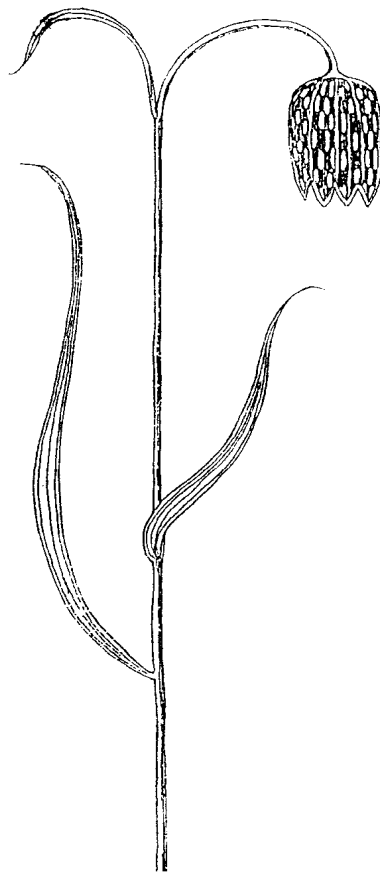


# **WILTSHIRE BOTANY**



**JOURNAL OF THE  
WILTSHIRE BOTANICAL SOCIETY**

**ISSUE NO. 7, FEBRUARY 2005**

**ISSN 1460-4612**



# WILTSHIRE BOTANY

## Journal of the Wiltshire Botanical Society

Issue No. 7, February 2005

### CONTENTS

- 1 Editorial
- 3 Identifying Wiltshire's ferns  
*Pat Woodruffe*
- 11 Algae within aquatic plant roots: Initial studies of endophytes inside the roots of  
*Lemna, Azolla, Callitriche* and *Elodea*  
*Jack Oliver*
- 18 Effects of thinning on an Elm wood  
*Ken Thwaite*
- 22 Great girth trees in Wiltshire: Aceraceae: Their size, seedlings and spread  
*Jack Oliver*
- 27 *Ornithogalum pyrenaicum* in Winsley  
*John Presland*
- 31 Monitoring *Ornithogalum pyrenaicum* at Clouts Wood - to 2004  
*Richard Aisbitt*
- 35 Plant records 2003

## EDITORIAL

### In this issue

This issue of *Wiltshire Botany* continues to break new ground. Pat Woodruffe's article incorporating identification keys for Wiltshire ferns is our first contribution on this group of plants. Hopefully, it will lead to increased and more accurate recording of this group. Ken Thwaite's article is the first we have had on woodland management. Jack Oliver has written about Algae in aquatic plant roots, a topic which is hard to find in botanical works generally. The unfamiliarity of the material makes his article something of a challenge, but everything is explained clearly, and readers will find themselves knowing things which will be new to many other botanists.

The remaining articles pursue themes which have already featured in these pages. Jack Oliver provides further information about ancient trees in the county - this time concentrating on the Aceraceae. There is the usual selection of items from our society plant records

Two articles on Bath Asparagus in this issue following one on the same topic in the previous issue might be thought excessive. However, it is one of the county's most important plants. The 1976 *Atlas of the British Flora* noted it for only twenty-two 10 km squares in Britain, of which 11 were in Wiltshire. Recently, it has been noted in about 10 such squares immediately to the west of Wiltshire, and has also been seen in Gloucestershire. Thus, even though there is a native site in each of Bedfordshire and Berkshire, it is almost entirely local to our region. Even in Wiltshire, its occurrence is largely restricted to a few areas, extending into West Wiltshire from the Bath area, with two locations near Swindon and noted elsewhere only in a tetrad near Marlborough, one east of Salisbury and 3 at Devizes. Here John Presland writes on a location in West Wiltshire, while Richard Aisbitt adds further data for his study in the Swindon area reported in the previous issue. The reasons for its restricted distribution and reluctance to spread, however, remain mysterious.

