MW Shaw

COEDYDD ABER P.N.N.R.

A Report on the Scientific Status of Sites in the Aber Valley, Caernarvonshire

by

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SUMMARY

The aim of this report was to conduct a critical re-appraisal of the scientific status of Coedydd Aber P.N.N.R. to provide a basis from which future policy regarding its acquisition can be formulated.

The report commences with a section on background, site history and general description. The results of recent survey work are given in descriptive form and the species lists (in terms of presence and absence) are then examined in relation to the National Association-Analysis recently produced at Merlewood. This is followed by further sections dealing with discussion, detailed recommendations and management considerations. Finally, there is a summary of recommendations and the scientific information upon which they are based. An appendix contains full species lists, a map and a diagram of the National-Association-Analysis.

The main conclusions of the report confirm the high scientific status of the notified P.N.N.R. but also draw attention to adjoining areas of equal status. It is recommended that these additional areas be upgraded to P.N.N.R. status and that they should form an integral part of any future proposals for the establishment of a National Nature Reserve in the Valley.

Introduction

The Nature Conservancy has had a long history of interest in sites in the Aber Valley (Grid Ref. SH(23) 665720). Since the mid-1950's various attempts have been made to provide for the long term conservation of much of the deciduous woodland within the valley. Most of these woodlands are in the hands of the Forestry Commission who are now apparently anxious to reach some agreement as to their future management. The most likely course seems to be the establishment of a National Nature Reserve, either by lease or outright purchase. In view of the considerable financial commitment involved, both for purchase and future management, it is essential that all National Nature Reserves should be of only the highest scientific importance.

Doubts have been expressed about the scientific status of Coedydd Aber, mainly on the grounds that the previously extensive woods have been reduced and fragmented by the activities of the Forestry Commission. The Woodland Habitat Team was requested by Regional Staff to re-examine Coedydd Aber in order to report on its present scientific status and advise accordingly on the future policy towards the site, and this report represents the views of the Woodland Research Section of the Habitat Team.

Background

Coedydd Aber received no individual mention in Cmd. 7122. It was however, within the proposed Snowdonia National Park and Area of Outstanding Scientific Value. First interest in the area was expressed in about 1950, but only within the Conservancy. The woodlands of the present P.N.N.R. were included within the larger area of the Afon Goch S.S.S.I. which was notified in 1955 on the basis of a scientific report prepared by Professor P. W. Richards. The S.S.S.I. includes the woods in the lower valley as well as the upper valley with its two waterfalls (including the well known beauty spot of Aber Falls - Rhaeadr Fawr) and the neighbouring cliffs. The part of the woods on which most emphasis was put at this time was the damp valley woods which are unique in Snowdonia. The woods were stated to be the habitat of Pine martens and many birds. The waterfalls and cliffs were thought to be ecologically interesting, but with few rare plants.

In February 1956, parts of the Afon Goch S.S.S.I. were proposed as a Local Nature Reserve under Section 21 of the National Parks and Access to the Countryside Act 1949. The boundaries of the proposed L.N.R. were similar to those of the present P.N.N.R., but included parts of the woods on the west side of the Afon Aber.

In the same year, 1956, the lower part of the Aber Valley on the east side of the river was acquired by the Forestry Commission. Since the area is on 'Category B' land within the National Park (forestry not desirable but might be accepted) the Commission had to have their planting plans approved by the National Parks Committee and Council for the Preservation of Rural Wales. During this period (1957), the Conservancy tried unsuccessfully to reach agreement with the

Commission on the establishment of a Forest Nature Reserve in the Aber Valley. About 80 acres with similar boundaries to the present P.N.N.R. were involved.

Also about this time the University College at Bangor was approached in order to reach some sort of agreement concerning the future management of the woods on the west side of the valley. Agreement was reached in principle but not formalised in any way.

In 1958, the Forestry Commission acquired additional land in the valley again to the east of the river. However, when in 1962 they proposed to acquire still further land on the west side, planning permission was refused.

The revision of the Caernarvonshire County schedule in September 1961 increased the status of Coedydd Aber to that of P.N.N.R. under Section 13 of the Act. The area involved, 82 acres of oak and alder woods, were thus scheduled for their ecological interest, fauna and value for teaching and research. Since this time, a number of attempts have been made to lease the woods from the Forestry Commission, but for a variety of reasons no final agreement has been reached. The climate of opinion has grown steadily more favourable over the last few years and there now seem to be no obstacles to obtaining an agreement that will satisfy both parties. Outright purchase, as opposed to a long lease, is now under consideration.

The activities of the Forestry Commission since 1956 have to some extent damaged the scientific value of the woods mainly by fragmentation. Most felling and re-planting with conifers was carried out in the early years and the only recent planting affecting the P.N.N.R. has been in the strip along the Afon Anafon where thinning and underplanting have been carried out. The erection of National Grid electricity transmission lines over the valley in the mid-sixties was accomplished with little disturbance to the woods. More recent disturbance has resulted from road construction by the Forestry Commission. There is now a new road from Bont Newydd up both sides of Meuryn Isaf and extentions to this system are proposed in the future. The present and future activities of the Forestry Commission now seem to be more directed to the higher non-wooded slopes of the valleys running into the Aber Valley from the south.

Site History

The Aber Valley has a long history of human occupation as shown by the Iron Age hill fort at Maes-y-Gaer and by the presence of a Roman road running from the coast to the Conway Valley. Ground survey reveals numerous relicts of former habitations such as old trackways and abandoned farmsteads. In fact, the valley has probably had a more or less continuous history of agricultural settlement from Medieval times until the present day when occupation has nearly ceased and only range-type grazing persists.

In the fifteenth and sixteenth centuries the hill slopes were divided into field systems by walls, presumably to facilitate the allocation of grazing.

The long history of human activity within the valley makes it extremely likely that most of the woodlands have suffered from intermittent disturbance. There are however, no records to suggest changes in the distribution of woodland cover which resulted from this. Some more inaccessible areas such as the steep slopes on Maes-y-Gaer and the Rhaeadr Fawr gorge have probably had a more or less continuous history of tree cover. Some felling was certainly carried out about 1840 in connection with building the railway and again during both World Wars. From the early eighteenth century until 1800 Maes-y-Gaer was managed as a rabbit warren with a resident keeper. After that date the rabbits ran wild until virtually destroyed by myxamatosis. Sheep replaced rabbits as the managed population of animals on Maes-y-Gaer thus bringing it in line with the main land use elsewhere in the valley. With the advent of the Forestry Commission in 1956, the grazing patterns in the valley were altered with areas such as Maes-y-Gaer being subject to drastically reduced grazing pressure from that date, followed closely by other areas in which planting has taken place. Unfenced areas to the east of Afon Rhaeadr Fawr are still grazed by sheep, cattle and ponies whilst in those to the west sheep are the most important domestic animals.

Topgraphy and Geology

The Aber Valley with a north-west/south-east orientation is situated on the north side of the Carneddau mountain group in Snowdonia. The general topography is typical of that range with predominantly smooth, rounded slopes, but with areas of steep scree and local cliff formations. Local rainfall is about 45" p.a., but probably increasing toward the head of the valley.

The main river (Afon Aber) leaves the valley in a defile below Bont Newydd. Above the bridge, the main valley divides into the Afon Anafon running north-west and the Afon Rhaeadr Fawr running north. Separating the two valleys, is a spur about 800 ft. high, ultimately leading up to the main ridge of the Carneddau. The Rhaeadr Fawr passes into a gorge above the confluence with sides up to 60' in height consisting of steeply bedded mudstones much faulted and with quartz intrusions. On the west side of the river, there is a more or less level area before the ground rises onto the spur with moderately steep slopes. To the west, the slopes are much steeper and rise directly from the side of the river and in consequence the two sides of the river have very different drainage patterns.

