

Case Study 10

Fernworthy Forest, Dartmoor, Devon

Location and ownership of woodlands

This case study deals with the Forestry Commission's Fernworthy Forest block on Dartmoor, some six miles south-west of Moretonhampstead. The total area of Fernworthy Forest is some 575ha (~1400 acres) of which ~150ha (~375 acres) has been designated for demonstration implementation of alternative silvicultural systems. The area of most relevance for ATC demonstration purposes is centred at SX 656835.

These woodlands are owned and managed by the Forestry Commission, in consultation with South West Water who manage the neighbouring Fernworthy Reservoir. The vast majority of the site consists of twentieth century spruce plantations onto open upland moorland. Fernworthy Forest lies within the Dartmoor National Park and the South Dartmoor SSSI site, in a highly-sensitive landscape.

Significance/ reasons for selection as case-study example

This site has been selected as a case-study within this project for two main reasons:-

1. It is one of the rather few examples where there is well-developed application of alternative silvicultural systems to perpetuation of upland Sitka spruce (adoption scenario 6). It can be compared with the Cwm Berwyn, Cefn Llwyd and Clocaenog cases. In an isolated plantation block within the sensitive Dartmoor landscape, adoption of ATC offers one approach to increasing public acceptance as a recreational resource, alongside timber production and watershed protection.
2. The site is one of the Forestry Commission network of alternative silviculture demonstration sites and hence is fairly well recorded in terms of inventory and past silvicultural operations applied. Stands range from well-developed ATC with a complex structure, to young stands receiving a first ATC-directed thinning. This makes it a valuable ATC demonstration example for high yield Sitka spruce.

Owner objectives for management (including adoption of ATC systems)

The Forestry Commission in England manages its estates for a combination of economic timber production, conservation and recreational amenity objectives. The balance between these objective sets varies with the type of forest and its location. At Fernworthy Forest priorities have been economic timber production, catchment/freshwater protection and recreational amenity. ATC is employed on a site specific basis by FC in support of management objectives. Alternative silvicultural systems are being adopted within this forest for demonstration purposes, and due to perception that landscape factors made perpetuation of forest cover a key priority and that existing spruce stands were regenerating. ATC should have significant economic benefits in terms of reduced restocking costs, environmental benefits by limiting the scope for siltation from clearfell operations and recreational amenity benefits in terms of maintaining a permanently forested landscape for the visitor experience.

Biophysical characteristics of the site

The areas of Fernworthy Forest of principle interest for ATC demonstration lie on the lower slopes surrounding the southern end of Fernworthy Reservoir and range in elevation from 350-400m asl, with north-easterly aspect. Other areas reach 500m asl.

The climate of the site is fairly warm and wet [ESC AT₅ ~1260 dd, MD ~75 mm, annual rainfall ~1840 mm] with a rather exposed wind regime for ATC [DAMS = 17]. The solid geology is of intrusive Dartmoor granite. Soils are primarily of the peaty podzolic type, in some cases with a substantial accumulation of peat. Hence these soils would typically have ESC SMR of Moist and ESC SNR of Very Poor.

Terrain is moderate across most of the forest, with only 20% by area posing issues for conventional harvesting and forwarding machinery. The site has relatively good road access for silvicultural management and timber extraction over a network of internal tracks and rides, giving egress onto a nearby minor public road. However subsequent timber transport in the East Dartmoor locality is sensitive, with the busy visitor season to be avoided. There is public access throughout the forest with basic visitor facilities.

Stand history and current composition

Fernworthy Forest is dominated by pure Sitka spruce crops established between 1920 and 1980 (with some younger stands being the second rotation on the site). These are high yielding crops with YC 14-24, average 16 for the forest as a whole but likely to be 18-24 for the more sheltered productive areas now under ATC transformation. The forest is notable for the development of large-diameter Sitka spruce with tree sizes in excess of 3m³ in the mature overstorey. There are also small areas of large-diameter Douglas fir, some western hemlock which regenerates strongly onto clearfelled sites and a limited amount of Japanese larch. Lower parts of the forest are already developing considerable structural diversity as a result of early advance regeneration.