### News of Ragweed

Ragweed, *Ambrosia artemisiifolia*, is a North American annual herb which has invaded other countries worldwide and has been seen in Wiltshire in recent years. It comes in bird-seed or other imported seed packages. In France, where it is very unpopular, recent research has shown that at least 6% of the population is allergic to its wind-dispersed pollen. This can lead to skin rashes, respiratory allergies, sinusitis and conjunctivitis. Fortunately, it is not common here and we may continue to regard it as an interesting find. However, it loves bare and cleared places, so one day it might need controlling. In the meantime, pollen sniffing is not advised.

## Identifying Wiltshire Willowherbs

To aid recording of this group with very similar features, the following key is offered. It based on the Key in Stace's Field Flora, but is simplified and non-Wiltshire species are omitted. Beware of hybrids, which are often larger than the parents and may produce no or rather impoverished fruits, as well as being intermediate in characteristics.

1. Flowers facing to the side when open and zygomorphic (= there's only one vertical plane in which you can cut the flower to give mirror-image halves) **E. (or Chamerion) angustifolium (Rose-bay Willowherb)**
- 1a. Flowers facing upwards when open and actinomorphic (= a vertical cut through anywhere will give two mirror-images) **2**
2. Stigma 4-lobed (though the lobes may be closed together with faint dividing lines between them) **3**
- 2a. Stigma club shaped **6**
3. Stem hairs long and spreading **4**
- 3a. Stems almost hairless **5**
4. Petals 10-16 mm; leaves slightly clasping; stems shaggy pubescent, stem and leaves green **E. hirsutum (Great Hairy Willowherb)**
- 4a. Petals 5-9 mm; leaves not clasping, rounded; leaves matted pubescent, stem and leaves greyish-green **E. parviflorum (Hoary Willowherb)**
5. Leaf stalks 2-6 mm **E. montanum (Broad-leaved willow-herb)**
- 5a. Leaf stalks 3-10 mm **E. lanceolatum (Spear-leaved Willowherb)**
6. Stem cylindrical without ridges **E. palustre (Marsh Willowherb)**
- 6a. Stem with 2-4 ridges or angles, at least in lower half **7**

7. Leaf stalks 0.5 cm + **E. roseum (Pale Willowherb)**
- 7a. Leaf stalks less than 0.5 cm **8**
8. Upper part of stem with both spreading hairs bearing round glands at the tips and appressed non-glandular hairs **E. ciliatum (American Willowherb)**
- 8a. No glandular hairs on stem **9**
9. Glandular hairs on calyx tube **E. obscurum (Short-fruited Willowherb)**
- 9a. No glandular hairs on calyx tube **E. tetragonum (Square-stemmed Willowherb)**

## Next issue

There is no specific policy on publication dates - an issue appears when there is sufficient material. So far, six issues have been published over a period of seven years, a frequency which may be difficult to maintain. Articles for the next issue should be submitted to John Presland, 175c Ashley Lane, Winsley, Bradford-on-Avon, Wiltshire BA15 2HR. He will also be pleased to discuss proposed articles informally (Tel: 01225 865125). A leaflet is available offering guidance to authors on the most helpful form in which to submit articles.

## ALGAE WITHIN AQUATIC PLANT ROOTS

### Initial Studies of Endophytes inside the roots of *Lemna*, *Azolla*, *Callitriche* and *Elodea*

Jack Oliver

### Introduction

Members of *Lemna* (Duckweed) genus can have bright green roots. Curiosity led me to examine the reason, or reasons for this phenomenon which can occur, to a lesser degree, in some other vascular water plants also.

The six aquatic plant species considered here were the following:-

1. Least Duckweed, *Lemna minuta*, from Lockeridge roof gutters and from the River Kennet.
2. Common Duckweed, *L. minor*, from a ditch near Pewsey.
3. Ivy-leaved Duckweed, *L. trisulca*, originating from a small garden pond in Swindon where it was presumed to have been carried by a bird.
4. Water Fern, *Azolla filiculoides*, from the River Avon at Malmesbury.
5. Blunt-fruited Water-starwort, *Callitriche obtusangula*, from the River Kennet at Marlborough.
6. Nuttall's Waterweed, *Elodea nuttallii* from the River Avon near Malmesbury.

