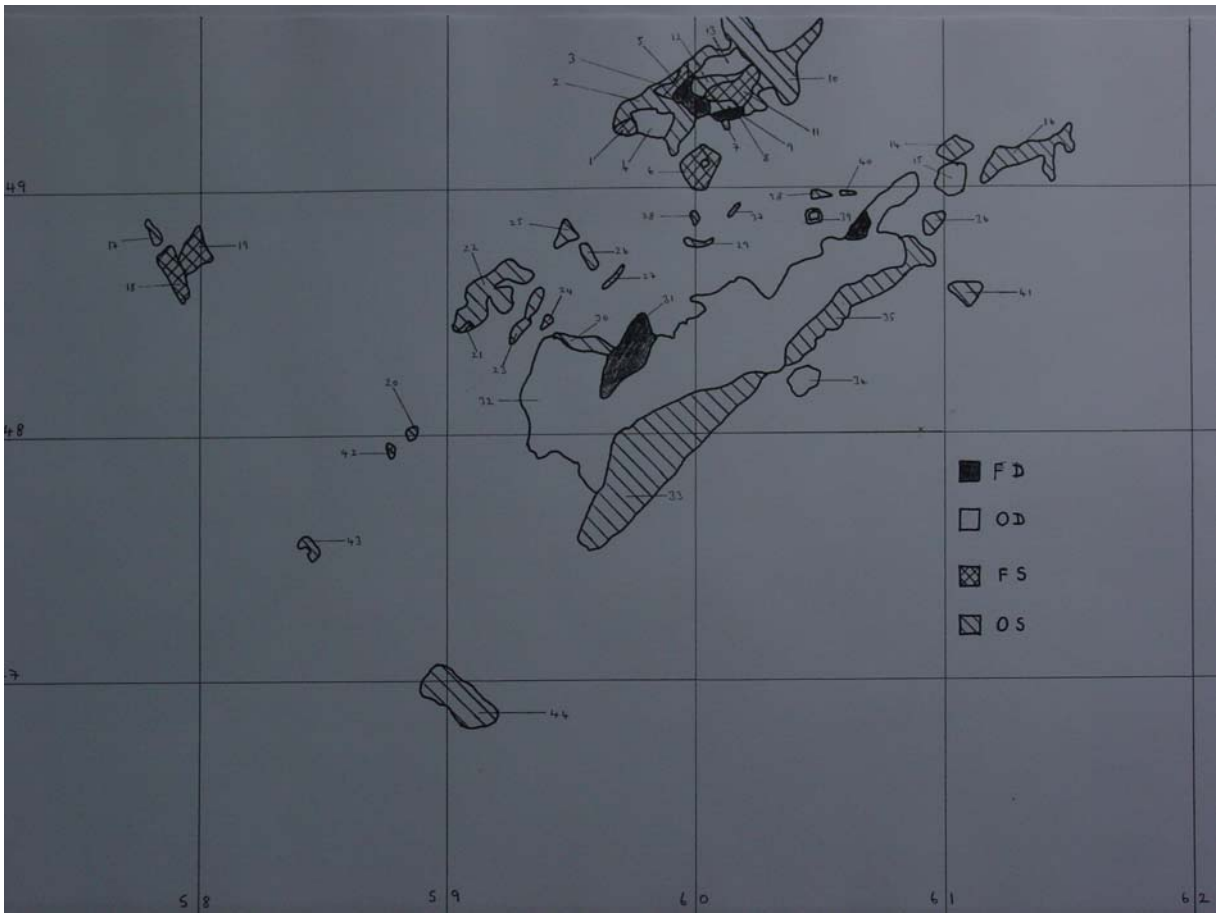
Map & Overlay for Coed Eryr block



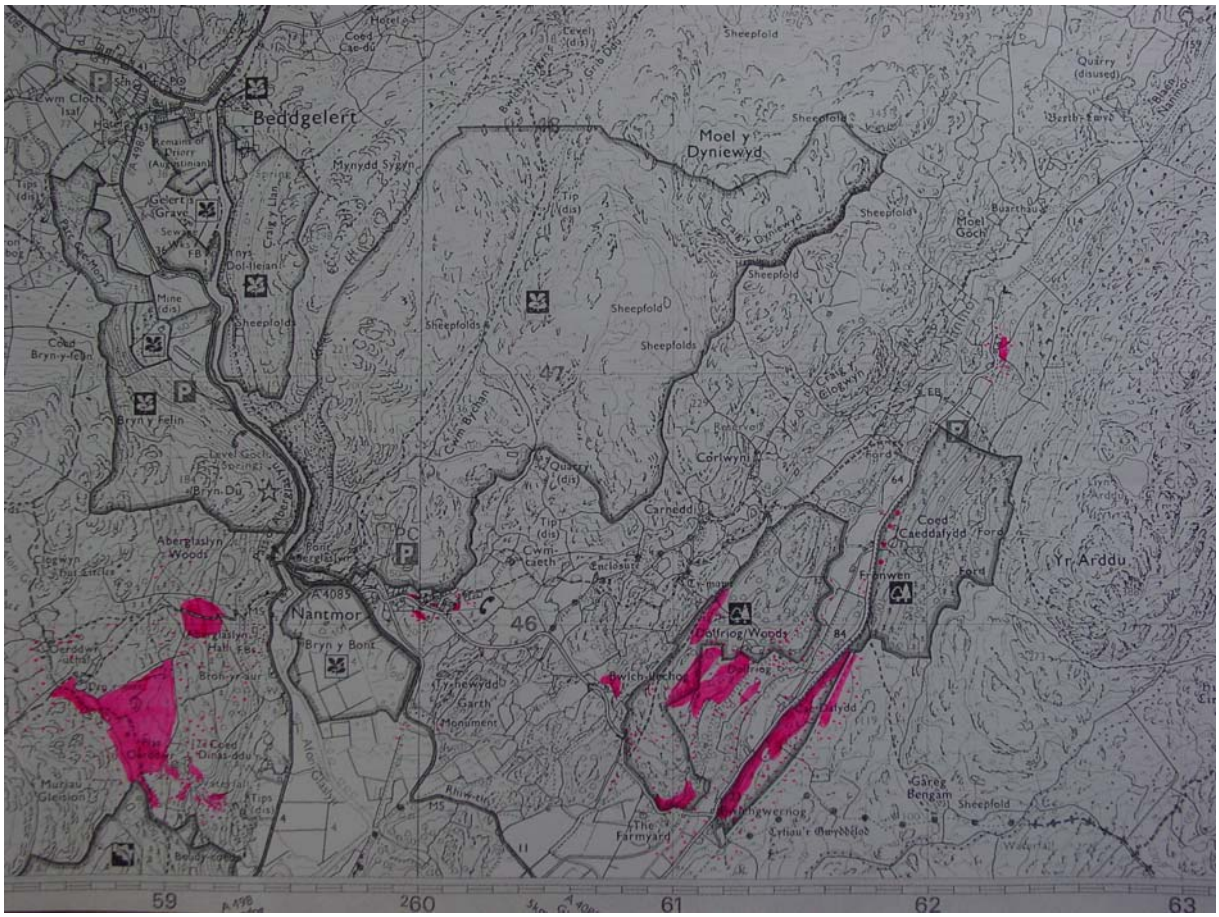


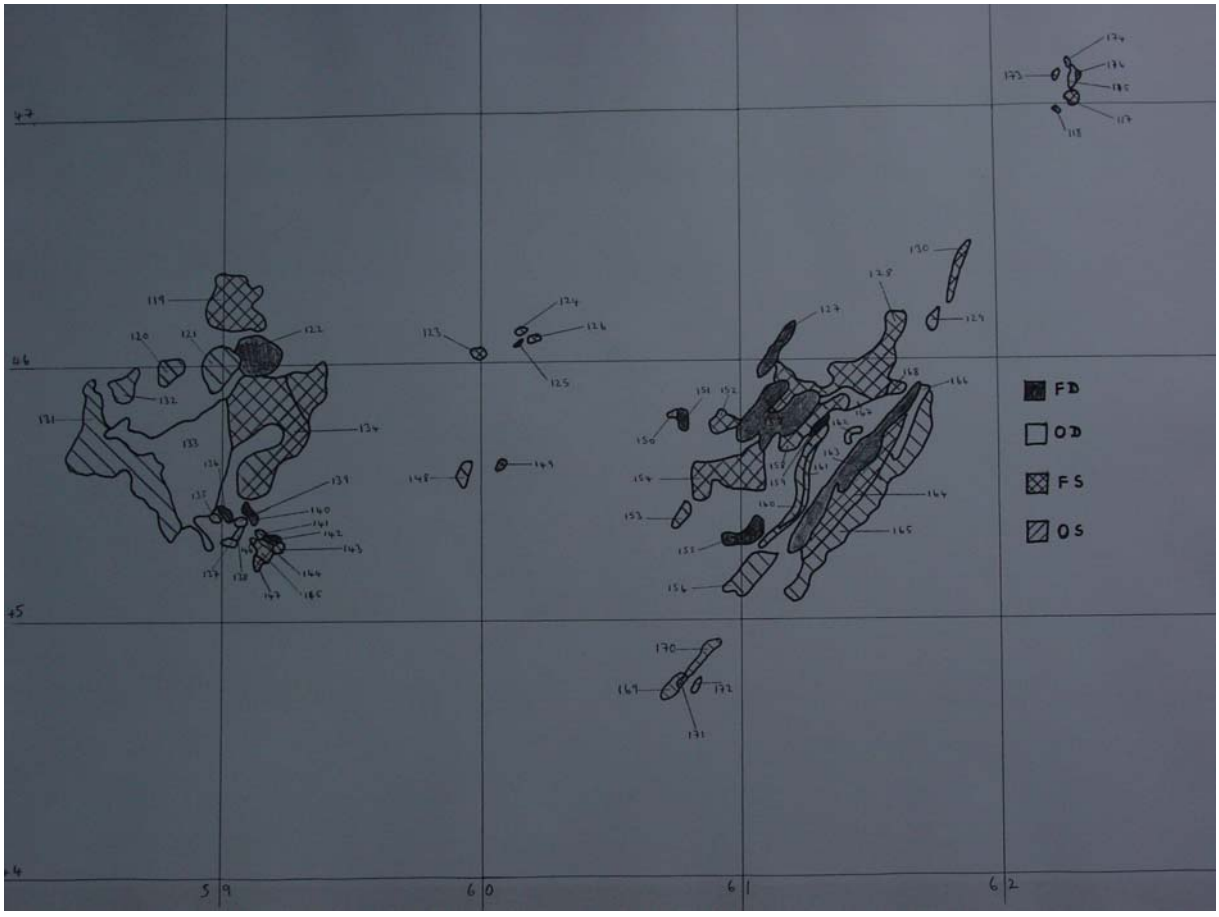
Map and overlay for Sygun and Craflwyn blocks





Map and overlay for Aberglaslyn/Plas Oerddwr and Dolfriog blocks





Appendix 2 Data from mapping

Gridref	ref	Name of area	Hectares	Owner	Cover	Canopy	Terrain	Access	comments
5949	1	Craflwyn	0.5	NT	S	F	M	P	some clearance
5949	2	Craflwyn	2.625	NT	S	O	M	P	being cleared - regrowth-transect
5949	3	Craflwyn	0.5	NT	S	F	S	P	
5949	4	Craflwyn	1.375	NT	D	O	M	M	some clearance
5949	5	Craflwyn	1	NT	D	F	M	M	some clearance
5949	6	Craflwyn	1.375	NT	S	F	F	G	some clearance
6049	7	Craflwyn	0.125	NT	D	O	M	G	
