

## **Case Study 27**

### **Coed Preseli, Bryn Arau Duon and Cwm Nant yr Eira, West Wales**

#### **Location and ownership of woodlands**

This case study deals with three separate upland spruce forests in western Wales, originally established between 1950 and 1975, where ATC systems are now being implemented with advice from SelectFor partners Phil Morgan and Huw Denman:-

1. Coed Preseli, Pembrokeshire [NGR SN 0xx3xx] which is owned by a private individual living locally. Area under ATC management is 170 ha (~420 acres).
2. Bryn Arau Duon, Carmarthenshire [NGR SN 7xx4xx] owned by a private estate in south-western England as an investment forest property. Area is 700 ha (~1750 acres). This site adjoins the Cwm Doethie-Mynydd Mallaen upland SSSI site.
3. Cwm Nant yr Eira Forest, Powys [NGR SH 9xx0xx] which is privately owned by a family living in the south of England. Area under ATC is 300ha (~750 acres).

#### **Significance/ reasons for selection as case-study example**

These examples were selected as case-studies in this project for two main reasons:-

1. They offer good illustrations of innovative early attempted transformation to alternative silvicultural systems in upland Sitka spruce forests at 30-40 years (adoption scenario 6, locally 8 in Norway spruce). Such approaches have been relatively uncommon in private investment forestry due to perceived higher management costs and risks of progressive windthrow. Here, a combination of enthusiastic owners and knowledgeable specialist forestry agents have embarked on programmes of “graduated density thinning” and inventory/ monitoring.
2. These sites also demonstrate the use of enrichment under-planting with desirable, shade tolerant conifers (DF, NS, RC) in mid-rotation spruce forests, to accelerate stand development and complement likely Sitka spruce natural regeneration (adoption scenario 16). This reflects earlier work at Glentress, Tavistock and Dartington and is made feasible by current low deer numbers in western Wales.

#### **Owner objectives for management (including adoption of ATC systems)**

As investment upland conifer forests, the principle objectives of management at these sites is capital appreciation and timber income. In each case there is also a secondary aspiration to personal/ private amenity for the owners when they visit, but there is no formal public access provision in place. Management at these forests is atypical in that there is a planned initiative to implement alternative silvicultural systems from a relatively early stage of spruce plantation development, involving graduated density thinning to promote Sitka spruce natural regeneration and species enrichment underplanting/ restocking with Douglas fir, western red cedar and Norway spruce. With specialist advice from SelectFor consultants in place, owner objectives of ATC adoption emphasise the development of a structurally (and in places species) diverse silvicultural structure that will be more attractive and resilient, together with the aspiration to restock the forests without recourse to the costs for coupe replanting.

### **Biophysical characteristics of the site**

The Coed Preseli is at 210-360 m asl on sites with gentle north-easterly (Tŷ Rhyg) and south-easterly aspects (Glyn Aeron). The climate is warm and very moist [AT<sub>5</sub> of ~1520 dd, MD of ~100 mm, annual rainfall of 1516 mm]. DAMS score of 17 reflects above-average wind exposure for ATC adoption. The solid geology is the Ordovician Arenig/ Llanvirn series, in this case producing peaty soils of low fertility [ESC SMR Very Moist to Wet, ESC SNR Poor]. Forestry access is generally satisfactory.

Bryn Arau Duon is at 300-430 m asl on plateau and steep slopes with varied aspects. The climate is fairly cool and wet [AT<sub>5</sub> of 1193 dd, MD of 70 mm, annual rainfall of 1554 mm]. DAMS score of 19 reflects significant exposure at higher elevations. Solid geology is the Silurian Llandovery series and soils include brown earths [ESC SMR Fresh, ESC SNR Poor] and peats [ESC SMR Very Moist]. Forestry access is good.

Cwm Nant yr Eira is at 270-420 m asl on undulating upland moorland with a westerly aspect. The climate is warm and wet [AT<sub>5</sub> of 1258 dd, MD of 86 mm, annual rainfall of 1345 mm]. DAMS score of 15 benefits from high ground to the west. Solid geology is Silurian Llandovery/ Ludlow/ Wenlock series, producing peaty soils of low fertility [ESC SMR Very Moist to Wet, ESC SNR Poor]. Forestry access is good.

### **Stand history and current composition**

Stocking at these three sites is dominated by regular Sitka spruce crops established between the late 1950's and the early 1970's, which would normally be considered for final felling and restocking under these upland conditions. At Bryn Arau Duon there are minor coniferous components of Japanese larch and lodgepole pine, while at Cwm Nant yr Eira there are significant areas of Norway spruce of similar ages. More recent plantings at Nant yr Eira have included a wider range of tree species including native hardwoods and western red cedar, while there have been trial-scale underplantings with western red cedar, Norway spruce and Douglas fir within thinned Sitka spruce stands at Coed Preseli and Bryn Arau Duon. Natural regeneration of Sitka spruce has begun to arise along the margins of Sitka spruce stands and in areas where crops have wind-blown and/ or been clear-felled at Cwm Nant yr Eira. It can be expected to become more extensive in future. There are also minor components of self-sown native hardwoods, mainly at Cwm Nant yr Eira.