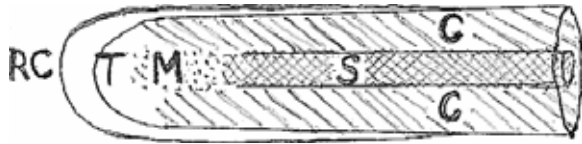
### The roots: structures, tissues, organelles & associated algae

Figures 1 & 2 overleaf illustrate the side view (a semi-longitudinal section) and transverse section respectively of a *Lemna* root. The *Azolla* roots were very similar. RC is the root cap (or root sheath) guarding T, the root tip, and M the meristematic (main cell division and growth) area. The root cap is, of course, necessary to protect the delicate elongating rootlets of land plants in sharp gritty soil. It may function to a limited degree to protect the tips of water plants from being nipped off by invertebrates' mandibles, or being rasped off by water snail radulae. I did not find root caps on the *Callitriche* or *Elodea* roots, which were otherwise as in Figures 1 & 2. C represents cortical tissue, consisting of large rectangular cells (roughly in the usual range of 30-70 microns (m) long in all 6 species). A micron is one thousandth of a millimetre. S is the stele or central vascular cylinder tissues concerned with conducting fluids along the root from the root tips up the root shaft to stem (or fronds in *Lemna* and *Azolla*), and the sugars resulting from photosynthesis in the opposite direction: much more important in land plants.

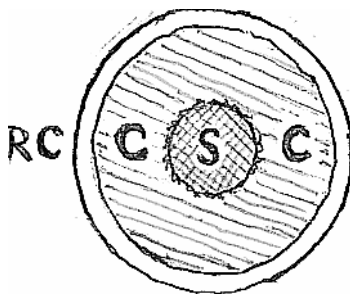
The term 'epiphyte' simply represents a plant growing on another (not a parasite or symbiont). These epiphytes, usually filamentous or other algae, could be stuck on the outside of the root cap, but more commonly adhered to the epidermal surface over the cortical tissue higher up the root shaft, especially on older, dying or decaying roots.

**Figure 1: Diagram of semi-longitudinal section of *Lemna* and *Azolla* root**

**RC = root cap sheath      T = root tip**  
**M = meristematic region    C = cortex tissues**  
**S = stele or central vascular cylinder**



**Figure 2: Diagram of cross section of *Lemna* and *Azolla* root**



'Endophytes' are plants that live inside other plants (but not as parasites). Plant tissues are penetrated. These had hardly been considered in the literature, or were assumed to be very rare, unless as tropical leaf parasites, or in aerial cycad roots, or in marine environments in certain seaweed species. (See later sections, the main topic of this paper).

The designation 'internal epiphyte' is a special case pertaining to this study. These internal epiphytes were algae which floated inside the root cap when the semi-attached rim started to loosen at the upper end. They then stuck onto the inside of the root cap, or the outside of the root tip, or both. Some of these algae might have penetrated the intact root cap sheath whilst still fully sealed, as true tissue-penetrating endophytes; but I also observed a variety of algae floating into the older unsealed upper rims to become attached before the root sheath was lost. These were different (and more varied) types from the obviously tissue-penetrating endophytic algae.

Plant cells contain a variety of small bodies called plastids, some of which are green because they contain chlorophyll and are called chloroplasts. Chloroplasts photosynthesise, creating the plant carbohydrates. In all the "higher" (evolutionarily complex) plants, and in the *Chlorophyta* (the algae from which the "higher" plants almost certainly

evolved), these carbohydrates are stored as starch in the chloroplasts, and often also deposited as starch grains. In "higher" plants these starch reserves can be plastids called amyloplasts, or as a "starch sheath" in the endodermis, the sheet of cells surrounding the central vascular cylinder. Regions of starch formation in the *Chlorophyta* are known as pyrenoids, often clearly visible (see Figure 3B overleaf). Chloroplasts are not described in roots (being usually in the dark), but the green bodies found in *Lemna minuta* roots seemed to include both endophytic algae (in the range of 2-8µm (microns) in diameter) and "higher plant" intracellular chloroplasts of similar size (see Oliver 2004a, 2004b, 2004c).