6049	8	Craflwyn	0.5	NT	D	F	M	G	
6049	9	Craflwyn	0.5	NT	S	O	M	M	
6049	10	Craflwyn	6.75	NT	S	F	M	M	
6049	11	Craflwyn	2	NT	S	F	S	M	
6049	12	Craflwyn	1.125	NT	S	O	M	P	
6049	13	Craflwyn	1.625	NT	D	O	M	P	
6049	14	Cae'r Moch	1		S	O	S	P	
6049	15	Cae'r Moch	1.5		D	O	S	P	
6049	16	Cae'r Moch	3.625		S	O	M	P	
5748	17	Meillionen	0.5	FE	S	O	F	G	
5748	18	Meillionen	1.625	FE	S	O	F	G	recent clearance
5748	19	Meillionen	1.375	FE	S	O	F	G	
5848	20	Beddgelert	0.25		S	O	F	G	garden
5948	21	Dinas	0.125		D	O	M	P	
5948	22	Dinas	4		S	O	M	P	
5948	23	Dinas	1		S	O	S	M	steep but next to road
5948	24	opp Dinas	0.125		S	O	F	G	
5948	25	W of Craflwyn	0.625		S	O	M	G	
5948	26	opp Dinas	0.625		S	O	F	G	along wall
5948	27	Cae Du Campsite	0.375		S	O	F	G	along river by campsite
5948	28	Opposite Craflwyn	0.125		S	O	F	G	along river
5948	29	Opposite Craflwyn	0.375		S	O	F	G	along river
5948	30	Cae Du (W Sygun)	1.25		S	O	M	G	
5948	31	Coed Cae-du (Sygun)	3.375		D	F	M	G	steep at top half
5948	32	Sygun main slope	49.5	NT(Sygun)	D	O	M	M	massive area, some scree
5948	33	Sygun top slope SW	18	Sygun?	S	O	S	P	smaller bushes, spreading up slope
6048	34	Sygun isolated block	1.125		D	O	M	P	small cwm
6048	35	Sygun top slope NE	6.625	Sygun?	S	O	S	P	bushes spreading up steep slope
6048	36	Sygun NE cwm	0.75		S	O	S	P	
6048	37	Ty Hen river	0.125	Sygun	S	O	F	G	by river
6048	38	Sygun entrance	0.25		S	O	F	G	
6048	39	Sygun car park	0.125		S	O	F	G	dense?