### **Silvicultural treatments applied to date and intended future silviculture**

Two main silvicultural approaches have been implemented to date at these sites to begin conversion to ATC (with a permanently irregular structure). Variable or "graduated" density thinning is used to reduce basal area, develop stable stems and extend the rotation period in the standing crops at 30-40 years of age. At Bryn Arau Duon this is generally accomplished by cutting single row racks out of the crop and then thinning the matrix between the racks (50% from the first row, 25% from the second, 0% from the third). This process is repeated on a four year cycle. Comparable approaches are at an earlier stage of implementation at the other forests. In the longer term, the intention is to operate these stands on a target-diameter felling basis, felling off maturing stems, with natural regeneration at variable density that may not require manual respacing. As only limited natural regeneration has arisen as yet, it is too early to determine if this will be successful, and there may be issues with the marketability

of larger diameter spruce logs arising from such a system. Tending of dense spruce regeneration can become an expensive operation, requiring manual labour. The other approach being adopted is small-scale underplanting with more shade-tolerant conifers (Norway spruce, Douglas fir and western red cedar) as a form of “accelerated diversification”. It is intended that these species will have a resulting “head start” on anticipated Sitka spruce regeneration, which is likely to have a faster growth rate. Mixed stands would then be managed on a selection system into the future. These operations have been accompanied by significant investments in improved road access at the three sites to facilitate future repeat-entry working under ATC systems.

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

These are primarily sites where alternative silvicultural systems are in *developmental category 3* (early-stage transformation), and in parts remain in *developmental category 4* (preliminary-stage adoption). Stands are generally quite young and natural regeneration as yet plays a fairly modest part of the forestry, although it is emerging to some degree at all three sites in areas outside full canopy shade. The small-scale implementation of shade-tolerant diversification planting and underplanting is unusual for stands at this age, but is reflected in the established record at Wykeham Forest since the 1950’s (Case-Study 9) and by the recent trial-scale working at Sherwood Forest (Case-Study 20). It appears likely that ATC application will continue at these sites for the foreseeable future, but this remains dependent on owner preference and specialist advice - it is some way off becoming a self-sustaining stand dynamic.

### **Commentary on inventory and monitoring protocols/ demonstration potential**

SelectFor advisors implement inventory and monitoring using methods based on the French AFI protocol. Such work is well advanced at Bryn Arau Duon and is likely to be taken forward at Coed Preseli and Cwm Nant yr Eira in due course. All of these sites have latent demonstration ATC potential, but owners are unlikely to favour unannounced self-guided visits. Bryn Arau Duon has hosted a small number of manager-led, organised demonstration visits and that is likely to remain the appropriate model for the future at these sites.

### **Commentary on economic and operational implications of ATC adoption**

Detailed economic analyses have been conducted by SelectFor advisors for Bryn Arau Duon for their clients, using financial appraisal methods adapted from the AFI. This is one of the very few private ATC adoption sites in Britain where such economic analyses have been carried out, but results are not in the public domain. Similar analyses may be carried out for Coed Preseli and Nant yr Eira in due course.

### **Other relevant field examples recorded within the project**

This example can be most directly compared with Wykeham Forest (Case Study 9) where species enrichment with shade-tolerant conifers is of longer standing. There is also a clear counter-point with upland Sitka spruce examples focussing on rolling spruce regeneration as at Fernworthy Forest (Case Study 10), Cwm Berwn Forest (Case Study 11) and also at Clocaenog Forest (previous). Future potential of western red cedar is highlighted by the experience at Dunster and Tavistock (Case Study 18).



## Photographic record



Left: preparatory thinning of  
p1970's Sitka spruce for conversion

### **COED PRESELI**

Right: enrichment underplanting  
with Douglas fir, Norway spruce  
and western red cedar



Left: installation of improved road  
access allowing gentle thinning of  
overstocked Norway spruce stands

### **NANT YR EIRA FOREST**

Right: establishment of new mixed  
conifer/ hardwood stands suitable  
for future ATC management



Left: reliance on prolific natural  
regeneration in conifer coupes

### **NANT YR EIRA FOREST**

Right: reliance on prolific natural  
regeneration in conifer coupes



Left: installation of improved  
access roads to allow ATC working

### **BRYN ARAU DUON**

Right: variable density thinning of  
p1960's spruce to promote advance  
regeneration



Left: installation of racks and  
thinning of intervening matrix in  
spruce crop on steep sites

### **BRYN ARAU DUON**

Right: underplanting with western  
red cedar to enrich 2nd rotation crop  
composition

