

Case Study 20

Sherwood and Thetford Forests (with Thoresby Estate), E. England

Location and ownership of woodlands

This case-study deals with mature lowland Corsican pine stands on sandy heath soils at the Forestry Commission's Sherwood and Thetford Forests in eastern England:-

1. Sherwood Forest, Nottinghamshire [forest office NGR SK 611638] lies between the towns of Mansfield, Worksop, Nottingham and Ollerton. With the exception of remnant ancient oakwoods, the forest comprises mainly Scots and Corsican pine stands planted in the mid-1900's, some of which have been felled/ restocked. The approaches discussed in this case-study are relevant over several x 100 ha.
2. Thetford Forest, Suffolk/ Norfolk [forest office NGR TL 816875] lies between the towns of Thetford, Brandon and Mundford. The forest comprises mainly Scots and Corsican pine stands planted in the mid-1900's, many of which have now been felled/ restocked. Small areas carry Douglas fir/ other conifers (Case Study 15). Approaches discussed in this case-study are relevant over several x 100 ha.

Brief reference is also made to comparable management on the Thoresby Estate close to Sherwood Forest [NGR SK 6xx7xx, including 20-30ha managed under ATC]

Significance/ reasons for selection as case-study example

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

1. They represent one of the most extensive potential applications for alternative silvicultural systems - diversification of mature Corsican and Scots pine stands, established between 1920 and 1960 in the English lowlands (adoption scenario 11). These stands are valued for timber production and for public amenity (especially on the National Forest Estate) but are now challenged by *Dothistroma*. Reliance on re-planting with purely pine crops is now considered inadvisable.
2. These sites illustrate three basic approaches to this challenge (a) relying on natural regeneration of pine and other conifers, when available, (b) converting to a predominantly native hardwood composition by natural regeneration and (c) enrichment under-planting with alternative conifers (e.g. Douglas fir or red cedar). Other public forests (e.g. Cannock) and private estates in eastern England face similar issues and are also considering and implementing alternative silviculture.

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. ATC is employed on a site specific basis by FC in support of management objectives. At Sherwood and Thetford Forests adoption of ATC is a relatively new phenomenon and is driven in large part by the need to diversify mature stands of Corsican pine to increase their disease resilience and improve their long-term silvicultural and amenity values. At present only small areas of these forests are under planned ATC regimes.

Biophysical characteristics of the sites

Sherwood Forest - located on the gently undulating East Midlands plain at elevations ranging from 40-100 m asl. Climate is rather warm and dry [AT₅ of ~1680 dd, MD of 186 mm, annual rainfall ~630 mm]. The site is moderately sheltered with typical DAMS of 12. The solid geology is of the Permo-Triassic Bunter sandstone, producing freely draining acid sandy soils [ESC SMR Fresh to Medium Dry; ESC SNR Poor]. Access for ATC management and extraction is usually excellent with a good network of internal rides and forest roads giving access to the public road network.

Thetford Forest - located on the flat East Anglian plain at near sea level. Climate is very warm and dry [AT₅ of ~1764 dd, MD of 216 mm, annual rainfall ~630 mm]. The site is moderately sheltered with typical DAMS of 12. Soils are developed from acid sands overlying Cretaceous chalk at depth and therefore very freely-drained and of low fertility [ESC SMR Slightly Dry, ESC SNR Poor]. Access for ATC management and extraction is good with a network of internal rides and forest roads.

Site conditions at the Thoresby Estate woodlands are similar to those for Sherwood.

Stand history and current composition

These forests consist mainly of first rotation plantation stands of Corsican and Scots pines established on heathland (or in some cases open oak-birch woodland) sites from the 1920's onwards. Especially in the case of Thetford Forest, a proportion of these stands have been felled and restocked by regular replanting with the same species. Corsican pine is a potentially productive tree on these sites, with YC 16-18, which is in demand from the regional saw-milling sector, but in recent years has been adversely affected by *Dothistroma* (red band needle blight), reducing its yield. Scots pine is typically slower grown (YC 12-14) and often of rather inferior stem form, but less impacted by *Dothistroma*. Many of the maturing pine stands have developed a spontaneous understorey of self-sown broadleaves, including oak, birch, rowan, beech and sycamore. In some cases this has become better developed with several cohorts/layers of regeneration, with considerable biodiversity value, but poor timber form due to top-shading, drought/ moisture competition and infertile soil types. To date, there has been no tending of emerging hardwood understories for timber. Regeneration of Scots and Corsican pines typically does not occur under the full shade of retained pine crops, but once these reach 50-60 years of age it does occur peripherally to the stands and can form a key component of the restocking on neighbouring clear-fell sites.