6048	40	Cae'r Moch farm	0.125		S	O	F	G	
6148	41	Back of Sygun	1		S	O	M	P	
5847	42	Royal Goat	0.25		D	O	F	G	
5847	43	Bron Hebog	0.5		S	O	F	P	long track to farm
5847	44	Bryn Felin	4	NT	S	O	M	M	possibly being cleared?
6351	45	Coed Eryr	13	FE	D	F	M	G	strip close to road
6351	46	Coed Eryr	0.375	FE	D	F	M	M	patch inside
6351	47	Coed Eryr	0.375	FE	D	F	M	M	patch inside
6351	48	Coed Eryr	63.25	FE	S	F	M	P	large block, some empty areas
6351	49	Bryn Gwynant woodland	2.375	YHA	D	F	M	G	wood next to road
6351	50	Bryn Gwynant Garden	0.375	YHA	D	O	M	G	garden next to road
6351	51	Coed Eryr	0.75	FE	D	F	M	P	inside near top
6351	52	Pen bryn uchaf	0.5		S	O	M	M	holiday cottage, no road
6351	53	Coed Eryr, S edge near wall	6.5	FE	D	F	S	P	good site but diff access and boggy
6351	54	Knoll	0.75		S	O	F	P	

Gridref	ref	Name of area	Hectares	Owner	Cover	Canopy	Terrain	Access	comments
6351	55	Pen bryn uchaf glade	0.25		D	O	F	P	boggy
6451	56	Pen bryn uchaf fields	1		S	O	M	M	
6451	57	Bryn Gwynant S woodland	2.625		S	F	M	G	
6451	58	Bryn Gwynant S woodland	3		D	F	M	M	
6451	59	fields behind Bryn Gwynant	2.125		D	O	F	M	
6451	60	fields behind Bryn Gwynant	0.25		S	O	F	M	track access?
6451	61	small knoll	0.25		S	F	F	P	
6451	62	Behind Bryn Gwynant	2.25		S	O	F	G	track
6451	63	Small knoll	0.125		S	F	F	G	
6451	64	Small knoll	0.125		S	F	F	M	further from track
6451	65	Behind Bryn Gwynant	0.375		S	O	M	G	next to track up
6451	66	Bryn Gwynant wood E	1.375		D	F	M	G	belongs to house next to yha?