### Methods of study

The marvellous abilities of a good quality digital camera (Nikon Coolpix 4500) with high resolution and with images saved on its compact memory card were used in conjunction with a trinocular microscope reaching x400 to x700 magnification. The camera was attached to the microscope using a commercially available specific adapter. The camera was set to an image size of 2272 x 1704 pixels and to an image quality of 'Fine' which uses a 'JPEG' compression ratio of 1:4. It was decided not to use the available 'High' setting which would have given the same size image, but with no compression would have given a much larger 'TIFF' file. The 'Fine' setting was found not to affect the quality obtained when the images were enlarged and I was able to get 70 images on my 128MB memory card.

Detailed investigation of root interiors would normally require the cutting of very thin sections through the root which allow light to pass through so that structures can be seen clearly under the microscope. However apart from the skills required, the two main disadvantages were as follows. The material dries, is changed and killed; and in the cutting, epiphytic algae can be carried across the surfaces to confuse the picture of the endophytic algae.

The characteristics of the digital camera are such that living tissues can be seen into. Although the human eye is very sensitive to green, at the very low light levels inside the depths of the root tissues, the camera is more sensitive still. Dim, hardly discernible images through the microscope eyepieces can appear green and clearer in playback mode on the camera monitor. The delayed timer must be used so that no movement from the shutter release button or from touching the microscope is transferred to the water surrounding the root whether or not under a coverslip. At these very low light levels the camera automatically increases the sensitivity from an ISO rating of 100 to 400. Even so images require a long time (up to 1 sec),

so there must be no movement. However focussing deeper or shallower, and/or moving the microscope stage either laterally, or for and aft by guesswork in the gloom, can sometimes permit more revealing images on the camera monitor play-back.

Another technique used was to put a drop of iodine solution onto the living root, to give strong black and white images of starch deposits (the 'starch-iodine' reaction). This occurs in Chlorophyte algae, and vascular plant chloroplasts which have been photosynthesising. Starch also is known to occur in the form of independent storage bodies in endodermal tissues ("the starch sheath") in vascular plant rhizomes and stems. This process seems, on my observations, also to be the case for *Lemna*, *Azolla* and *Callitriche* roots. These starch bodies can look very similar to some of the iodine-stained algae – so parallel "green" microphotos are needed to supplement the "black" ones.

### Green roots

This subject has intrigued me, on and off, for 12 years (Oliver 1993, 2004a, 2004b, 2004c). There are four, perhaps five reasons for this phenomenon.

1. Epiphytic, especially filamentous algae. Old or dying *Lemna* roots can have minute filamentous or other algae attached. Although these are intricate and beautiful through the microscope, the direct visual impression to the naked eye is a faint uneven tinging of brownish olive green, or greenish dirty-looking patches.
2. Root chloroplasts (Oliver 2004a). These appear to be in the root cortex cells. The *Lemna* roots look clear mid-green, rather like the new young tendrils of leguminous plants, but usually thinner, straighter and more translucent.
3. Green algae lining the inside of the root cap (Oliver 2004c). These algae could be termed endophytes, but perhaps more properly "internal epiphytes". They vary greatly in type and appearances, and include *Entocladia* and probably *Desmococcus*, as well as other genera. To the naked eye, the root cap and root tip look a clear pretty lime-green, almost yellow.
4. Internal endophytes, extracellular, within cortical and other root tissues (Oliver 2004b, 2004c). Malcolm Storey first drew attention to this probability based on his scrutiny of the published colour microphotos shown in the earlier publication (Oliver 2004a), this being the main subject of this paper. These roots appear macroscopically similar to (2) above, clear mid-green. The phenomena (2), (3) and (4) are frequently seen together in the same root.
5. Apparent lime-green or yellow colouration sometimes seen in the meristematic region above

the young root tip. Possibilities include a yellow pigment; artefacts of light reflected, focussed or otherwise transmitted from green areas a little higher up the root shaft; or perhaps concentrations of tiny green spores. Occasionally the colouration of the meristematic area is a more intense, deeper green, rather than the yellow or lime-green translucency.