Above the gorge, the valley opens out into a flatter area covered by drift deposits through which the river has cut a small gorge below the Falls. The cliffs, over which Rhaeadr Fawr and Rhaeadr Bach fall, rise steeply from this flat area. To the left of the main fall, is an area of steep scree, but elsewhere the terrain is only rocky for limited areas below and above the main cliff.

The rocks of the main valley belong to the Ashgill Series of Lower Ordovician age. The succession includes a range of associated sedimentary rocks of which the main types are intensely cleaved, blue-black and grey, often iron

stained, mudstones with some intercolated gritty bands. In some areas, bands of tuffaceous limestone are present and contain up to 50% calcite. The sedimentary series is intruded with dolerite sills which generally give rise to low base-status brown earth soils - in contrast to the shallow acidic soils derived from the mudstones. Creigiau Rhaeadr Fawr includes an outcrop of Granophyre and as such is the only area within Snowdonia where this rock type outcrops on the surface. The area is of general geological interest and requires further intensive study to determine its significance.

Over most of the area, the solid geology is masked by mountain drift, mainly of local origin, to a variable depth. The drift is particularly deep in the bottom of the valleys where it is exposed by the river in several places, notably below the gorge and the falls on the Rhaeadr Fawr and above the powerline on Afon Anafon. The exposures have lead to slumping and consequent erosion by the rivers. Generally, the soils developed on the drift are acidic in nature, but are frequently influenced by flushing from the surrounding slopes. The valley floor is a complex of brown earth/brown podsolic and gleyed soils, the latter sometimes tending to peat accumulation.

Site Description

For descriptive purposes, the notified P.N.N.R. can conveniently be divided into four blocks (numbered 1-4 on the attached map).

1. Maes-y-Gaer
2. Wern Goch
3. Coed Nant (including the recently proposed extension on the east side of the ridge)
4. Afon Anafon.

In the course of field survey carried out in September and October 1969, other areas within the valley were examined and are reported on below.

5. Coed Cae'r Mynydd
6. Coed Nant (west side of the ridge)
7. Creigiau Rhaeadr Fawr
8. The wood south-east of Maes-y-Gaer (not surveyed on the ground).

The first section will deal with the detailed site descriptions and the second will place these combinations of vegetation types within the context of the National Association-Analysis recently produced by the Woodlands Section at Merlewood.

Section One: Detailed Site Descriptions

A previous survey has been carried out in considerable detail by Mrs. Catherine Whittle (nee Richards) in 1957. This survey did not however cover the whole area at present involved in the P.N.N.R. and also the maps drawn by her were

not available. An earlier survey had also been carried out by Professor Alun Roberts and his map was consulted and showed no great changes, except for conifer plantations, from the patterns of vegetation present today. The descriptions given below reduce the number of vegetation types from the 1957 survey, but expand those of the earlier date and show general agreement with both surveys.

Notified P.N.N.R.

1. Maes-y-Gaer

Topography: a steep sided hill rising to 750' O.D. with rockly cliffs to the south but more gentle slopes to the north-west. The river runs along the bottom of the slope through a narrow alluvial belt 20-30' wide.

The woodland in this block may be conveniently divided into five areas within which the vegetation is relatively uniform.

(a) The Riverside: Immediately beside the river, a wide range of basiphilous species occur mixed with others of a wide range of tolerance. The habitats vary from scree to swamp. The tree cover includes ash, alder, birch, oak and wych elm. Vigorous regeneration of all species, but particularly oak and ash, is present in a mixed aged structure, with grazing minimal. An overgrown track runs beside the river indicating previous utilisation. Towards the north-west, is an area of steep, mobile scree on which wych elm occurs with a sparse ground cover consisting mainly of Hedera helix and Urtica dioica with Hypnum cupressiforme abundant on rocks and boulders.

In open areas Chamaenerion angustifoloium, Rubus fruticosus and Pteridium aquilinum form dense thickets with Eurhyncium striatum forming an almost pure stand beneath.

(b) Central slopes: Within this zone, oak forms, over most of the area, an almost pure stand although towards the north birch becomes locally abundant in gaps created by felling. In this area, the oak stems originate from coppice stools whereas elsewhere they are generally growing singly. The ground flora is characteristic of the dry acid oak wood series with Holcus mollis, Teucrium scorodonia, Agrostis tenuis and Deschampsia flexuosa as abundant species. The bryophyte flora is limited in species but quite abundant in quantity with Hypnum cupressiforme, Isothecium myosuroides and Polytrichum formosum occurring widely.

In open areas, oak is regenerating freely and throughout small seedlings are common. Birch seedlings were also present and Sarothamnus scoparium is abundant in one area towards the north-west. Few signs of grazing were observed.

(c) Upper slopes (west): Further up the slopes, the soil becomes shallower with patches of scree. The grassy areas of the central slopes merge with a ground flora consisting of Erica cinera and Calluna vulgaris with Hylocomium splendens and Dicranum scoparium growing between the stems. Towards the upper limit of the wood in this area, patches of hawthorn and hazel occur. A feature of interest is the vigour with

which oak, birch and hazel are extending into the heathy area on the margin of the woodland.

Within the heathy area, there are patches of dense Pteridium aquilinum and Chamaenerion angustifolium with Endymion non-scriptus, Oxalis acetosella and Rubus fruticosus as associated species and with a very poor bryophyte flora.

(d) Upper slopes (south): Towards the south the ground becomes more rocky eventually terminating in the small cliffs that can be seen from Bont Newydd. The trees are often growing out of split boulders or on small cliffs and are stunted and wind swept. In the ground flora, Teucrium scorodonia, Erica cinerea and Calluna vulgaris are conspicuous. The area is very dry and freely drained and not rich in bryophytes although Hypnum cupressiforme and Dicranum scoparium are frequent.

(e) The top of Maes-y-Gaer: The top of the hill is mainly a lightly grazed grassy sward with Deschampsia flexuosa, Agrostis tenuis, Endymion non-scriptus and Pteridium aquilinum. Isolated oak and rowan seedlings are present well away from the woodland below. In the rockier areas, Vaccinium myrtillus, Erica cinerea and Calluna vulgaris are more frequent with Canpylopus pyriformis and Dicranum scoparium. An interesting feature is the abundance of Endymion growing amongst the heathers. Towards the north and west, the grassland grades into scattered hawthorns and eventually into the birch/oak wood below.

2. Wern Goch

Topography: The area comprises the left bank of Rhaeadr Fawr and consists of the river gorge and the slopes outside. The latter have complex drainage patterns and are covered to a variable depth in drift.

Vegetation: The divisions within this area form a mosaic related primarily to drainage conditions in contrast to the mainly altidudinal divisions within Maes-y-Gaer:-

(a) The riverside woodland above the wooden footbridge and below Wern Goch. Immediately above the footbridge, alder, ash, oak and wych elm occur in the canopy. The ground flora consists of basiphilous species with Brachypodium sylvaticum and Dactylis glomerata often prominent. The boulders and rocks beside the river are usually covered in mosses notably Isothecium myosuroides. Elsewhere Dryopteris filix-mas and Athyrium filix-femina are locally abundant. Beside the river grassy, heavily grazed "lawns" are present with Agrostis tenuis, Trifolium repens and Prunella vulgaris occurring frequently.

(b) In badly drained areas, alder is present with Holcus lanatus, Rubus fruticosus and Ranunculus repens growing in the ground flora. Further away from the river, these areas are heavily grazed. Mnium undulatum, Thuidium tamariscinum and Pellia epiphylla are common bryophytes under these conditions. In some small ungrazed areas beside the river, alder is regenerating freely. Several fine stands of Equisetum telmataeia are present, growing to 3-4 ft. in height.

(c) In better drained areas further away from the river, oak is dominant with an Agrostis/Festuca sward, heavily grazed beneath. Polytrichum formosum, Rhytidiadelphus loreus and Isothecium myosuroides are frequent bryophytes in this type. Hazel forms an understorey in some areas.

