

## **Case Study 14**

### **Longleat Estate, Wiltshire**

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

These woodlands lie to the south of the town of Warminster, Wiltshire. The areas of principle relevance to this case-study are the main woodland block to the west of Crockerton (NGR ST 847427) and the Southleigh Woods to the east at ST 875425. Their total current extent is of the order 500ha (1250 acres) with much of that area having been under some form of non-clearfell silvicultural system for many years.

The woodlands are owned by the Longleat Estate, ancestral seat of the Marquis of Bath. The forests are managed by an estate head forester and forestry work team.

Southleigh Woods are regarded as replanted/ PAWS, with other areas being long-established plantations. Those woodlands dealt with here are not SSSI designated.

#### **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. Longleat Estate has a very long record of growing high quality Douglas fir under alternative silvicultural systems (adoption scenario 7). There is a strong reliance on natural regeneration, secured under a target-diameter felling/ selection forestry system with several size-classes present. Superior stems are marketed in the 70-100cm diameter classes to specialist construction markets in the region. Mature Douglas fir also serves as a context for holiday accommodation and recreation.
2. Longleat Estate also apply flexible alternative silvicultural systems to the management of valuable crops of a range of the minor conifer species that are of considerable interest to the wider forestry sector at the present time. These include fine larch, grand fir, coastal redwood, Lawson and Leyland cypresses (adoption scenario 9). Those species are better marketed here than in most other cases.

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

Longleat Estate manage their woodlands primarily for economic timber production with a secondary emphasis on landscape and recreational amenity. There is permissive public access throughout the main woodland block and a major commercial residential holiday park is located within the central forestry area. Unlike many other private estates, sporting use of the woodlands is not a major consideration.

Longleat Estate have used alternative silvicultural systems combining shelterwood and selection approaches as their main mode of management for at least 40 years. Adoption was partly a product of the silvicultural interests of the Marquis and head forester at the time (John McHardy), but mainly due to a belief that ATC offered the best way to combine profitable commercial forests with high amenity value. Longleat specialises in growing a wide range of conifers and marketing premium large logs.

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

The site is of a basically lowland type, although at some 130-230 asl, occupying gentle slopes and plateau ground. Aspect is varied, due to the undulating terrain.

The climate at Longleat is warm and rather dry [ESC AT<sub>5</sub> 1640 dd, MD 150 mm, annual rainfall ~920 mm] with a moderately sheltered wind regime [DAMS = 12]. The solid geology is primarily of Cretaceous upper greensand with local Gault clay. The greensand produces a very favourable freely-drained and moderately fertile soil [ESC SMR Fresh, ESC SNR Poor to Medium] which is ideal for conifer regeneration.

Terrain is easy throughout the site, posing few constraints on ATC forestry operations. The site has relatively good access for management and timber extraction over a network of internal tracks and rides with egress to the nearby minor public roads. The estate operates its own sawmill taking basic fencing grades and has very strong marketing contacts with a local generalist sawmill and regional specialist mills.

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

The woodlands of interest at Longleat comprise extensive areas of diverse mixed-coniferous stocking dating from ~1920 to the present time, with limited replanting having taken place since inception of ATC working in 1969. Half of the forest areas were clear-felled during the last war with extensive replanting during the period 1945-1969, primarily with Scots pine, larches and Douglas fir, but also with a diverse spectrum of alternative conifer species including notable coastal redwood, Lawson/Leyland cypress, grand fir and western red cedar, but also some western hemlock and Corsican pine. There is a dispersed secondary component of hardwoods throughout the forest, mainly arising from natural regeneration, including oak, ash, beech, birch, sycamore and sweet chestnut. Some oak and cherry have been planted in the past. Many mixed selection stands of Douglas fir, larch and pines have a complex structure including mature stock at low stem-density with abundant pole-stage, sapling and seedling regeneration below. Stands of the more shade-tolerant species including coastal redwood, grand fir, western red cedar and Lawson cypress are operated more as shelterwoods with a two-storey structure of mature stock and profuse advance regeneration, although in many cases the latter has since been tended and respaced.