### Inside the root cap sheaths

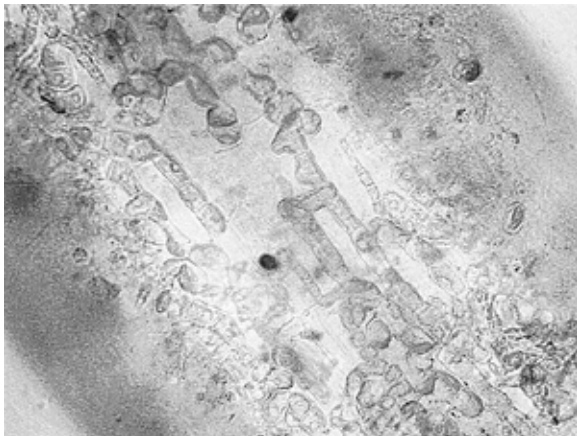
Surprisingly for water plants, both *Azolla* (Water Fern) and the 3 *Lemna* species studied so far have conspicuous root-cap sheaths. These are firmly attached in young roots, but eventually can be squeezed off by pressure on cover slips. Small algae may infiltrate early on, but the bulk probably enter around the loose rim later (I have micro-photos of the latter process). Eventually the effect is of green-lined test tube (Oliver 2004c). The variety of these algal endophytes (or "internal epiphytes") is breathtaking. However one identified genus, *Entocladia* is shown as a picture and drawing, in Figures 3A and 3B. This has been seen in *Lemna minor* as well *L. minuta*. The irregularly anastomosing filaments sometimes track along the straight lines of rectangular root-cap cells (approx 50 x 30 microns), as indicated by the arrow in Fig. 3B, and also shown by the lines of *Entocladia* filaments in Figure 3A. They eventually tend to form green sheets in due course, turning the root end an attractive yellow green colour. Further examples of wholly different algae within root cap sheaths of *L. minuta* are seen in Figure 4. The only other possibly identified algal genus noted to date is in packets of cells in groups of 2 or 4 which are reminiscent of the terrestrial alga *Desmococcus*. This is not too surprising, because these were in the root caps of *L. minuta* taken from a colony in a roof gutter, below slates often green with this alga.

### Invasions of the root cortices

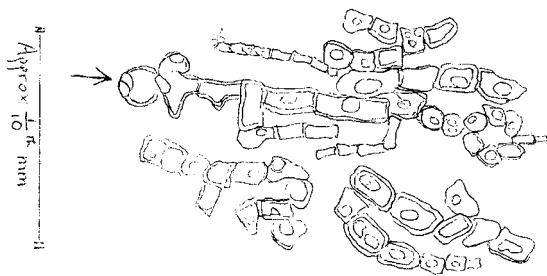
It is not just the root tips and root caps of *Lemna minor*, *L. minuta* and *L. trisulca* which can be green. The root shafts can be a clear mid-green or deep green right up to the frond. Chloroplasts 2-4m in diameter can account for some of this greenness (Oliver 2004a). These appear to be intracellular, regularly spaced, typical of vascular plant leaf (or stem) chloroplasts, and shaped like human red blood cells. As a shorthand, I call these, "green erythrocytes"! From the facial aspect, they appear as a dimpled disc (A in Figure 5) 2-4m Edge on, they are again the same shape as red blood cells (erythrocytes) (B in Figure 5) 2-4m

By contrast, other green bodies are even more common and are at times obviously extracellular.