(d) The gorge: A short way above Bont Newydd, the river passes through a well developed gorge. Within the gorge, an interesting but limited range of species are present forming well defined communities. Notable among these are ledges upon which Festuca altissima and Luzula sylvatica form almost pure stands. The former is a new record for Caernarvonshire (subject to confirmation) and occurs at only one other locality in North Wales (Merioneth). Elsewhere, Hedera helix covers large areas of the cliffs with Dryopteris filix-mas, and Athyrium filix-femina forming extensive 'fern ledges'. By the side of the river, a wide range of bryophytes occur notably Thamnium alopecurum, Pellia epiphylla and Metzgeria furcata.

(e) Above the gorge, the character of the alder swamp becomes more montane than lowland in its affinities with, Juncus articulatus, Juncus effusus and Narthecium ossifragum being abundant in the ground flora and with Sphagnum spp. becoming prominent.

3. Coed Nant

Topography: The wood occupies the area between the 400 and 600 ft. contours on the spur in the centre of the valley. Slopes are moderately steep and are not rocky.

Vegetation: The block of hardwoods is surrounded by conifers and consists mainly of oak which towards the top of the slope gives way to stunted birch. Generally the ground flora is uniform and comparable with the dry acid oak wood on the central slopes of Maes-y-Gaer. The following facies may however, be distinguished.

(a) Dry oakwood with Dactylis glomerata, Agrostis tenuis, Deschampsia flexuosa and Endymion non-scriptus as leading species. Probably three quarters of the Central oakwood falls into this category. Towards the top of the wood, areas have been underplanted with Abies spp. The bryophyte flora is poor with Hypnum cupressiforme as the main species. Oak seedlings are widely scattered in this area.

(b) On the north and west lower slopes, extensive thickets of Rubus fruticosus and Chamaenerion angustifolium occur.

(c) In open areas within the woodland, dense stands of Pteridium aquilinum are present with Oxalis acetosella, Endymion non-scriptus and Stellaria holostea growing below. Several old tracks pass through the wood suggesting past disturbance. Grazing pressure is quite low.

4. Afon Anafon

Topography: The woodland is growing beside the river on eroded, slumped drift.

Vegetation: Passing through the centre of the narrow strip of deciduous woodland is a sheep fence showing a marked contrast between the grazed area (on the river side) and the ungrazed on the other. The woodland may be divided into four areas:

(a) By the riverside - immediately by the river is a narrow, grassy, heavily grazed strip of "lawn". Anthoxanthum odoratum and Ranunculus repens are prominent constituents in the sward. The boulders are often covered with Isothecium myosuroides.

(b) Above the river, are a number of eroded banks with Athyrium filix-femina and Dryopteris filix-mas. On the more mobile areas Tussiliago farfara is locally abundant.

Above the eroded banks, is a mosaic of two types:-

(c) Wet alder wood, the "lowland type" of the Wern Goch area.

(d) Dry acid oakwood with Holcus mollis and Agrostis tenuis prominent.

New Areas Surveyed

5. Coed Cae'r Mynydd

Although not covered in detail, visits were made to parts of this block in the course of the other survey. The different tree dominants were also noted and confirmed by examination of aerial photographs.

Topography: The woodland occupies the right bank of the river extending from below Bont Newydd to the top of Wern Goch. The bedrock is generally more of a slatey type than the gritty rocks of Maes-y-Gaer. The steep slopes are occupied by freely drained soils but the north-east aspect results in more humid conditions than on the opposite side of the valley (south-west). One of the major features of this block is the heavy grazing pressure of sheep. The whole wood is used for over wintering of sheep from the College Farm.

Vegetation: From the superficial inspection there appear to be five major discontinuities in the woodlands:-

(a) Below Bont Newydd. In this section, the slopes are very steep with rocks emerging through the trees which at the westerly limit of the wood are mainly birch. The ground flora appears to be mainly Deschampsia flexuosa and various ferns, which are growing vigorously.

(b) The above section grades into an area of predominantly oak with open spaces occurring quite frequently. Deschampsia flexuosa is prominent in the ground flora with Pteridium in the gaps.

(c) At the base of the slope above Bont Newydd, there is a narrow strip by the river with alder and ash as canopy species and Filipendula ulmaria and Ranunculus repens in the ground flora.

(d) The main section of oak woodland has an increasing proportion of ash until it merges into scrub in which isolated large ash trees are present. Here and under the oak, hazel forms an extensive understorey. In many areas, the ground flora is sparse due to the heavy grazing, but Deschampsia flexuosa and ferns such as Dryopteris filix-mas and Dryopteris filix-femina are common. There is however, much bare ground in which slate fragments are abundant.

(e) Above the upper limit of the wood, extensive areas of hawthorn scrub are present. Further ground survey of these extensive woods is desirable before a final decision is made about the future of the area.

6. Coed Nant (western extention)

This is a continuation of the woodland in the present P.N.N.R. along the western side of the spur. The characteristic vegetation type is that of the dry grassy oakwood previously described. The oak trees in this part of the wood are shorter and wind trimmed thinning out into birch scrub at the top of the slope. The mapped area has been greatly reduced by groups of conifers and underplanting. Further road works are planned to cross the remaining area of deciduous woodland and extraction routes from higher up the slope will add considerably to the disturbance.

7. Cregiau Rhaeadr Fawr

Topography: This area is an extension from Wern Goch and includes part of the flat area below the cliffs, the scree (mobile and stabilised), and the cliff itself with a limited area of the rocky slopes above.

Vegetation: Woodland types:-

(a) Ash/oak woodland: the area contiguous to Wern Goch is a mixture of ash and oak in the canopy with isolated hazel and hawthorn bushes growing as understorey. The canopy is very open. Small groups of alder are also present. The ground flora is mainly heavily grazed Agrostis/Festuca grassland but with patches of other species depending mainly upon local drainage conditions. Hypnum cupressiforme and Rhytidiadelphus squarrosus are commonly occurring bryophytes.

(b) Cliff Woodland: The cliff has a distinctive area of woodland presumably of a relict nature. The trees are mainly birch, ash and rowan although wych elm, holly, hazel, oak and willow are also present. The trees are growing on a variety of situations from rock ledges to cracks in vertical rock faces. The area is characterised by wide variations in the ground flora occurring within small distances. On much of the area, Luzula sylvatica forms almost pure stands but elsewhere herb rich ledges with species such as Alchemilla glabra and Angelica sylvestris are common.

Towards the top of the cliff and to the west, the conditions are drier and Calluna vulgaris and Vaccinium myrtillus become prominent. The bryophyte flora is exceptionally rich with a wide range of species many of which have Atlantic affinities.

(c) Scrub. There are two types of scrub:

(i) Below the falls and above the limits of the woodland, is an extensive area of hawthorn/crab apple scrub. The trees do not appear vigorous and little regeneration is occurring although both species were fruiting abundantly. The ground flora consists of dense Pteridium with Agrostis tenuis and Endymion non-scriptus beneath.

(ii) Above the falls and on the cliffs to the south-west, are scattered groups of birch and rowan. Many of these are young and regeneration is taking place in gaps. As these are at about 1200'-1300' they are at about the altitudinal limit for trees on the exposed hill slopes and therefore represent an interesting transition zone. The ground flora consists mainly of vigorous Calluna and Vaccinium.

In addition to the woodlands in this zone, there is a range of montane and submontane vegetation which may be summarised as follows (the terms employed follow Ratcliffe (1959) wherever possible).

(i) Flush bog: a small area would be included in the extension near Wern Goch. Juncus effusus, J. articulatus and Sphagnum spp. are abundant.

(ii) Scree: to the north-east of the falls, there is a steep area of mobile scree on which only a few patches of Cryptogamma crispa and Digitalis purpurea are present.

(iii) Between the falls and the area of scrub above Wern Goch, is an extensive area dominated by Pteridium beneath which Oxalis acetosella, Endymion non-scriptus and Agrostis tenuis are abundant.