6451	67	Behind Bryn Gwynant	1.25		D	O	M	G	
6451	68	Behind Bryn Gwynant	0.125		D	O	M	G	along river
6451	69	Behind Bryn Gwynant	0.25		D	F	M	M	along river over wall
6451	70	Behind Bryn Gwynant	0.5		S	O	M	G	field & small wooded knoll
6451	71	Behind Bryn Gwynant	0.375		D	O	M	M	further upstream over wall
6451	72	Behind Bryn Gwynant	0.75		D	F	M	M	further upstream over wall
6451	73	Behind Bryn Gwynant	0.375		D	O	M	M	further upstream over wall
6451	74	Afon cors y celyn	1.125		S	F	M	P	over walls, 400m from track
6451	75	Clogwyn Llwyd	25.75		S	O	M	P	hill slopes NE of Bryn bedd
6250	76	Bryn Dinas	2.625		S	F	S	G	next to road but very steep
6250	77	Bethania/Glaslyn river	0.5		S	O	F	G	along river next to road
6250	78	Bethania/Glaslyn river	0.625		S	O	F	G	downstream
6250	79	Llyndy Isaf	0.375		S	F	S	G	steep bluff near farm
6250	80	Llyndy Isaf	0.25		S	F	F	G	by road to farm
6250	81	Coed yr Odyn	1.875		S	F	M	G	next to road
6350	82	lower Afon llynedno	2.25		S	O	M	G	following river, poss steep
6350	83	Castell	0.375		S	O	F	G	fields behind farm buildings
6350	84	lower Afon llynedno	0.375		S	F	M	G	wooded area by river
6350	85	Hafod Tan y Graig	0.875		D	O	F	G	
6350	86	Hafod Tan y Graig	2.25		D	O	F	G	small fields between forestry
6350	87	land behind Coed Eryr	1.25		D	O	F	P	boggy
6350	88	land behind Coed Eryr	5.25		S	O	F	P	
6350	89	land behind Coed Eryr	1.5		D	O	F	P	
6350	90	Knoll behind Coed Eryr	2		D	F	M	P	
6350	91	Open land N of Bryn Bedd	2		S	O	F	P	good (open) but need tractor
6350	92	Open land N of Bryn Bedd	7		D	O	F	P	good (open) but need tractor
6350	93	Open land N of Bryn Bedd	10.5		S	O	F	P	good (open) but need tractor (transect)
6450	94	woods between Bryn bedd & Bryn Gwynant	4.75		D	F	F	M	300m from track
6450	95	woods between Bryn bedd & Bryn Gwynant	2.125		D	F	F	P	further from track
6450	96	Hen Goed	34.5		D	O	M	P	large area on open hill N of Bryn Bedd merges with #75, tractor?
6450	97	Hen Goed	0.25		D	F	M	P	small wood, tractor?
6149	98	Glan Llyn	0.125		S	O	S	G	next to road, along from Bryn Dinas
6249	99	Hafod Owen	18.25		S	O	F	P	open fields NE of Hafod Owen - need tractor?
6249	100	Hafod Owen	0.5		S	O	F	P	open fields NE of Hafod Owen - need tractor?
6349	101	Llyndy Uchaf	0.5		S	O	F	G	fields near farm
6349	102	Llyndy Uchaf	0.75		D	O	F	G	fields near farm
6349	103	Llyndy Uchaf	0.5		S	O	F	G	fields near farm
6349	104	Hafod Owen	0.75		S	O	F	P	open fields NE of Hafod Owen - need tractor?
6349	105	Afon Llynedno	1.25		S	O	M	G	by river - steepish?

Gridref	ref	Name of area	Hectares	Owner	Cover	Canopy	Terrain	Access	comments
6349	106	Bryn Bedd	0.125		S	O	M	G	patches by afon llynedno
6349	107	Bryn Bedd	0.125		D	O	M	G	patches by afon llynedno
6349	108	Bryn Bedd South	4.75		S	O	F	G	fields by road s of bryn bedd
6349	109	Maes ysguboriau	0.125		D	F	F	P	small patch edge of conifer wood
6248	110	Bryn Castell	1.5		S	F	M	P	300m from nearest track
6248	111	Bryn Castell	7.75		S	O	F	M	some clearance, need 4wd?
6348	112	Bryn Castell	0.5		D	O	F	P	over wall, need 4wd?
