Wessex Silvicultural Group
Field Meeting Notes

2019 Study '100 Years of Forest Research in Wessex'

Meeting 1: Micheldever Wood, Tuesday 30th April 2019

Theme: Oak Sample Plots and Natural Regeneration Trials

by Freia Bladon

This year the Wessex Silvicultural Group marks the centenary of the Forestry Commission by studying the theme '100 years of Forest Research in Wessex', visiting past and present research trials throughout the region. The first of our visits looked at trials established during the 1950s at Micheldever Wood, Hampshire. The 1950s was a great period in the history of Forest Research with a number of experimental sites established around the country to inform foresters on a wide range of subjects now and into the future. At Micheldever, experiments were laid down to study the growth and yield of oak under four different thinning regimes, to compare ordinary thinning with 'free growth' of oak, and later to look at natural regeneration under a beech-dominated canopy. Our visit provided the opportunity to look at what can be learnt from these trials, and how the results may influence our silvicultural decisions in the future.

Micheldever Wood covers some 370 ha, 85 per cent of which comprises native broadleaves with beech by far the dominant species (around 71 per cent of the woodland). The soil, which overlays chalk, is a stony argillic brown earth with elements of clay.

Growth and yield of oak under different thinning regimes

Our first stop was at an experimental site that was set up in 1953 with the aim of studying the growth and yield of oak under different thinning regimes. Planted in 1928, the stand of pedunculate oak was subject to four different thinning treatments: No thin, crown thin (70% of yield class), standard thin (low thin), and heavy low thin (effectively free growth), all currently measured on a five year cycle.

The experimental site represents one of the network of permanent mensuration sample plots established and maintained by Forest Research.

Figure 1: Growth and yield of oak under different thinning regimes. Left: No thin plot. Right: Heavy thin plot.

This sample plot network is one of the longest-running forest growth monitoring networks in the world. Ian Craig (Forest Research Sample Plot Manager) outlined the history and rationale behind the sample plot network. The first sample plots were established in 1911 by the Forestry branch of the Board of Agriculture and Fisheries, and since then Forest Research has collected data on forest growth and yield from 1946 sample plots. Mensuration data from sample plots (incorporating thinning experiments such as the oak trial at Micheldever) is now normally recorded every five years (subject to external influences), and used to inform growth and yield models for key forestry tree species. It is these models that form one of the foundations of forest management in the UK.

Despite pressure to reduce sampling frequencies and the number of plots maintained, Forest Research have retained a good core of sample plots to continue to inform growth and yield models – there are currently 260 viable plots. Where the focus for establishing new plots had previously been on species including larch, Corsican pine and ash, the arrival of diseases including Phytophthora, Dothistroma needle blight and Chalara ash dieback has moved the emphasis to species with greater future potential in the UK such as Douglas fir, oak and birch to add to the core holding of Sitka spruce and Scots pine.

Forest Research continue to work on updating and strengthening existing growth and yield models. This includes work to incorporate improved assessments of growth rates and form factors for each species within models, and to address the need for model adjustments that may be required now that the trees within sample plots are older. There are also plans to expand the sample plot network to gather data on emerging species, although locating suitable stands in which to establish such plots can be challenging. Potential stands must be a minimum of 2.0ha in size, with the first measurements ideally taken just before the first thin to enable baseline data to be gathered.

Our stop at the oak thinning trial served to reinforce the value of these sample plots, the meticulous records that have been kept, and the subsequent modelling of growth and yield that has been made possible by this long-term monitoring. While we do not know what issues and questions there might be in the future around the growth performance and potential yield of particular species or types of forest, the permanent sample plot network will be an invaluable source of information to help address future silvicultural questions.

'Free growth' of oak

Adjacent to the oak sample plots is an experiment laid down in 1956 to compare ordinary thinning with 'free growth' of oak. This experiment was established at a time when considerable interest was being shown in efforts to speed up the diameter growth of oak so as to produce saw bench timber more quickly, based on the ideas of Fred Hummel in the 1940s and laid down later by R.F. Wood. An equivalent long-term experiment was established at Crumblands, Tintern Forest, Gwent (Kerr, 1996; Kerr and Forster, 2018)

The oak stand at Micheldever was part of an old experiment laid down in 1928. In 1956 eleven pairs of trees were selected and two treatments applied, one treatment each to every pair of trees:

Table 1: Mean dbh and mean increment of 'free grown' oak and oak that had been subject to normal thinning over the course of the Micheldever experiment.