(iv) Stabilised scree: the bracken area grades into an area of fixed scree covered in vegetation mainly of Festuca/Nardus and Agrostis/Festuca types.

(v) Acidic crag vegetation: most of the cliff area falls into this category in which Deschampsia flexuosa, Calluna and Vaccinium are leading species.

(vi) Vaccinium and Calluna: above the falls, within the extension, the vegetation falls into these two types. Both species are growing vigorously and are lightly grazed and have not been burnt for some time.

(vii) Within this area, small springs emerge in which a characteristic group of species such as Carex demissa and Breutelia chrysocoma occur.

8. Wood south-east of Maes-y-Gaer

Unfortunately no ground survey was carried out in this area but from an examination of aerial photographs it appears that this may well be a useful area of relatively undisturbed woodlands. Its topographic position suggests that it should have its main affinities with the dryer types of oak woodland. A ground survey will be carried out at the earliest opportunity and a short appendix report prepared.

Section Two: Coedydd Aber in Relation to the National Association-Analysis

Introduction

A full write-up of the Association-Analysis of British woodlands has not yet been completed. However, much of the preliminary interpretive study is available and details of the methodology involved are reported in the Merlewood Research and Development Paper No. 9.

In brief, the analysis involved an objective procedure to examine presence and absence data from 2463 woodlands throughout Britain and divide these woodlands into meaningful ecological groups based on the strength of associations between species. The groups may then be interpreted in terms of the species with the highest associations on which the hierarchical divisions of the analysis are based. Further understanding may be gained by examining regional and geological trends within the groups. In the past, a standard level of Association has been used to terminate the divisions, but, in the present study, owing to the very large number of groups, the analysis was examined at a level giving 103 groups.

Any woodland for which a species list is available can be run down using the divisive species in the analysis and a dichotamous key has been prepared to facilitate this operation. The component blocks of the P.N.N.R. were located by this method. Two areas of the Aber Valley woods were included in the original analysis -'Maes-y-Gaer and Coedydd Aber' and 'Coed Nant'. Despite the further intensive survey undertaken for this report, the latter site remained in the same group and the former was reclassified into the next group.

Results

The component blocks fall into the following groups whose position in the hierarchy is shown in the accompanying diagram:-

Maes-y-Gaer: Group 37 Coed Nant: Group 87
Wern Goch: Group 37 Afon Anafon: Group 41
Creigiau Rhaeadr Rawr: Group 42 Coed Cae'r Mynydd: Group 35.

Group descriptions: These are based on generalisations made from the ecological information available concerning the groups. A key to the abbreviations to regions and geological

formations (taken from the 10" geological survey of Great Britain) is given in Appendix 3.

Group 37 (40 sites): north-western, diverse, acidic.

Regional pattern:

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
-	29	3	1	2	-	-	-	1	2	2	-

Therefore mainly from north-west England.

Underlying geology:

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox. Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
1		1				1	2	5	18	12	

Therefore predominantly on Silurran rocks and on the miscellaneous mainly acidic rocks, i.e. generally on acid soils but with extensive flushed areas.

Divisive species

The presence of Filipendula under the range of rock types represented in the group, usually indicates flushed conditions. + Galium indicates a dry acidic facies in which open areas are present (Galium cannot compete in a dense sward). + Acer pseudoplatanus usually occurs on deeper, well drained, more base rich sites and perhaps indicates the proximity and duration of human occupation in an area. The absence of Euonymus and Carex sylvatica, suggests that extensive enriched areas do not occur although + Mercurialis indicates that some base-rich influence is present. Rubus fruticosus is the final divisive species providing a division of the present group from a small group of predominantly Scottish sites. Within the Group 37 the divisions to the final group stage are on species reflecting minor variations in base status and grazing pressure.

Site inferences

The majority of sites within the group have variable combinations of species groupings. This is a characteristic of woodlands in north-west England where the high rainfall results in small streams leading to local flushes. In consequence, a wide range of edaphic conditions are present although the sites are predominantly acidic. The woods often cover large areas and frequently extend from the valley floor up the valley sides, thus covering the associated soil catona.

Group 41 (45 sites): western diverse acid.

Regional composition:

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
1	7	2	9	5	-	-	-	1	2	18	1

Therefore mainly occurring in west Scotland but with a significant proportion from south Wales and north-western England.

Underlying geology

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
						6	4	3	10	22	1

Therefore most frequently occurring on miscellaneous acidic rocks but also on the Devonian and Silurian rocks. Consequently the soils are mainly acidic but with flushed areas probably present.

Divisive species:

The presence of Filipendula, under the range of rock types represented in the group, indicates wet, usually flushed conditions. + Galium indicates a dry acidic facies in which open areas are present (Galium cannot compete in a dense sward). The absence of Acer pseudoplatanus indicates that the flushing is probably very local or gives rise to conditions without deeper well drained soils, - for example, swamps. The division based on Asperula odorata removes a group of sites with more base-rich affinities and the presence of Endymion non-scriptus is indicative of well drained sites with fairly open canopies that are now heavily grazed.

Site inference

The sites in this group are usually a steep often rocky slopes with freely drained conditions predominating. However, there are badly drained areas present, but these tend towards humus rich soils in contrast to the generally more aerobic mineral flushes of Group 37. A base rich facies is present, but is usually of limited extent. The woods are usually large and again occupy both valley sides and floors. Variations within the group are due mainly to management and grazing pressure. There is a distinct division between Scottish sites and those from south Wales and north-west England.

Group 42 (24 sites): Welsh, grazed, diverse acidic.

Regional composition:

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
-	2	6	7	4	-	-	-	-	-	4	1

Therefore predominantly Welsh but with significant proportion of sites from north-east England.

Underlying geology:

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox. Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
							4	2	6	7	5

Therefore mainly on the miscellaneous acidic, Silurian and Ordovician rocks. The occurrence of a group of sites on these particular rock types suggesting acidic soils.

Divisive species

The presence of Filipendula under the range of rock types represented in the group indicates wet usually flushed conditions. + Galium indicates a dry acidic facies in which open areas are present (Galium cannot compete in a dense sward). - Acer pseudoplatanus indicates that the flushing is probably very local or gives rise to conditions without deep well drained soils, for example, swamps. The division based on Asperula oderata removes a group of sites with more pronounced base-rich affinities. The absence of Endymion is indicative of several convergent features notably very wet soils or heavy grazing. The correlations implicit in the + Quercus division are on the negative side of the group which have certain features in common.

Site inferences

The position of this group on the right of a main division within the hierarchy suggests that it contains a more narrow range of species than the previous groups. Nevertheless a distinctive base-rich facies is present although usually of rather limited extent. There is some evidence for convergence within this group. This could be due to a series of factors, but heavy grazing seems likely to be a linking factor. As a result there is a mixture of more conventional site types. There is a marked discontinuity within the group between the Welsh sites and those from Scotland and north-east England.

Group 87 (39 sites): Welsh, dry rocky.

Regional composition:

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
-	3	7	15	7	-	1	-	3	-	2	1

Therefore markedly from south Wales but with a representative proportion from north Wales and north-east England.

Underlying geology:

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox. Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
							4	5	21	7	2

Therefore mainly on Silurian rocks but with some sites occurring on the miscellaneous acidic type - a common feature of this group is free drainage and shallow skeletal soils markedly acidic in nature.

Divisive species

The absence of Acer, Filipendula, Mercurialis and Ajuga indicate that this group of localities have no extensive base-rich areas. In conjunction with the absence of Sphagnum spp. and the presence of Galium the site conditions of the group are well drained acidic soils with exposed rocks. The presence of Lonicera, within this range of sites is usually indicative of cliffs and the group of sites without it, do not usually have the feature well developed. The absence of Cirsium palustre and Erica tetralix is indicative of dry conditions and confirms the description of an extreme facies of well drained, dry, acidic woodlands.