6350	113	Plas Gwynant garden	0.5		S	O	F	G	near block 82
6350	114	Plas Gwynant garden	0.625		S	O	F	G	near block 82
6247	115	Nanmor	0.25		D	O	F	G	garden
6247	116	Nanmor	0.125		S	O	F	G	garden
6247	117	Nanmor	0.375		S	F	F	G	
6246	118	Nanmor	0.125		S	O	F	G	
5846	119	Aberglaslyn woods	4		S	F	M	P	not checked throughout, 900m from road
5846	120	Oerddwr uchaf	0.75		S	O	F	P	600m from tractor track
5846	121	Oerddwr uchaf	2		S	O	F	P	1km from tractor track
5946	122	Aberglaslyn woods	2		D	F	M	P	some steep, 600m from road
5946	123	Nantmor	0.25		S	F	F	G	gardens
6046	124	Nantmor	0.125		S	O	M	G	gardens
6046	125	Nantmor	0.125		D	F	M	G	gardens
6046	126	Nantmor	0.125		S	O	M	G	gardens
6146	127	Dolfriog wood	1.25	FE	D	F	F	P	1km from road, poss quad/tractor
6146	128	Dolfriog wood	5.5	FE	S	F	M	M	poss poor access 400m to road
6146	129	Fronwen	0.25		S	O	F	G	
6146	130	Coed Caedafydd	0.875	FE	S	F	M	G	just by edge of road
5845	131	Oerddwr uchaf Hill	17		S	O	M	P	0-200m from tractor track
5845	132	Oeddwr uchaf	0.75		S	O	F	P	need tractor
5845	133	Plas Oerddwr	11.25		D	O	F	P	need tractor, massive area, some m terrain
5945	134	Bron y Aur wood	11		S	F	M	P	some steep terrain, bottom half - better access (7ha)
5945	135	Plas Oerddwr	0.125		S	O	F	G	by 4wd track
5945	136	Plas Oerddwr	0.25		D	F	F	G	need 4wd, garden
5945	137	Plas Oerddwr	0.25		S	O	F	P	by tractor track
5945	138	Plas Oerddwr	0.25		D	O	F	G	by 4wd track
5945	139	Plas Oerddwr	0.25		S	F	F	G	by 4wd track
5945	140	Plas Oerddwr	0.375		D	F	F	G	by 4wd track, garden
5945	141	Plas Oerddwr	0.125		S	O	M	G	by 4wd track
5945	142	Plas Oerddwr	0.25		S	F	M	G	by 4wd track
5945	143	Plas Oerddwr	0.25		S	O	M	M	by 4wd track, by river
5945	144	Plas Oerddwr	0.375		D	O	M	G	by 4wd track
5945	145	Plas Oerddwr	0.375		S	O	M	G	by 4wd track
5945	146	Plas Oerddwr	0.125		D	O	F	G	by 4wd track
5945	147	Plas Oerddwr	0.25		S	F	F	M	200m to 4w track
5945	148	Nantmor old railway	0.375		S	O	F	G	
6045	149	Ty Newydd Garth	0.25		S	F	M	G	
6045	150	Bwlch llechog	0.125		D	O	F	G	garden
6045	151	Bwlch llechog	0.25		D	F	F	G	garden
6045	152	Dolfriog wood	0.625	FE	S	F	F	P	may need quad/tractor 400m to road
6045	153	The Farmyard field1	0.5		S	O	F	G	
6045	154	Dolfriog wood	3.5	FE	S	F	M	G	access max 300m
6045	155	Dolfriog wood	1.125	FE	D	F	M	G	
6045	156	The Farmyard	1.75		S	O	F	G	by river
6145	157	Dolfriog wood	4.5	FE/P	D	F	M	M	some 300m from road
6145	158	Dolfriog wood near house	1.75		S	F	M	G	closer to road
6145	159	Dolfriog wood	0.5	FE	D	F	F	G	near river
6145	160	Dolfriog wood by river	1.5		S	F	F	G	by river

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6145	161	Dolfriog wood by river	0.5		S	F	F	G	by river
6145	162	Cae Dafydd Farm	0.25		S	O	F	G	garden
6145	163	Cae Dafydd Wood	4.25	FE	D	F	M	G	some steep
6145	164	Cae Dafydd Wood	3.5	FE	S	F	M	M	access poss poor
6145	165	Behind Cae Dafydd	6.25		S	O	M	P	need tractor
6145	166	Behind Cae Dafydd	1.25		D	O	M	M	400m to road
6145	167	Dolfriog farm	0.875		S	O	F	G	garden
6145	168	Dolfriog road	0.375		S	O	F	G	by road
6044	169	Pont Talyrn	0.375		S	O	F	G	by river
6044	170	Pont Talyrn	0.625		S	O	F	G	by river
6044	171	Pont Talyrn	0.125		S	F	F	G	by river
6044	172	Pont Talyrn	0.25		S	O	F	G	by road
6044	173	Nanmor	0.125		S	O	F	G	garden
6247	174	Nanmor	0.125		S	O	F	G	garden