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

The main silvicultural approach applied over the years at Longleat has been heavy crown thinning in stands of Douglas fir, larch and Scots pine as these reach 20-30 years of age, allowing development of dense multi-storeyed regeneration below. Density of mature trees in these fairly light demanding species is lower than would be the case in regular forests - for example 40-50 stems/ ha at 80 years in Douglas fir, 20-30 stems/ ha at 100 years and 10-15 stems/ha retained in perpetuity. Initially such heavy thinning resulted in some loss of production, but as the natural regeneration has developed a complex structure, site occupancy has increased and production likewise. Natural regeneration was originally respaced once to 1.5m x 1.5 spacing, by clearing saw, when 1.5-2m in height/ 5-8 years of age, at which time bracken was controlled. Now that many stands have a complex structure, stems are removed on a frequent

selection (“off the shelf”) basis from all size classes to meet market demands at the time and to ensure that natural regeneration continues to come forward. Bracken is now generally better suppressed by the level of shade from selection stands. High pruned Douglas fir and fine larch are premium crops marketed for beamwork, with specialist outdoor carpentry outlets for coastal redwood and western red cedar and generalist local treated fencing markets for true firs, hemlock and cypresses. Stands of the shade-bearers such as grand fir are managed on a “rolling-offtake” basis where heavy thinnings to a market target diameter ensure continuous advance regeneration. There is no planned change to this silvicultural regime unless forced by climatic factors (unlikely given the species in use here) or pest/ disease (may eliminate larch).

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

Due to the long-established practice of alternative silvicultural systems at Longleat (essentially “irregular shelterwood cum group selection”) many areas of the woodlands can be considered to be in *developmental category 1* (complete/ near complete transformation), with much of the remainder being in *developmental category 2* (progressive/ advanced transformation). Natural regeneration of a wide range of conifer species is prolific and is by far the main method of restocking across the woodlands at Longleat. While there may well need to be adaptation to climate change and pest/ disease factors in the selection of preferred tree species (e.g. larch), there seems every likelihood that ATC will continue to be the main approach applied.

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

ATC management at Longleat has conventionally relied on the experience of the long-service head forester to assess stocking and regeneration and prescribe thinnings based on visual inspections. There has been limited emphasis on formalised repeat enumeration, but this could be adopted in the future. Longleat has fulfilled a valuable ATC demonstration role for guided forestry visits over many years. If unguided visits were contemplated, and agreeable to the owner, support materials would be needed.

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

Longleat Estate have developed considerable experience in operating their woods under alternative silvicultural systems and marketing valuable/ specialist timber arising from this management (particularly large-dimension Douglas fir for beams). There are no significant operational issues. Respacing of natural regeneration is the only cost operation, but is more than offset by savings on site preparation/ replanting. Due to the emphasis on premium stock, comparison with regular forestry is difficult.

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

Due to the mix of shade-tolerant coniferous species used for productive forestry under ATC at Longleat Estate, there are obvious comparisons with Cirencester Park Estate (Case Study 2), Tavistock Estate and Dartington Hall (Case Study 18), Bowhill and Eildon Estates (Case Study 19), Ffrwdgrech Estate (Case Study 5) and Weasenham Woods (Case Study 30). Longleat has a near-unique experience of growing species such as Douglas fir for identified target markets on a “harvest on demand” system.

Photographic record



Left: Douglas fir - mid rotation stand



Right: Douglas fir - premium mature stands with developed regen.



Left: Douglas fir - premium mature stands with developed regen.



Right: Douglas fir - premium mature stands with developed regen.



Left: Lawson cypress after thinning



Right: Lawson cypress after thinning



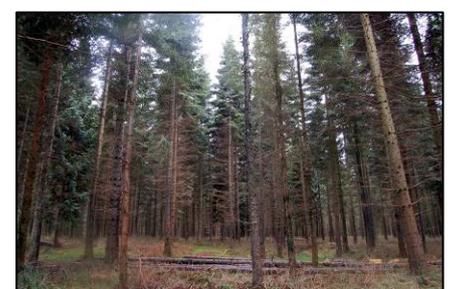
Left: Coastal redwood after thinning



Right: Coastal redwood after thinning



Left: premium European larch stems



Right: Grand fir stand subject to regular thinning



Left: premium European larch stems



Right: trial plantation of Leyland cypress