

Case Study 11

Cwm Berwyn Forest, Ceredigion & Cefn Llwyd Forest, Denbighshire

Location and ownership of woodlands

This case-study deals with two separate upland spruce forests in Wales:-

1. Cwm Berwyn Forest, by Tregaron, Ceredigion [NGR SN 727573]. The land is owned and managed by the Forestry Commission. The area under ATC management extends to 200 ha out of a total forest area of 1800 ha (some 11%).
2. Cefn Llwyd Forest, Llandderfel, Denbighshire [NGR SJ 010360]. The land is owned by private individuals and managed on their behalf by UPM Tilhill. The area under ATC management extends to 330 ha out of a total forest area of 865 ha (some 38%) which is expected to expand as transformation progresses. The forest adjoins the Berwyn SSSI and contains small relicts of semi-natural woodland.

Significance/ reasons for selection as case-study example

These sites were chosen as case-studies within this project for two main reasons:-

1. They represent two of the better-developed examples of adoption of alternative silvicultural systems in Sitka spruce plantations on more challenging upland sites in Wales (adoption scenario 6). They provide valuable evidence for managers of similar forests elsewhere as to what can realistically be achieved. The Cefn Llwyd site has been the most prominent British example of the strip shelterwood approach for many years, whereas the Cwm Berwyn site represents the Forestry Commission's trial site for adoption of ATC in exposed/ unstable upland spruce. Valuable operational experience has been gained for ATC on sensitive peaty soils.
2. One part of the Cefn Llwyd site also has interest as an unusual example of successful diversification of mature upland spruce, pine and larch plantations by a fairly intimate group selection working system (adoption scenarios 4, 5 and 10).

Owner objectives for management (including adoption of ATC systems)

Both Cwm Berwyn and Cefn Llwyd are upland commercial spruce plantations primarily managed for economic timber production. At Cwm Berwyn the Forestry Commission also manage to a degree for public recreation of the active outdoor type, due to remoteness of the forest. At Cefn Llwyd, UPM Tilhill grant permissive access for recreational activities and there is a significant nature conservation interest for the adjoining Berwyn moorlands, including provision of potential black grouse habitats.

Both forest managers have adopted alternative silvicultural systems over the past 20-30 years for a combination of economic reasons (securing cost-effective natural regeneration) and silvicultural demonstration/ curiosity. Cefn Llwyd has previously been managed by CCF specialists Talis Kalnars and Phil Morgan for the Shotton Paper Company, and CCF advocate Alex Dauncey initiated work at Cwm Berwyn.

Biophysical characteristics of the sites

Cwm Berwyn Forest - located on the western face of the Cambrian Mountains at elevations ranging from 400-450 m, with predominantly north-westerly aspects. Climate is cool and wet [AT₅ of 1145 dd, MD of ~65 mm, annual rainfall 1600 mm]. The site is noticeably exposed for ATC with DAMS of 17-18. The solid geology is of the Silurian Llandovery shales with peat and peaty gley soils [ESC SMR Moist to Wet; ESC SNR Poor or Very Poor]. Site conditions significantly constrain ATC here.

Cefn Llwyd Forest - located on the northern face of the Berwyn Mountains at elevations ranging from 300-420 m, with predominantly north-westerly aspects. Climate is cool and wet [AT₅ of 1145 dd, MD of ~72 mm, annual rainfall ~1200 mm]. The site is moderately exposed for ATC with DAMS of 18. The solid geology is of the Ordovician Ashgill-Caradoc shales with peaty podzol and peaty gley soils [ESC SMR Moist to Wet; ESC SNR Poor or Very Poor]. Site conditions constrain ATC.

These upland sites have distinct ecological and silvicultural similarities and represent the extreme of climatic, exposure and soil conditions under which ATC is feasible.

Stand history and current composition

Cwm Berwyn Forest - stands here comprise almost pure Sitka spruce established in the early 1960's on open moorland which has achieved YC 12-20. The normal mode of management would have been a no-thin clearfell and restock regime determined by optimum economic felling ages and windthrow/ terminal height predictions (site WHC is 4). This would have seen stands clearfelled over the decade following 1998. As a result of the experimental ATC thinning and group/ strip felling operations implemented since 1994, there is now a significant volume of seedling regeneration.

Cefn Llwyd Forest - stands of interest here were established 1952-63 on upland grouse moor, and although dominated by Sitka spruce at ~90% contain significant minor components of Norway spruce, Japanese larch, Douglas fir and Scots pine, concentrated in Caletwr. There is also a minor native hardwood component. As a result of the experimental ATC thinning and group/ strip felling operations implemented since 1986, there is now a significant volume of seedling regeneration.