Silvicultural treatments applied to date and intended future silviculture

A proportion of the older, well-thinned p1920's and p1930's spruce stands had "self converted" by advance regeneration prior to the formal ATC trial being established. The main silvicultural approach adopted since 2004 at Fernworthy Forest has been transformation thinning. While some of the older stands had received motor-manual intermediate first thinnings and brashing prior to establishment of the ATC demonstration project, younger stands had not. Thinning is now carried out using standard forestry harvester and forwarder equipment sets, although as the proportion of larger trees >0.7m³ increases, motor-manual initial felling and lower-stem cross-cutting is required. Permanent racks are installed through the younger crops at 15m spacing, from which the intervening matrix can be intermediate first thinned by harvester reach without ground pressure within the growing area. Subsequent thinning strategy adopts a frame-tree selection/ crown thinning method by contrast to the standard intermediate or low thinning typically used in clearfell-restock forestry. Two different experimental stand treatments are applied depending on the desired final stand structure (a) simple two-storied shelterwood and (b) complex irregular. It has

been found to be necessary to pre-mark frame trees prior to mechanised thinning as harvester cabs did not allow adequate visibility for feller-select crown thinning. Later thinning operations may require much greater dependence on motor-manual working.

Considerable experience has been gained in avoiding damage to dense natural regeneration when thinning the over-storey in the older stands - this depends on effective directional felling when motor-manual techniques are used, coupled with careful take-down control and lift-out to racks when mechanised harvester are used. Skidding has been considered inappropriate due to the greater risks of regeneration damage. Due to rapid growth rates, some natural regeneration in mature stands now requires respacing, which will be carried out with brush-cutters when 6ft in height.

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

Although formal conversion to alternative silvicultural systems only began at Fernworthy Forest in 2004, the profuse level of advance spruce regeneration and the rapid growth rates achieved in the forest mean that substantial areas have already reached *developmental category 2* (progressive/ mature transformation) while others are at *developmental category 3* (early-stage transformation). The most advanced areas have begun to develop some complexity and irregularity in their structure, while other areas are essentially uniform two-storeyed spruce shelterwoods. Continuation of ATC silvicultural transformation at Fernworthy Forest appears to be secure, as it is proving successful and forms an established part of the FC national ATC network.

Commentary on inventory and monitoring protocols/ demonstration potential

This site forms part of the Forestry Commission ATC demonstration site network and hence has an existing regime of enumeration for inventory and research purposes, using the protocols set out in FCIN45. The site therefore has considerable and ongoing ATC demonstration value and potential. The site is potentially suitable for both organised and self-guided learning visits, but, for the latter option, there would need to be a significant investment in interpretation materials (probably portable).

Commentary on economic and operational implications of ATC adoption

Economic and operational aspects of ATC adoption at Fernworthy Forest have been assessed and reported as a case-study within FR IPIN 13/06. The large size of some spruce trees has posed a challenge both in terms of the need for motor-manual felling and subsequent outside marketing. Careful brush management to protect forwarding and extraction routes is required in case of thinning operations generating less brush.

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 Fernworthy Forest can be compared with the Welsh examples at Cwm Berwyn and Cefn Llwyd Forests (Case Study 11), Clocaenog Forest (previous report) and the upland Scottish work at Kilmichael and Penninghame Forests (Case Study 12). Work at Fernworthy has been successful in large part, but for a number of reasons has not been as prominently reported as that at Clocaenog and Cefn Llwyd.

Photographic record



Left: landscape view of Fernworthy Forest



Right: landscape view of Fernworthy Forest



Left: natural regeneration of spruce and hemlock on a clearfelled site



Right: natural regeneration of spruce into small felling coupe



Left: natural regeneration of spruce in a small canopy gap



Right: natural regeneration of spruce under irregular shelterwood



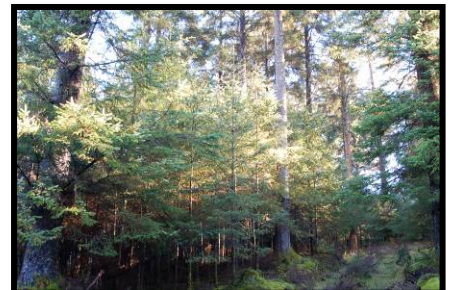
Left: natural regeneration of spruce under irregular shelterwood



Right: natural regeneration of spruce under irregular shelterwood



Left: natural regeneration of spruce under uniform shelterwood



Right: a cone of well-developed spruce regeneration



Left: access rack to a mid-rotation spruce stand to permit thinning



Right: access rack through established spruce understorey