Site inferences

The majority of sites within the group conform to the above description which therefore appears to be well defined. Variations within the group are due mainly to species related to management differences or grazing pressure.

Group 35 (4 sites): Exceptional diverse (north-west)

Regional composition

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
-	3	-	1	-	-	-	-	-	-	-	-

Therefore mainly from north-west England.

Underlying geology

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox. Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
		3						1			

Therefore mainly connected with Carboniferous limestone.

Divisive species

The presence of Filipendula indicates a usually wet influence although with limestones this is not necessarily so. + Galium is indicative of a dry acidic facies in which open areas are present. Acer pseudoplatanus is present on deep, moist well drained rich soils although it can occur on shallow limestone soils. Euonymus occurs always on eutrophic sites and usually on calcareous soils.

Site inferences

Within this small group the variation is exceptional in both basic and acidic directions. Two of the north-western sites are characterised by having a limestone/slate boundary within the wood. The other two sites are well known for their exceptionally diverse site conditions. All four sites are large in area. There are no divisions within the group.

Complete Site

The affinities of the six blocks may be summarised on a National basis by combining the data from the five groups of the Association-Analysis into which they fall:

Total number of sites involved in National Analysis (153):-

Group 37 (40 sites)	Group 35 (4 sites)
Group 41 (46 sites)	Group 87 (39 sites)
Group 42 (24 sites)	

Regional composition

SW	NW	NE	SWA	NWA	EA	SE	S	M	SSc	WSc	ESc
1	44	18	33	18	-	1	-	5	4	26	3

Therefore the affinities are mainly to north-western England and Wales, but also to west Scotland and to a lesser extent to north-east England.

Underlying geology

Chalk	Ool. Li.	Carb. Li.	Keup. Marl.	Ox. Clay	Weald Clay	Devon	Sand	Mill Grit	Silu.	Misc. Acid	Ordo.
-	1	4	-	-	-	7	14	16	55	48	8

Therefore the site shows no aberrant features and conforms with other woodlands occurring on similar sites (Coedydd Aber is on the Ordovician rocks and on miscellaneous acidic types in terms of the analysis).

Divisive species

As a complete site Coedydd Aber falls into group 35 - exceptional diverse sites - providing an expression of its variability and value in providing a very wide range of facies within a well defined series of combined site characters.

Discussion

To summarise the vegetation in broad, conventional ecological terms, four major types can be identified within the complex of the present P.N.N.R.

1. Dry grassy oakwood with Agrostis tenuis, Teucrium scorodonia, Endymion non-scriptus and Hypnum cupressiforme in the ground flora.

2. Dry heathy oakwood with Erica cinerea, Calluna vulgaris, Dicranum scoparium and Hylocomium splendens in the ground flora.

3. Riversides. (a) Basiphilous: with a diversity of canopy and ground flora species. (b) The gorge with Luzula sylvatica and ferns dominant.

4. Alder swamps. (a) Lowland type with Ranunculus repens and Rubus fruticosus in the ground flora. (b) Upland with Juncus effusus and Sphagnum spp. abundant.

If the additional areas surveyed are considered, two further types can be identified.

5. Cliff Woodland: with a diversity of species but with Luzula sylvatica and Vaccinium myrtillus characteristic.

6. Deschampsia - Fern communities. Much of the Coed Cae'r Mynydd area consists of variations within this broad type.

Summarising the seven blocks of woodland:

Type	1 Maes-y Gaer	2 Wern Goch	3 Coed Nant	4 Afon Anafon	5 Coed Cae'r Mynydd	6 Coed Nant (west)	7 Creigiau Rhaeadr Fawr
1	*		*	*		*	
2	*						
3(a)	*	*		*			
(b)		*			*		
4(a)		*		*	*		
(b)		*					
5							*
6					*		

From the four blocks within the P.N.N.R. 137 species of vascular plants were recorded - 113 from Wern Goch, 94 from Maes-y-Gaer, 71 from Afon Anafon and 42 from Coed Nant. 124 species were recorded from Creigiau Rhaeadr Fawr, but no detailed records were made from Coed Cae'r Mynydd. Full species lists are given in Appendices 1 and 2. Creigiau Rhaeadr Fawr contained 26 species not within the P.N.N.R. Many of these have montane affinities such as Saxifraga stellaris and Alchemilla glabra.

Fauna of the Aber Valley

So far little attention has been paid to the zoological interest of the area, largely because this is not feasible on the basis of rapid surveys.

The bird populations of the valley have been studied and a wide range of species have been recorded in both breeding and non-breeding categories. The woods always give the impression of having a large population of woodland birds (e.g. chaffinches and tits). The presence of scrub areas and many older and often decaying trees result in a wide range of nesting sites. Dr. Gibb of the University Zoology Department, Bangor, has been studying Pied Flycatcher populations above Bont Newydd. This work is carried out in co-operation with Conservancy staff in Merionethshire and in mid-Wales. The cliffs at the head of the valley provide a useful addition to the range of bird habitats.

The invertebrate fauna, particularly that associated with the woodland canopy, is active if not rich. There are large populations of canopy defoliator at frequent intervals and in 1963-64 a population explosion of Winter moth (Operophtera sp.) spread from the deciduous woodland to inflict substantial damage on nearby conifers. More information concerning invertebrates could doubtless be obtained from the Agricultural Zoology Department who use the area for teaching.

There is little detailed information concerning the mammalian fauna. Red squirrels are still common within the valley and the grey may not have reached this area yet. Fox, hare and probably rabbit are present. No badger setts were recorded during the survey but probably exist. The valley is said to be the habitat of Pine martens and there seems little cause to doubt this statement. Cattle, ponies and sheep graze the valley but no deer have been recorded yet.

The rivers are notably free from pollution of any sort and, despite its small size, the Afon Aber attracts a good run of sea trout and some salmon in addition the resident brown trout. The Aber Valley should thus offer a suitable habitat for the otter, particularly the more inaccessible parts within the woods.

In general, the Aber Valley contains an unusually wide range of habitats for both invertebrate and vertebrate fauna.

Recommendations

In general, the current survey confirms the high scientific status of Coedydd Aber P.N.N.R. Some areas, notably Coed Nant and Afon Anafon have been damaged by the activities of the Forestry Commission, but this does not represent a serious loss. Considering the areas within the notified P.N.N.R. in detail :-

1. Maes-y-Gaer (33 acres)

The high scientific status of this block is confirmed and it appears to involve no particular management problem. The present boundaries are quite satisfactory, the adjoining areas of woodland to the north and south being considerably disturbed, the former by felling (is now mainly birch) and the latter, by the introduction of conifers.

2. Wern Goch (20 acres)

Again, the scientific status of this block is confirmed or even enhanced by discovery of the gorge area which does not appear to have been described previously, probably because of its relative inaccessibility. The one disadvantage of this block is its shape, long and narrow, but this is unavoidable. Presumably the eastern boundary adjoining the agricultural land will have to be enclosed, giving a fence line of over 1,000 yards. The area can, however, only be discussed fully in the context of the policy relating to Coed Cae'r Mynydd (5).

3. Coed Nant (17 acres)

This area has been much reduced by the activities of the Forestry Commission both in planting and road construction. However, including the previously proposed extension on the eastern slope (3 ex.) it still constitutes a worthwhile area of woodland and should definately be retained in the P.N.N.R.

4. Afon Anafon (5 acres)

The survey casts no doubts on the scientific status of this block except to indicate that most of the ecological types represented within it are as well or better represented elsewhere. The configuration of the block is far from ideal, with a long boundary (not far short of one mile all round) for such a small area. The woods along the western edge away from the river have also been underplanted in most places. It was therefore concluded that unless the area was considered along with the woods on the opposite side of the river, below Wern-y-Pandy, it might be better to discard this outlying block from the P.N.N.R. and concentrate on other more important areas.

It is now proposed to consider the additional areas covered by this survey in relation to their scientific status and suitably for inclusion in a National Nature Reserve.

