

## Wessex Silvicultural Group Visit Report

Meeting 1: Wednesday 13 April 2002

Study subject: Silviculture for biodiversity

Location: Farnham Woods (ST939163) and Chase Woods (ST978173), Rushmore Estate, Tollard Royal, Wiltshire

### Soils

343h ANDOVER 1 (well drained calcareous silty soils over chalk of varying depth) and 581d CARSTENS (well drained fine silt over clay, often very flinty) (Avery, 1980).

### Site

	2022	2080
Accumulated temperature <sup>1</sup>	1754	2930
Exposure <sup>1</sup>	14	14
Moisture deficit <sup>1</sup>	164	251
Soil moisture regime <sup>1</sup>	6 (Slightly dry)	6 (Slightly dry)
Soil nutrient regime <sup>1</sup>	4 (Rich)	4 (Rich)
Rainfall <sup>2</sup>	780 mm	-
Elevation <sup>3</sup>	100-260 m	

<sup>1</sup> ESC version 4; <sup>2</sup> UK Met. Office; <sup>3</sup> site notes

More details on the soils and site at Rushmore is given in the notes for the Estate.

### Background and objectives of the day

Theme for the day: The relationship between stand structure and biodiversity

The Rushmore Estate contains one of the largest blocks of ancient semi-natural woodland in southern England and half of the Estate's 800 ha of woodland is a SSSI. The Estate has had an active programme of management since 1990, including the restoration of large areas of coppice. However, the search for a financially sustainable means of delivering favourable condition for the SSSI has led to the development of irregular high forest structures with integrated understoreys to supplement coppice, ride management and areas of limited intervention.

The lack of research into the effect on biodiversity of manipulating high forest led to the establishment of a major research project in 2015 which seeks to look at the relationship between structure and biodiversity output and to look explicitly at the role of irregular high forest in comparison with coppice and limited intervention. The study uses birds, moths and bats as the vectors to measure biodiversity and has a PhD study undertaken by Danny Alder at its centre. Fieldwork has been completed and the first two peer-reviewed papers on the basic data have been produced (on birds and bats), with a third in preparation on moths.

On the day we were joined by Andy Poore (Forest manager and tour Leader), Danny Alder (PhD student) and Phil Sterling (an international expert on moths).

## Summary of stops and discussion

### 1. Compartment B22, Farnham Woods

The main objectives of this stop were to introduce all WSG members to the approach to irregular silviculture used on the estate and to outline the background and methods used by Danny in his PhD study. Details of the stand structure are given in the handout but in general it was an oak/ash stand with a basal area of  $13 \text{ m}^2 \text{ ha}^{-1}$  and a patchy understorey of hazel (mainly) and birch. Where the understorey had gaps there was full development of bramble as would be expected on a W10/W8 site. Future treatment would involve removal of disease affected ash from the overstorey, installation of permanent extraction racks (which would need maintenance) and underplanting with oak (mainly) and whitebeam.

In his PhD study, Danny had compared the different stand structures on the Estate (irregular, coppice, limited intervention and even-aged being transformed [but still with a high basal area]) in terms of the number and diversity of bats, birds and moths. The summaries of the published scientific papers on birds and bats can be found at the bottom of this report. Sampling points for each study were spread around the Estate; for example, the study on birds used 310 observation points. The results were described at stop 7.

### 2. This stop was missed due to the number of questions and discussion at stop 1!

#### **The tour moved to Chase Woods (5 Km northeast of Farnham Woods)**

### 3. This stop and the following one focussed on the approach to the management of coppice at Rushmore. The main points and discussion focussed on:-

- The relationship between overstorey density and quality of coppice. The main message was the 'less the better'; much overstood coppice had very little utilisable material (10-15%).
- Fencing; hazel coppice must be fenced whereas birch did not require fencing. Economics and the requirements of the hunt had led to the area of fenced coppice being reduced from 400 ha to 30 ha over a 15 year period.
- Coppice is an essential element in irregular structures on the Estate but is difficult to expand in stands that required more, such as at stop 1.
- Figures were circulated showing how the deer cull had increased from 100 animals per year in 1970 to 400 in 2021 (95% fallow; 5% roe and other species).

### 4. See stop 3

### 5. To maintain and enhance biodiversity on the Estate, 15% of the woodland area has been committed to 'limited intervention' management, which was the focus of this stop.

### 6. A mature stand of P62 Norway spruce growing at GYC14. The stand had been managed at low basal area ( $25\text{-}30 \text{ m}^2 \text{ ha}^{-1}$ ) with thinning occurring 6 times (starting in 1981) and 2 removals prompted by wind damage. Permanent extraction racks had recently been installed and DF and WRC had been planted in 2019 arranged in groups using 60 cm treeselters (because hares were a significant issue). The main points of discussion were: (1) natural regeneration of NS [at age 60 the stand was 10-15 years off the main period of seed production]; (2) use of nest planting [tight spacing in groups at 10-15 m spacings sometimes with thorny shrubs on outside to deter

browsing]; (3) use of 'Trico' [a spray formulated with emulsified sheep fat from wool] to deter browsing.

7. A semi-developed area of irregular high forest composed of oak, ash, hazel and birch standing at 18 m<sup>2</sup> ha<sup>-1</sup>. A high diversity of lichen had been located on some of the larger trees and this has necessitated a different approach to stand interventions at the last intervention in 2007. Most of the trees with important lichen assemblages had been protected from sudden changes in environment by no thinning taking place in a 10-15 m radius of each tree. In the next intervention, scheduled for 2023, this may be changed so that only one half of the circular non-intervention zone is treated with possibly the next being treated in the next or next but one intervention. The Group admired this approach to silviculture that was aiming to maintain the biological diversity of the stand.

