Case Study 16

Craigvinean, Ae and Fearnoch Forests, Scotland

Location and ownership of woodlands

This case study deals with three Forestry Commission sites in Scotland where attempts have been made to regenerate maturing Norway spruce under ATC:-

1. Craigvinean Forest, Perthshire. [NGR NN 997450] compartments on lower and mid-slopes with Norway Spruce crops dating from 1920-1960 . Area of case-study interest is ~136 ha. Some parts are Planted Ancient Woodland Sites (PAWS).
2. Forest of Ae, Dumfries-shire. [NGR NX 985919] compartments along Water of Ae with Norway Spruce crops dating mainly from 1930-1950. Area of case-study interest is ~150 ha. Some parts are Planted Ancient Woodland Sites (PAWS).
3. Fearnoch Forest, Argyll [NGR NM 970311] compartments of Norway spruce dating from 1936. Area of case-study interest is ~17 ha. Some parts are Planted Ancient Woodland Sites (PAWS).

Significance/ reasons for selection as case-study example

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

1. They represent some of the most prominent attempts to date to operate mature stands of Norway spruce under alternative silvicultural systems on the National Forest Estate in Scotland (adoption scenario 8). There is interest in perpetuating Norway spruce as an element of forest composition due to its importance as a food source for red squirrel, landscape significance on valley corridor sites and future regional potential as a more drought tolerant timber tree that Sitka spruce.

2. Despite extensive experience in Continental Europe, there have been significant difficulties in securing natural regeneration of Norway spruce in Britain. It tends to cone later than Sitka spruce and Douglas fir, and many stands have been prematurely thinned in anticipation of regeneration which has not developed. On typically more fertile Norway spruce sites, weed competition can be problematic.

Owner objectives for management (including adoption of ATC systems)

The Forestry Commission in Scotland 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. ATC is employed on a site specific basis by FC in support of management objectives. There is an overall policy aim to manage 20-25% of the national forest estate in Scotland towards ATC systems. At the three forest areas examined in this case-study, adoption of ATC was stimulated by a desire to perpetuate maturing crops of Norway spruce (established 1920-1960) without clearfelling, by encouraging natural regeneration, thereby maintaining species diversity and providing continuity of red squirrel forage area/ habitat. Also, the Craigvinean and Forest of Ae areas covered are seen as important forest sites for landscape, visitor and recreational amenity values.

Biophysical characteristics of the site

The Craigvinean Forest site is at 50-250m asl on east-facing lower slopes. The climate is cool and moist [AT_5 of ~1110 dd, MD of ~89 mm, annual rainfall of ~1100 mm]. A DAMS score of 7 reflects very strong topographical shelter. Soils are developed over the Dalradian schist series and are therefore freely-drained and of moderate fertility [ESC SMR Fresh, ESC SNR Medium]. Forestry access - fair/good, some steep slopes.

The Forest of Ae site is at 150-200m asl on lower slopes and valley bottom. The climate is fairly warm and moist [AT_5 of ~1340 dd, MD of ~116 mm, annual rainfall of ~1345 mm]. A DAMS score of 10 reflects moderate topographical shelter. Soils are developed over the Silurian Llandovery series and are rather moist and of moderate fertility [ESC SMR Very Moist, ESC SNR Medium]. Forestry access is good.

The Fearnoch Forest site is at 50-100m asl on east facing slopes and plateau. The climate is warm and very moist [AT_5 of ~1306 dd, MD of ~103 mm, annual rainfall of ~1925 mm]. The site is moderately exposed with a DAMS score of 14. Soils are developed from Devonian andesite/ basalt and therefore fairly well-drained and of moderate fertility [ESC SMR Fresh-Moist, ESC SNR Medium]. Forestry access good.

Stand history and current composition

The sites considered in this case-study are all stocked with mature, even-aged, first rotation crops of Norway spruce, originally established between 1935 and 1945. This places them at the age when natural regeneration can be expected to commence in earnest in Norway spruce (70-80 years). Productivity of these stands varies considerably (YC 8-18), but tends to be quite high, and there has been a tendency to under-thinning earlier in the rotation. Neighbouring crops typically include stands of Sitka spruce, Douglas fir and grand fir of similar age - generally producing abundant advance natural regeneration earlier than does Norway spruce itself. Particularly at Craigvinean Forest, site types are reasonably fertile, with a propensity to produce competitive lush grass-fern vegetation assemblages in response to canopy opening.