5. Coed Cae'r Mynydd (79 acres)

It is clear from a study of the past negotiations relating to the Aber Valley (see section on Background) that this large area of woodland was always considered to be an integral part of any nature reserve or conservation area to be established in the valley. It is of course within the Afon Goch S.S.S.I. but has never been notified as being of potential National Nature Reserve status. As previously noted the land all belongs to U.C.N.W. College Farm and its current use is overwintering of sheep.

This present survey has drawn attention to the high scientific status of this area, and particularly the more inaccessible parts near the river. The other half of the Wern Goch gorge is included within this block. The main body of woods have suffered a long period of heavy grazing and are now rather open-canopied in places. Many good trees are however still present and judging from the vigorous regeneration seen elsewhere in the valley the exclusion of sheep or a marked reduction in grazing would result in a rapid recovery.

The only reservation to recommending that this area be upgraded to P.N.N.R. status is that, before such a step is taken, there should be a more thorough survey of the area than was possible within the limitations of the present exercise. It would be a serious mistake to confront the U.C.N.W. authorities with anything less than a fully prepared and documented case, which is not available at the present time.

6. Coed Nant (western side) (16 acres)

As has already been stated, much of this area has now been converted to conifers. There are also plans for a road extension and extraction routes within what is already reduced to a narrow strip. Apart from these considerations, it would have been a useful addition to Coed Nant to which however, it adds nothing more than increased area. It is therefore concluded that this area should not be considered as P.N.N.R. status. However, in terms of conservation of the valley as a whole it would be a mistake to loose any existing hardwood areas and, if the Forestry Commission can be prevailed upon to retain this piece of woodland, this should be done. In fact, it could be taken as a matter of general policy that all existing areas of hardwood be retained to provide a more desirable balance between hardwoods and conifers when the Commission complete their planting programme in the upper valleys.

7. Creigiau Rhaeadr Fawr (120 acres)

This large area is still within the Afon Goch S.S.S.I. and includes the two waterfalls and cliffs specified in the original notification. Much of the area is not in fact woodland at the present time, but the range of montane and submontane habitats included would provide additional interest to the P.N.N.R. and extend the range of its scientific value.

The area below the cliffs (about 75 acres) is all potential wood , most of it still retaining a scattered tree cover at the present time. As already described, the cliffs themselves carry a "relict" woodland, presumably because of their relative inaccessibility to sheep. The transition zone above the falls from woodland to dwarf shrub is of some interest, the only other examples of woodlands at or near their altitudinal limit being at Coed Dolgarrog N.N.R. and the very small woodland at Cwn Glas Crafnant N.N.R. The vigorous Calluna and Vaccinium in this area is unusual in the Carneddau (see Ratcliffe 1959) and is a vegetation type of limited extent in Snowdonia.

Dr. A. J. E. Smith (Lecturer in Botany, U.C.N.W., Bangor) was consulted concerning the bryophytic interest in the area. Above Bont Newydd is regarded as a good site for bryophytes but not exceptional. The whole site is regarded as excellent for teaching purposes and is used as such by the University owing to the wide range of conditions. The assemblage of bryophytes is similar in composition to Coed Dolgarrog but not as rich. It is also comparable with valleys in Merionethshire but again not as rich. However, in his opinion, the particular combination of species in the Aber Valley was unlikely to occur elsewhere. Generally the bryophytic flora has strong Atlantic affinities, but with many of the extreme species within this range absent. Dr. Smith also emphasised that on Creigiau Rhaeadr Fawr, particularly to the west, there is a fine assemblage of Atlantic bryophytes. The list of bryophytes provided by Dr. Smith is given in Appendix 3. This list was compiled only from the valley of Rhaeadr Fawr and comprises 120 species - Dr. Smith has records of a further 135 species from elsewhere in the Aber Valley.

On the basis of the information gained in the survey, the position in the National Association-Analysis and the other features discussed above it is recommended that Creigiau Rhaeadr Fawr be upgraded to P.N.N.R. status.

The ownership position of the area is not known. The low ground below the cliffs and to the west of the Afon Rhaeadr Fawr probably belongs to the University, whilst that to the east may belong to the Forestry Commission. The cliffs and the land above may be National Trust.

8. Wood south-east of Maes-y-Gaer (15 acres)

As already stated this area was not included in the present survey, but it looks useful on the aerial photograph. It is therefore recommended that it should be examined in the near future with a view to making a firm decision on its status. The area is probably best regarded as an extension of Maes-y-Gaer. At the very least, the general policy of retaining hardwood areas, discussed in relation to Coed Nant (6), would certainly apply to this area.

Management Considerations

The Aber Valley is an area of considerable interest to the general public. There is already considerable public pressure and this will undoubtedly grow with time. Main attractions at the present are the Aber Falls (signposted from the main A.55 road), the river, picnicing and walking. Main footpaths from the Valley lead over the Carneddau to the Conway Valley, Llyn Ogwen and Bethesda. The presence of the general public in large numbers gives an ideal opportunity to put over the Nature Conservancy's point of view. It must not, however, be forgotten that such commitments are extremely demanding on our already limited resources of time and manpower. In particular, acquisition of the Creigiau Rhaeadr Fawr (including the Aber Falls) would involve us in the direct responsibility for a well-known beauty spot. In general, woodlands are not particularly susceptable to public pressure (in the way that sand dune

systems are) and there is no reason why the requirements of amenity and conservation should not be happily combined in the Valley.

The presence of the Forestry Commission working alongside us in the Valley also presents us with other valuable opportunities both for inter-organisational understanding and co-operation in the management of the area and for a unified approach to public relations and amenity. For example, joint Nature Trails illustrating the aims of commercial forestry and conservation and their inter-relationships could be set out.

Another important use of the area, that of education, must also receive due attention. The Aber Valley is the nearest area to the University containing a comparable range of ecological types and has been extensively used by them for teaching purposes. This use could be further widened to school sixth forms without placing undue pressure on the area.

The notified P.N.N.R. plus the two major extensions recommended on this report (a total of 269 acres) constitute a substantial landholding (comparable to that in the Vale of Ffestiniog) and the management problems inherent in the ownership of a number of isolated blocks and narrow strips have been largely overcome. It should also be appreciated that activities of the Forestry Commission will eventually result in a considerable area (several square miles in extent) of woodland habitat. The P.N.N.R. and its proposed extensions will be an integral part of this complex which may go a long way towards reducing the island effect. As has been argued in the Coed Cymerau N.N.R. Management Plan Shaw 1963), conifers and their possible future regeneration are unlikely to constitute a serious threat to the deciduous woodlands.

Summary and Conclusions

The high scientific status of the notified P.N.N.R., both as a whole and in its component parts, is confirmed by the present survey and an examination of its position in the National Association-Analysis. The survey has however, drawn attention to other areas within the Aber Valley that are of equal scientific status and it is recommended that, subject to the reservations previously made, these be upgraded to P.N.N.R. status. The following table summarises the position.

	Name of Area	Acreage	Recommendation
1.	Maes-y-Gaer	33	Retain as P.N.N.R.
2.	Wern Goch	20	Retain as P.N.N.R.
3.	Coed Nant (+ E. extension)	17	Retain as P.N.N.R.
4.	Afon Anafon	5	Probably exclude from P.N.N.R.
5.	Coed Cae'r Mynydd	79	Upgrade to P.N.N.R. (subject to further survey)
6.	Coed Nant	16	Do not upgrade but try to retain
7.	Creigiau Rhaeadr Fawr	120	Upgrade to P.N.N.R.
8.	Near Maes-y-Gaer	15	Further survey required

Present P.N.N.R.	=	70 acres
Proposed Extension	=	199 acres
TOTAL		269 acres

The main scientific reasons for confirming the P.N.N.R. status of Coedydd Aber and recommending P.N.N.R. status for its proposed extensions can be summarised as follows:-

(1) The complex of woodlands within the valley, when considered as a single site, falls within a group of the National Association-Analysis defined as "Exceptional diverse". As such it is the only representative of this type at present known from North Wales.