Silvicultural treatments applied to date and intended future silviculture

Cwm Berwyn Forest - the approach here has involved felling groups or strips of trees, coupled with preparatory thinning of stands on better parts of the site. The first experimental intervention came at 30-35 years of stand age, whereas ideally one would wish to intervene by first thinning at 20-25 years to maximise the chances of success with ATC transformation, before terminal height is reached. Profuse regeneration of Sitka spruce regeneration has arisen in group/ strip felling areas and within some thinned stands. Some of the regeneration has reached 1-2 m in height, but there are significant operational issues with tending of dense regeneration groups. A decision will soon be taken as to whether to remove the remaining canopy or attempt to develop a more complex (rather than the current two-storied) ATC structure.

Cefn Llwyd Forest - two distinct approaches have been adopted to ATC at Cefn Llwyd since inception of transformation in 1986 under the late Talis Kalnars (later Phil Morgan from 1993). In the larger Caban Twm block the emphasis has been on

progressive strip shelterwood felling into the wind, in Sitka spruce stands. Other areas at Caban Twm have seen group or seed-tree felling approaches. Natural regeneration of Sitka spruce has been impressive and is respaced to 2500 stems per ha when it reaches 1m height. The intention had been to carry out preparatory thinnings in the intervening crops, but this has not always been pursued. At Caletwr, a variety of smaller-scale group and single-tree selection fellings have been carried out in mixed crops of spruce, fir, pine and larch, with some restocking of groups by planting. The aim here, so far with some success, is to create a more species and structurally diverse mixed stand type that will be managed into the future on an irregular ATC system.

Evaluation of current silvicultural status in terms of ATC adoption/ regeneration

Silvicultural development under alternative systems at these sites has progressed to *developmental stage 3* (early-stage transformation) for the areas as a whole, but with some parts of both forests achieving *developmental stage 2* (progressive/ mature transformation) where there has been subsequent tending of the regeneration. Natural regeneration is well developed at both sites and forms the main mode of restocking, although there may remain a role for enrichment/ diversification planting. At Cefn Llwyd it seems likely that ATC will continue in operation and may expand, while at Cwm Berwyn the original intention had only been to secure restock without planting. There is therefore consideration as to how the Cwm Berwyn site will be taken forward, and some uncertainty as to whether it is feasible to operate perpetuated ATC. The risk of catastrophic windthrow will always be a possibility on such exposed sites.

Commentary on inventory and monitoring protocols/ demonstration potential

Some early-stage transformation monitoring work has been implemented at Cwm Berwyn, using the plot-based methods set out in FCIN45. Managers at Cefn Llwyd have not found it possible to justify the costs of this type of monitoring and prefer periodic crop and regeneration assessments using semi-quantitative methods. Both of these sites have been fulfilling a demonstration function for organised groups over 20-30 years. At Cwm Berwyn this could be augmented for self-guided visits by provision of portable interpretation materials (already drafted for a recent CCFG visit). At Cefn Llwyd it will likely remain more appropriate for visits to be led by forest managers.

Commentary on economic and operational implications of ATC adoption

Site conditions and exposure within these forests have raised some economic and operational issues, especially at Cwm Berwyn. Key aspects are (a) the logistics of multiple entry working for ATC on sensitive peaty sites where conventional forestry machinery is used and (b) additional costs for tending of dense spruce regeneration. At Cefn Llwyd the local contractor base has accumulated valuable ATC experience.

Other relevant field examples recorded within the project

As an example of the application of ATC working to near-pure upland Sitka spruce, experiences at Cwm Berwyn and Cefn Llwyd Forests can be compared with the examples at Fernworthy Forest (Case Study 10), Clocaenog Forest (previous report) and the upland Scottish work at Kilmichael and Penninghame Forests (Case Study 12). Cefn Llwyd is near unique in its application of the strip shelterwood working system to extensive upland spruce, while Cwm Berwyn deals with difficult ground.

Photographic record



Left: conventional clearfell-replant working at Cwm Berwyn Forest

CWM BERWYN

Right: natural regeneration in strip shelterwood area of trial



Left: natural regeneration in group/irregular shelterwood area of trial

CWM BERWYN

Right: natural regeneration in strip shelterwood area of trial



Left: initiation of strip shelterwood felling, 2004

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Right: early stage of regeneration in strip shelterwood area, 2004



Left: well developed regeneration in strip shelterwood area, 2012

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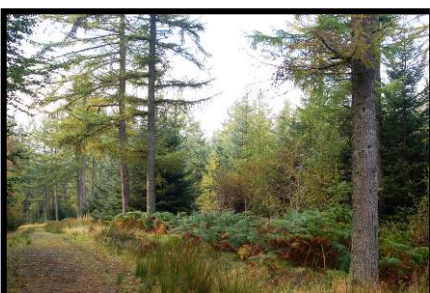
Right: spruce matrix adjoining strip shelterwood regeneration



Left: spruce matrix adjoining strip shelterwood regeneration - thinning

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Right: advance spruce regeneration under matrix stand



Left: group structure in diverse conifer stands (pine-larch-spruce)

CEFN LLWYD

Right: group structure in diverse conifer stands (pine-larch-spruce)