Silvicultural treatments applied to date and intended future silviculture

Conventionally, stands of Scots and Corsican pines in these forests were not thinned sufficiently heavily during the rotation to recruit pine regeneration on a seed-tree or uniform shelterwood basis, as described elsewhere in Case Studies 4, 6, 7 and 8. Corsican pine in particular has been regarded as relatively slow to regenerate naturally in this way. Hence there has been an expectation that stands would be restocked by replanting. Some of the work at Thoresby Estate suggests that shelterwoods may be possible in Scots pine crops, forming mixed pine-hardwood understories that can be selectively tended as they develop to favour pine over birch. In recent years a regime

of heavier “ventilation” thinning has been implemented in FC pole-stage pine crops to reduce the moisture content of the air and thereby reduce the inoculum loading of *Dothistroma*. Although these stands may have reduced rotational yield as a result of *Dothistroma*, there is a reasonable expectation of enhanced natural regeneration opportunities as they mature. Consideration is also now being given to species diversification to mitigate the *Dothistroma* threat, with Douglas fir, western red cedar and *Sequoia* redwoods being favoured alternative species at present. Case Study 15 demonstrates that Douglas fir of the correct provenances can be a productive option for these sites. So far, small areas of mature pine have been set aside for active diversification by heavy thinning/ group felling and enrichment underplanting with Douglas fir and western red cedar transplants. So far this ATC work is on a trial scale but it is expected that it will be expanded as resources allow over the coming years.

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

Progress with adoption of alternative silvicultural systems within more mature Corsican pine stands (p1920-1960) at Sherwood and Thetford Forests has reached ***developmental category 3*** (early-stage transformation) where natural regeneration of pine or native broadleaves has initiated, creating a two-storied structure. Similarly for those stands, as at Sherwood Forest, having recently been underplanted with alternative conifers. In younger crops (p1960 onwards) ATC adoption remains at ***developmental category 4*** (preliminary stage adoption) as there is limited natural regeneration, although stands may have received a first transformation thinning.

Commentary on inventory and monitoring protocols/ demonstration potential

Stands in these forests are currently monitored using the standard Forestry Commission periodic inventory system rather than by detailed enumeration. As any conversion to ATC is at a rather early stage, demonstration value for some time will consist of the opportunity to visit typical stands undergoing natural regeneration or underplanting operations. A leaflet or map of these would support self-guided visits or pre-arranged groups could be taken around working sites by district forestry staff.

Commentary on economic and operational implications of ATC adoption

It is too early in the progress of ATC development within these forests for meaningful comparison of clearfell/ restock and ATC working systems. Thinning operations to initiate ATC are likely to be rather similar to those under regular forestry systems. Regeneration expenditure will tend to be on respacing and tending rather than planting, although the decision to enrich stands by underplanting will incur some cost.

Other relevant field examples recorded within the project

Links can be made between this example and those involving species enrichment in pine-larch stands as at Wykeham Forest (Case Study 9) and in spruce stands as at Coed Preseli/ Bryn Arau Duon (Case Study 14). Consideration should also be given to the potential of lowland Douglas fir under ATC as at Wyre, Mortimer and Thetford Forests (Case Study 15) and to the potential of multi-species regeneration under pine as at Cawdor (Case Study 4). Case Study 13 offers a Scottish lowland comparator.

Photographic record



Left: typical retained Corsican pine stand with partially-intruded broadleaved understory

THETFORD FOREST

Right: typical retained Corsican pine stand with partially-intruded broadleaved understory



Left: well-developed partially-intruded broadleaved understory under mature Scots pine

THETFORD FOREST

Right: Corsican pine shelterwood with some natural pine regeneration



Left: well-developed partially-intruded broadleaved understory under mature Corsican pine

SHERWOOD FOREST

Right: well-developed partially-intruded broadleaved understory under mature Corsican pine



Left: occurrence of some natural pine regeneration near stand edges

SHERWOOD FOREST

Right: occurrence of some natural pine regeneration near stand edges



Left: under-planting of heavily thinned Corsican pine with Douglas fir and western red cedar

SHERWOOD FOREST

Right: under-planting of heavily thinned Corsican pine with Douglas fir and western red cedar



Left: well-developed partially-intruded broadleaved understory under mature Scots pine

THORESBY ESTATE

Right: occurrence of some natural pine regeneration near stand edges