(2) The six component blocks of the woodland surveyed fall within five groups of the National Association-Analysis. All the groups have marked north-western or Welsh affinities and with one exception occur on almost exclusively acidic rock types.

(3) The valley as a whole contains an unusually wide range of habitats for birds and mammals.

The main reason for Coedydd Aber being one of the most diverse woodlands in North Wales is partly because of its large area but also because it occupies the valley floor in addition to the sides, thus providing a more or less complete catena. Valley floor woods of any size are fairly uncommon in Wales and the occurrence of both valley floor and side woods together, and reasonably intact, is even less common. The geology, which includes base-rich dolerites and calciferous beds within an acid matrix, coupled with variable contributions from drift and a complex drainage pattern, contributes further to the diversity.

The position of Coedydd Aber within the North Wales series of oakwoods, based on geological/edaphic (base-rich

to acidic) and climatic (low to high rainfall) variables, is not immediately obvious within the framework of the Regional Association-Analysis, but is somewhat clearer in the National-Analysis. In general, however, diversity and edaphic conditions tend to dominate the analysis and climatic gradients are not conspicuous (they are often related edaphic conditions anyway) except as broad inter-regional differences such as western oceanic types and eastern continental types. Looked at as a purely edaphic series, Coedydd Aber fits in quite well asasort of intermediate between the base-rich Coed Gorswen N.N.R. and other woods with some base-rich influence such as Coed Dolgarrog N.N.R., which itself grades into the more acidic woods in the Ffestiniog Valley. Since the other examples of the North Wales series occupy slope sites with predominantly free draining soils the valid comparison may only be with similar sites in Coedydd Aber, such as parts of Maes-y-Gaer and Coed Nant. If these areas are taken as the low rainfall (ca. 45" p.a.) representative of an acid oakwood a direct comparison can be made with similar woods under higher rainfall such as Coed Camlyn, Coedydd Maentwrog and Coed Cymerau.

Other, non-scientific reasons for recommending Coedydd Aber as a P.N.N.R. are:-

(4) It is an important area for teaching, both University and school.

(5) It is an important amenity area and has a high potential in the field of public relations.

(6) It should provide a valuable and practical meeting point for co-operation between the Nature Conservancy and the Forestry Commission.

Acknowledgements

We wish to acknowledge the assistance of Regional Staff in North Wales through woodland survey in connection with the Reserve Review, access to files and discussion. We would also thank colleagues at Merlewood for useful discussion during the writing of the report.

APPENDIX 1. SPECIES LISTS FROM COEDYDD ABER P.N.N.R.

1 = Maes-y-Gaer
2 = Wern Goch (Valley of Afon Rhaeadr Fawr)
3 = Coed Nant
4 = Afon Anafon

	1	2	3	4
Acer pseudoplatanus	*	*		
Achillea ptarmica		*		
Agrostis canina	*	*	*	*
Agrostis stolonifera		*		*
Agrostis tenuis	*	*	*	*
Ajuga reptans		*		*
Alnus glutinosa	*	*		*
Anemone nemorosa			*	
Agelica sylvestris	*	*		*
Anisantha sterilis	*			
Anthoxanthum odoratum	*	*	*	*
Arrhenathrum elatior				*
Arum maculatum	*			
Asplenium adianthum-nigrum	*			
Asplenium trichomanes	*			
Athyrium filix-femina	*	*	*	*
Betula spp.	*	*	*	*
Brachypodium sylvaticum	*	*		
Calluna vulgaris	*	*	*	*
Campanula rotundifolia			*	*
Cardamine flexuosa	*			
Cardamine pratensis		*		
Carex binervis		*		
Carex echinata		*		
Carex panicea		*		
Carex remota	*	*		*
Castanea sativa	*			
Chamaenerion angustifolium	*	*	*	*
Carysosplenium oppositifolium	*	*		*
Circaea lutetiana	*	*		*
Cirsium palustre		*		
Cirsium vulgare	*	*		*
Conopodium majus		*		
Corydalis claviculata			*	
Corylus avellana	*	*	*	*
Crataegus monogyna	*	*	*	*
Crepis paludosa				*
Dactylis glomerata	*	*	*	*
Deschampsia caespitosa	*	*		*
Deschampsia flexuosa	*	*	*	*
Digitalis purpurea	*	*	*	*
Dryopteris austriaea	*	*		*
Dryopteris filix-mas	*	*	*	*
Endymion non-scriptus	*	*	*	*
Epilobium montanum	*	*		*
Equisetum telmataeia	*	*		
Erica cinerea	*	*	*	*
Fagus sylvatica	*			
Festuca actissima	*	*		
Festuca gigantea	*	*		
Festuca ovina	*	*	*	*
Fraxinus excelsior	*	*	*	*

	1	2	3	4
Galeopsis tetrahit	*	*	*	
Galium aparine	*	*		*
Galium hercynicum	*	*	*	*
Galium palustre	*	*		*
Geranium robertianum	*	*	*	*
Geum urbanum	*	*		
Glechoma hederacea	*			
Glyceria spp.		*		*
Hedera helix	*	*		*
Heracleum sphondlium	*			
Holcus lanatus	*	*	*	*
Holcus mollis	*	*	*	*
Hydrocotyle vulgaris		*		
Hyperichum pulchrum	*	*	*	
Ilex aquifolium	*	*	*	*
Juncus articulatus		*		
Juncus bulbosus	*	*		
Juncus effusus	*	*		*
Lapsana communis	*	*		*
Leontodon spp.		*		
Lonicera periclymenum	*	*		*
Lotus corniculatus		*		
Luxula campestris		*		
Luzula sylvatica	*	*		
Lysimachia nemorum	*	*		*
Malus sylvatica			*	
Melica uniflora				*
Melampyrum pratensis	*	*		
Melandrium rubrum	*	*		*
Mentha aquatica		*		
Mercurialis perennis	*	*		
Molinia caerulea		*		
Montia fontana	*	*		*
Mycelis muralis	*	*		
Narthecium ossifragum		*		
Oenanthe croccata	*	*		*
Oxalis acetosella	*	*	*	*
Pedicularis palustris		*		
Phyllitis scolopendrium	*			
Poa nemoralis		*		
Polypodium vulgare	*	*		*
Potentilla erecta	*	*	*	*
Potentilla sterilis	*	*		*
Primula vulgaris		*		
Prunella vulgaris	*	*		*
Prunus spinosa		*		
Pteridium aquilinum	*	*	*	*
Quercus spp.	*	*	*	*
Ranunculus acris		*		
Ranunculus flammula		*		
Ranunculus repens	*	*		*
Rosa spp.	*	*	*	
Rubus fruticosus	*	*	*	*
Rubus idaeus	*	*	*	*
Rumex acetosa	*	*	*	*
Salix spp.	*	*		
Sambucus nigra	*	*		*
Sanicula europea	*	*		
Sarothamnus scoparium	*			
Schrophularia nodosa	*			
Sedum anglicum	*	*		*
Senecio spp.		*		

	1	2	3	4
Sieglingia decumbens		*		
Sium erectum		*		
Solanum dulcomara	*			
Solidago virgaurea		*		*
Sorbus aucuparia	*	*	*	*
Stachys sylvatica	*			
Stellaria holostea	*	*	*	*
Succisa pratensis		*		
Taraxicum agg.	*	*		*
Teucrium scorodonia	*	*	*	*
Trifolium repens		*		
Tussilago farfara		*		*
Ulex europaeus	*			
Ulmus glabra	*	*		*
Umbilicus rupestris	*			
Urtica dioica	*	*	*	*
Vaccinium myrtillus	*	*	*	*
Valeriana officinalis		*		
Veronica beccabunga		*		
Veronica chamaedrys		*		
Veronica officinalis	*	*	*	
Viola palustris		*		
Viola riviniana	*	*	*	*

APPENDIX 2

List of species from Creigiau Rhaeadr Fawr (species not recorded from elsewhere in the P.N.N.R. underlined).