Silvicultural treatments applied to date and intended future silviculture

The Norway spruce stands are seen as particularly important for red squirrel as a conservation priority species, which prefer its larger cones, and there is a desire to retain Norway spruce as a component of forest stocking, potentially better suited to a drier future climate than Sitka spruce. In order to promote natural regeneration in these Norway spruce stands, the main approach to date has been progressive thinning. This is most advanced at Craigvinean, where the approach has been pursued over the past 15-20 years, whereas initial thinning interventions at Forest of Ae and Fearnoch are somewhat more recent. Silvicultural systems are described variously as being irregular shelterwood at Craigvinean, uniform shelterwood at Fearnoch and group selection at Forest of Ae, but observable differences in actual thinning practices are fairly subtle. Given the perception that natural regeneration of Norway spruce tends to be delayed and light-demanding, thinning intensities applied have been deliberately heavier than would be normal in regular stands. At Craigvinean, there has been some variation in thinning intensity across the sites, whereas at Forest of Ae and Fearnoch, intensity has apparently been more uniform. At Craigvinean and Ae, there has been a fairly vigorous response of the ground vegetation to increased light availability following thinning interventions, and this may tend to reduce the window for natural

regeneration of spruce. At Fearnoch, opening of the stand has been more recent and the site is apparently less fertile, so vegetation response has not developed as yet. Overall amounts of Norway spruce regeneration recruited have been disappointing, although the amounts at Craigvinean are increasing as stands approach 80 years. Other conifer species such as Sitka spruce, grand fir and western hemlock have produced greater volumes of regeneration where present. Future developments of silvicultural practice for Norway spruce stands of this type might involve retention of a higher basal area to control ground vegetation until stands reach 70-80 years, coupled with use of enrichment/ reinforcement planting where this is required.

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

Due to difficulties encountered in securing Norway spruce regeneration, these sites have not progressed as rapidly as might have been hoped in terms of ATC adoption. The Craigvinean example has reached ***developmental category 3*** (early-stage transformation) due to the recruitment of natural regeneration including some Norway spruce, but also Sitka spruce, Douglas fir and grand fir from adjoining stands. There is localised progress towards ***developmental category 2*** (progressive/ mature transformation) in some areas, especially with Douglas and grand fir components. The Fearnoch and Ae examples remain at ***developmental category 4*** (preliminary stage transformation) - relevant thinnings having been undertaken without significant regeneration of Norway spruce having recruited as yet. Improved progress can be expected with ATC in Norway spruce once well-thinned stands reach 70-80 years and natural regeneration tends to accelerate, but there may be a need for underplanting.

Commentary on inventory and monitoring protocols/ demonstration potential

The growing stock at these three sites is monitored using the Forestry Commission's standard periodic system, assessing stocking and natural regeneration. The Craigvinean site forms part of the existing FC ATC demonstration site network. Sample plots were established there in 2008 and baseline assessed using the FCIN45 protocols, but repeat enumeration after 5 years is currently pending. All of the sites have open public access and would be suitable as self-guided ATC demonstration sites, given interpretation materials (signage or portable), preferably including the results of more intensive enumeration work as for the wider FC ATC network.

Commentary on economic and operational implications of ATC adoption

The type of thinning operations required under ATC management in these stands has been found to be little more demanding or expensive than regular thinning systems, other than where motor manual felling is required for larger diameter trees. FC have access to necessary equipment/ skills. Natural regeneration which is locally too sparse/ dense may occasion additional costs for respacing or supplementary planting.

Other relevant field examples recorded within the project

This example is unusual in dealing primarily with Norway spruce, a species that is attractive as a timber tree in parts of Britain too dry for Sitka spruce and which is desirable as a provider of red squirrel forage. However natural regeneration has been difficult to secure as in these reported cases. Hence examples involving enrichment underplanting with shade-tolerant conifers as at Wykeham Forest (Case Study 9) and Coed Preseli/ Bryn Arau Duon (Case Study 27) are potentially relevant.

Photographic record

Left: p1930's Norway spruce stand on valley floor, thinned, with only sporadic natural regen. to date

FOREST OF AE

Right: p1930's Norway spruce stand on valley floor, thinned, with only sporadic natural regen. to date

Left: p1930's Norway spruce stand on valley floor, thinned, with only sporadic natural regen. to date

FOREST OF AE

Right: p1930's Norway spruce stand on valley floor, thinned, with only sporadic natural regen. to date

Left: p1936 Norway spruce stand prior to thinning intervention to promote natural regeneration.

FEARNOCH FOREST

Right p1936 Norway spruce stand prior to thinning intervention to promote natural regeneration.

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FEARNOCH FOREST

Right p1936 Norway spruce stand prior to thinning intervention to promote natural regeneration.

Left: p1940's Norway spruce stand with patches of mixed conifer regeneration following heavy thin

CRAIGVINEAN FOREST

Right: p1940's Norway spruce stand with patches of mixed conifer regeneration following heavy thin

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