	Mean dbh (cm)							Mean increment (cm/yr)
	1956	**1959**	**1961**	**1965**	**1969**	**1978**	**1979**	
a. Normal thinning	12.9	13.9	15.0	17.0	18.6	23.8	24.3	0.52
b. Free growth	12.7	14.3	15.8	19.4	21.8	28.1	28.8	0.73

a. Normal thinning, no pruning.
b. 'Free growth' conditions; a space equal to about their crown width being maintained around the crowns of selected dominants. Prune to 24ft, but the crown at no time to be reduced to below half the total height of the tree.

This experiment was maintained until 1978. Table 1 shows the effect of the 'free growth' over the course of the experiment. Now, at 91 years of age, some of the 'free growth' trees at Micheldever have reached >60 cm dbh, the same being true of some trees in the equivalent experiment at Crumblands (results from the latter being reported in Kerr (2018)).

As highlighted by members of the group, the financial returns possible for high quality oak are currently excellent, with the construction market buoyant. As an example, the 'free grown' oak pictured in Figure 2 (64cm dbh) was thought likely to achieve around £180/m^3 for the first 5m of the stem at rideside, with stems of 85-90cm dbh optimal. A final key point was brought to light at this stop - unlike species such as sycamore and beech, oak is susceptible to entering a state in which the growth rate does not recover after a period of canopy closure, meaning that timing is very important when establishing any 'free growth' trials of oak.

Figure 2: The crown of a 'free grown' oak (left) and that of an oak that had been subject to normal thinning (right).

Figure 3: Possibly the largest diameter oak for its age in Britain.

Before moving to the afternoon session, the group stopped to admire what is possibly the largest diameter oak for its age in Britain, measuring 93cm dbh in 91 years (Figure 3).

Natural regeneration of beech woodland

The afternoon session looked at an experiment with natural regeneration of a beech woodland, established in 2003/4 and led by Ralph Harmer. The trial aimed to determine which thinning treatments could best increase the number of broadleaf native tree species becoming established in beech-dominated woodland, and hence improve overall stand biodiversity. Four thinning treatments were applied that removed 0, 20, 40 and 80 per cent of the basal area, with fenced and unfenced areas within each treatment. Observations were made annually, and the number of seedlings, vegetation cover, species present, mortality etc. recorded for each treatment.

The results of the experiment (unpublished) indicate that the 80 per cent thin treatment significantly increased natural regeneration and stand scale diversity, but that none of the other treatments altered stand composition significantly (Figure 4). Regenerating species largely consisted of willow and birch, with very little beech regeneration being observed over the course of the trial. The trial also looked at browsing damage across plots, with results highlighting the high deer pressure at this site. Willow was browsed much more than birch, with little or no willow regenerating outside fenced areas.

After thinning treatments the cover of bramble increased continuously throughout the experiment, with fencing leading to a much more rapid development. A later study at Micheldever found that bramble appeared to facilitate the establishment of willow and birch (Harmer *et al.*, 2010). In contrast, slower growing species including oak and beech are less likely to establish as they are unable to compete with the growth of the bramble (Harmer and Morgan, 2007). It would therefore appear that slower growing species need to become established before bramble if they are to survive. This makes careful timing of thinning operations (to tie in

with mast years) crucial in achieving successful natural regeneration of slower growing species*.

Summary

Beat Forester Michael Ullman concluded the visit by outlining how the experiments at Micheldever have, and will continue to, influence the management of the woods. The natural regeneration trial has been invaluable in demonstrating how diversity can be encouraged and regeneration established, while results have helped inform approaches to PAWS restoration. There are plans to continue with experimentation with the 'free growth' of oak, and there is a broader aim to continue the legacy of experimentation at Micheldever, with current trials focussing on emerging species, group shelterwood systems, and underplanting.

The visit served not only as an excellent celebration of '100 Years of Forest Research in Wessex', but also as an important reminder for the next generation of foresters of the rich network of trials that have been laid down over the past century, and their immense value.

*An RFS visit to Escot Estate, near Honiton, Devon on October 2nd will look at planned long-term experiments with oak CCF, of which there are very few examples in the UK.

Figure 4: Only the 80 per cent thin treatment significantly increased natural regeneration and stand scale diversity (remaining trees were removed 2010/11).

References and Further Reading

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Kerr, G. (1996) The effect of heavy or 'free growth' thinning on oak (*Quercus petraea* and *Q. robur*). Forestry, 69(4):305-320.

Kerr, G. and Forster, J. (2018) Can we grow oak to 60cm DBH in less than 100 years in Britain? Quarterly Journal of Forestry, 112(3): 156-162.

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