Agrostis stolonifera, A. tenuis, Alchemilla glabra, Alnus glutinosa, Angelica sylvestris, Anthoxanthum odoratum, Athyrium filix-femina, Bellis perennis, Betula spp., Blechnum spicant, Brachypodium sylvaticum, Calluna vulgaris, Cardamine hirsuta, C. pratensis, Carex binervis, C. demissa, C. echinata, C. panicea, C. pulicaris, Centaurea nigra, Chamaenerion angustifolium, Chrysosplenium oppositifolium, Circaea lutetiana, Cirsium palustre, Corylus avellana, Crataegus monogyna, Crepis paludosa, Cryptogamma crispa, Cynosurus cristatus, Dactylis glomerata, Deschampsia caespitosa, D. flexuosa, Digitalis purpurea, Dryopteris filix-mas, Dryopteris austriaca, Empetrum nigrum, Endymion non-scriptus, Epilobium pedunculare, E. montanum, Erica cinerea, Eriophorum angustifoloium, Festuca ovina, F. vivipara, Filipendula ulmaria, Fraxinus excelsior, Galium hercynicum, G. palustre, Geranium robertianum, Geum urbanum, Hedera helix, Holcus lanatus, H. mollis, Hydrocotyle vulgaris, Hymenophyllum wilsonii, Hypericum androsaemum, H. elodea, H. pulchrum, Ilex aquifolium, Jasione montana, Juncus articulatus, J. bulbosus, J. effusus, Lathyrus montana, Linum catharticum, Lonicera periclymenum, Lotus corniculatus, Luzula pilosa, L. sylvatica, Lysimaehia nemorum, Malus sylvatica, Mentha aquatica, Menyanthes trifoliata, Mercurialis perennis, Montia fontana, Mycelis muralis, Nardus stricta, Narthecium ossifragum, Oxalis acetosella, Pedicularis palustris, Pinguicula vulgaris, Plantago lanceolata, Poa anna, P. pratensis, Polypodium vulgare, Potomegeton spp., Potentilla erecta, P. sterilis, Primula vulgaris, Prunella vulgaris, Pteridium aquilinum, Quercus spp., Ranunculus acris, R. flammula, R. hederacea, R. repens, Rosa agg., Rubus fruticosus agg., Rubus idaeus, Rumex acetosa, Sagina procumbens, Salix spp., Saxifraga stellaris, Sedum anglicum, Selaginella selaginoides, Siellingia decumbens, Solidago virgagirea, Sorbus aucuparia, Stachys officinalis, Stellaria holostea, Succisa pratensis, Taraxacum agg., Teucrium scorodonia, Thymus drucei, Trifolium repens, Ulex spp., Ulmus glabra, Umbilicus rupestris, Urtica dioica, Vaccinium myrtillus, Valeriana officinalis, Veronica chamaedrys, V. officinalis, Viola palustris, V. riviniana.

APPENDIX 3

List of bryophytes recorded from Afon Rhaeadr Fawr above Bont Newydd and below the falls (information supplied by Dr. A. J. E. Smith, Department of Botany, U.C.N.W., Bangor)

Mosses

Acrocladium cuspidatum
Amphidium mougeottii
Andreea rothii
Andreea rupestris
Anomodon viticulosus
Antitrichia curtipendula
Atrichum undulatum
Barbula cylindrica
Bartramia pomiformis
Brachythecium plumosu,
Brachythecium populeum
Brachythecium rivulare
Brachythecium rutabulum
Breutelia chrysocoma
Bryum alpinum
Bryum capillare
Bryum pallens
Bryum pseudotriquetrum
Camptothecium lutescens
Camptothecium sericeum
Camplium stellatum
Camphylopus atrovirens
Camphylopus flexuosa
Camphylopus fragilis
Camphylopus piriformis
Ctenidium molluscum
Dicranella heteromalla
Dicranum majus
Dicranum scoparium
Diphyscium foliosum
Ditrichum heteromallum
Eurhyncium murale
Eurhyncium praelongum
Eurhyncium riparium
Eurhyncium striatum
Fissidens adianthoides
Fissidens bryoides
Fissidens cristatum
Fissidens Eu
Fissidens taxifolius
Fontinalis aquatica
Grimmia rivulare
Grimmia doniana
Grimmia trichophylla
Heterocladium heterostichum
Hookeria lucens
Hylocomium splendens
Hycomium flagellare
Hypnum cupressiforme
Hypnum resupinatum
Isopterygium elegans
Isothecium myosuroides
Leptodontium flexifolium
Leucobryum glaucum
Mnium hornum
Mnium punctatum
Mnium undulatum
Neckera complanata
Orthotrichium lyellii
Philonotis fontana
Plagiothecium denticulatum
Plagiothecium silvaticum
Plagiothecium undulatum
Pleurozum schreberi
Polytrichum aloides
Polytrichum alpestre
Polytrichum alpinum
Polytrichum commune
Polytrichum formosum
Polytrichum formosum
Polytrichum juniperinum
Polytrichum piliferum
Polytrichum urnigerum
Pseudocleropodium purum
Ptychomitrium polyphyllum
Rhacomitrium aciculare
Rhacomitrium aquaticum
Rhacomitrium heterostichum
Rhacomitrium lanuginosum
Rhytidiadelphus loreus
Rhytidiadelphus squarrosus
Rhytidiadelphus triquetrum
Sphagnum papillosum
Sphagnum subsecundum
Tetraphis pellucida
Thanmium alopecurum
Thuidium tamariscinum
Tortula murale
Ulota crispa

Hepatics

Calypogeia fissa
Conocephalum conicum
Diplophyllum albicans
Frullania dilitata
Frullania tamariscinium
Lejeunea patens
Lophozia alpestris
Lophozia ventricosa
Marsupella aquatica
Marsupella emarginata
Marsupella funckii
Metzgeria conjugata
Metzgeria furcata
Mylia taylori
Nardia scalaris
Nowellia curvifolia
Pellia epipylla
Plagiochila asplenoides
Plagiochila spinulosa
Porella laevigta
Porella thuja
Ptilidium ciliare
Reboulia hemispharica
Riccardia pinguis
Saccogyna viticulosus
Scapania compacta
Scapania gracilis
Scapania nemorosa
Scapania undulata
Trichocolea tomentella
Tritomaria quinquedenta

APPENDIX 4

(a) Key to Regional abbreviations used in the Association-Analysis group interpretations. The regions are those of the conservation branch of the Conservancy.

S: South
SE: South-East
SW: South-West
SSc: South Scotland
NE: North-East (England)
NW: North-West (England)
NWA: North Wales
SWA: South Wales

M: Midlands
EA: East Anglia
SSc: South Scotland
ESc: East Scotland

(b) Key to geological abbreviations used in the Association-Analysis Group interpretations including Series combined under single heads.

Chalk: All chalk formations.
Ool. Li: Oolitic limestone, Corallian, Cornbrash.
Carb. Li: Carboniferous limestone, Magnesian limestone, Scottish limestones.
Weald Clay: Weald Clay, Oldhaven series, Hastings series, Portland and Perbeck beds.
Ox. Clay: Oxford clay, Kimmeridge Clay.
Keup. Marl: Kemper Marls, Lias Series.
Sand: Greensand, Keuper and Bunter sandstone, Bagshot series, Old red sandstones, Scottish calciferous sandstones.
Devon: Devonian series excluding sandstones.
Mill. Grit: Millstone grits, Culm measures, Barren and productive coal measures.
Silu.: Ludlow, Wenlock and Tarannon.
Misc. Acid: Cambrian series, Lavas and tuffs, granites and other igneous rocks plus any types not belonging to other groups and sites whose exact position was unknown.
Ordo.: Ashgill, Llandeilo and Arenig series.