A fulsome discussion of Danny's PhD results then ensued. In general the two studies that have been published so far support the use of irregular silviculture to improve stand diversity in terms of birds and bats. For example, in the bird study, ten of the 20 species studied had highest spring abundance in irregular stands but in winter preferences were not quite so marked between the different stand structures. In the bat study it has been shown that irregular silviculture provides many of the structural attributes associated with high bat occupancy (open canopy, low growing stocks, reduced understorey, large trees and deadwood snags). The Group praised the people involved in the establishment, funding and implementation of such an excellent study and felt the policy relevant results needed to be well communicated to FC, Defra and other bodies.

#### **Supporting materials available for WSG visit:**

- Note of introduction and objectives for the day
- Description of Rushmore Estate and crop details and management history of each stand visited.
- Two scientific papers (\*see references below)
- Summary data relating stand structure to bird and bat diversity
- Project description of the woodland biodiversity research project

#### **References**

Avery, B.W. 1980 *Soil classification for England and Wales (Higher categories)*. Soil Survey Technical Monograph No. 14. Soil Survey of England and Wales, Harpenden.

Alder, D.C., Fuller, R.J. and Marsden, S.J. 2018 Implications of transformation to irregular silviculture for woodland birds: A stand wise comparison in an English broadleaf woodland. *Forest Ecology and Management*, 422: 69-78\*

Alder, D.C., Poore, A., Norrey, J., Newson, S.E. and Marsden, S.J. 2021 Irregular silviculture positively influences multiple bat species in a lowland temperate broadleaf woodland. *Forest Ecology and Management*, 483 (2021) 118786\*

Southwood, T. R. E. 1961 The number of species of insects associated with various tree species. *Journal of Animal Ecology* **30**, 1-8.

Photos to illustrate key points

	
<b>Stop 1: typical irregular structure</b>	<b>Stop 3: Overstood coppice</b>
	
<b>Stop 3: Group planting to form irregular structure</b>	<b>Stop 4: Birch coppice – high quality cut on 3 year cycle for house jumps</b>
	
<b>Stop 5: Minimal intervention</b>	<b>Stop 5: Minimal intervention</b>



**Stop 6: P62 Norway spruce underplanted**

**Lunch**

### Summaries of scientific papers

#### The study on bats:

#### Highlights

- Bat passes and habitat measures were collected from 3 woodland management types.
- Comparisons included irregular silviculture, novel in British broad-leaf woods.
- Bat species richness was greatest in irregular high forest compared to coppice.
- Six of 9 bat species had highest occupancy in irregular stands.
- Habitat associations varied depending upon bat species.
- Irregular silviculture creates habitat structures likely to benefit bats in the UK.

Changing economics in the 20th century led to losses and fragmentation of semi-natural woodland in Britain and to a reduction in active woodland management with many becoming increasingly neglected, even-aged and with closed canopy. Lack of woodland management is known to contribute to declines in some taxonomic groups, for example birds. However, the response of bats to changes in woodland structure are poorly understood. We compared two measures of bat activity, derived from static acoustic recorders across 120 sample plots in coppice, irregular high forest (uneven-aged, continuous cover) and limited intervention (under-managed, even-aged) management stands, within a large tract of ancient woodland in southern England. Bat species richness was highest in irregular high forest stands, and there were significant differences in occupancy rates for most bat species across stand management types. Coppice recorded low activity of several bat species and irregular high forest showed high occupancy rates, including for *Barbastella barbastellus*, which is IUCN listed as near threatened. The occupancy rates in stand management types differed for some bat species between mid- and late summer counts, suggesting seasonal variation in habitat use. Within stands, most bat species were associated with opened canopy, lower growing stocks and reduced densities of understorey, and to a lesser extent, with large-girthed trees and presence of deadwood snags. In some cases, species responded to a given habitat variable similarly across the three stand management types, whereas in others, the response differed among stand management types. For example, increased numbers of large-girthed trees benefitted a number of bat species within coppice where these were least common, but not in irregular stands. Irregular silviculture high forest appears to provide many of the structural attributes that positively influence occupancy of several woodland bat species, including *Barbastella barbastellus*.

## The study on birds

### Highlights

- Bird and habitat data was collected from 310 woodland sample plots of 4 stand types.
- Comparisons included irregular CCF a new silvicultural practice in UK broadleaf woods.
- Significant differences were found between stand types for 13 of 17 habitat variables.
- Ten of 20 bird species had highest densities in irregular stands.
- Broadleaf stands in irregular CCF are likely to benefit woodland birds in the UK.

Woodland birds in Britain have undergone significant long term declines since the late 1960s, associated in particular with changes in woodland structure in general, and loss of early successional vegetation. Irregular, continuous canopy broadleaf management is a form of selective logging, very recently adopted in UK that produces woodlands with open canopies and substantial mid- and understorey growth. We examined spring and late winter bird densities, estimated using distance sampling, at 310 points in irregular, transitional (that being managed towards irregular), limited intervention, and coppice stands within a large working broad-leaf woodland in lowland southern Britain. Almost all understorey and canopy vegetation measures differed significantly across stand types. Ten of 20 species had highest spring abundance in irregular woodland, five in coppice, three in transitional, and just two in limited intervention. In winter, 5–6 species preferred each of limited intervention, irregular and transitional, while no species preferred coppice. Densities differed little across seasons except in Paridae where abundances increased in late winter during which limited intervention stands were used more by this group. Birds generally occupied similar niche positions and had similar niche breadths across seasons. Compared to under-managed woodlands, irregular silviculture in UK's broadleaf woodlands is likely to enhance habitat quality for woodland birds, including several species of conservation concern e.g. marsh tit *Poecile palustris* which was twice as abundant in irregular stands as in any other stand type.