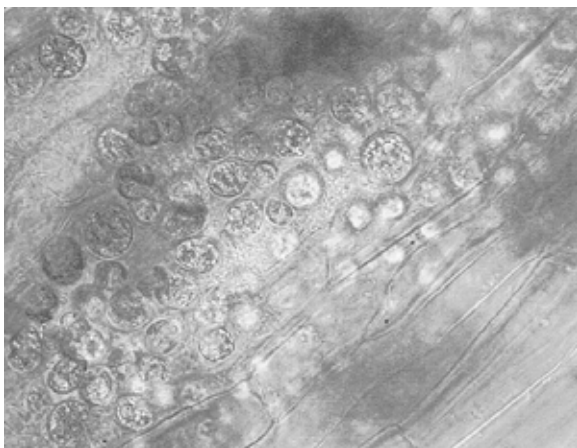
**Figure 3A:** Microphoto of the inner surface of the root cap sheath of *Lemna minuta*. Mainly a sheet of the alga *Entocladia* (probably “internal epiphytes”)



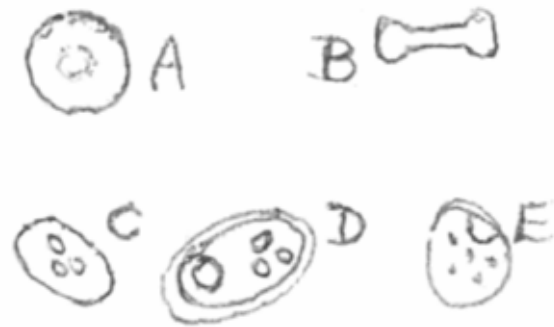
**Figure 3B:** Prostrate masses of anastomosing filaments of *Entocladia* with prominent pyrenoids, spreading as a sheet over the inside of the *Lemna minuta* root sheath



**Figure 4:** Microphoto of the inner surface of the root cap sheath of *Lemna minuta*, showing numerous spherical algae, quite different from those in Figures 3A and 3B, but probably also “internal epiphytes” rather than true endophytes



**Figure 5:** Examples of green bodies within the root cortex tissues. A and B show facial and side-on views and are 2-3 microns in diameter; C, D and E are 2-5 microns in diameter

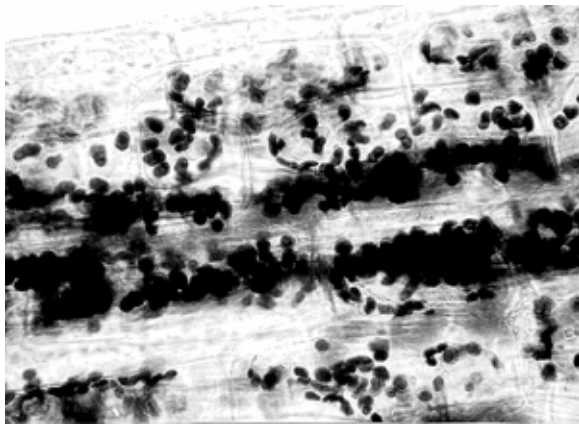


They can be shaped like the “green erythrocytes”, but are usually slightly elongated, ovoid or irregular in outline, thus variable in shape and even more variable in size, from 0.25 to 9 microns across. Sometimes algal organelles are discernible, algal chloroplasts or pyrenoids. These shapes (C, D and E in Figure 5) 5-8μm are not typical of the leaf or frond chloroplasts of any of the vascular plant genera I have used for comparisons (*Lemna*, *Azolla*, *Elodea* and *Callitriche*). The greatest and easiest differentiation between the “green erythrocytes” and the invading algae is the disposition of the latter. Invading algal bodies are irregularly scattered, or massed in (extracellular) clumps, or in continuous or broken lines. Micro-photos of leaf cell chloroplasts have a sparkling green regular beauty and symmetry. These are not the pictures seen when green algae invade root tissues.

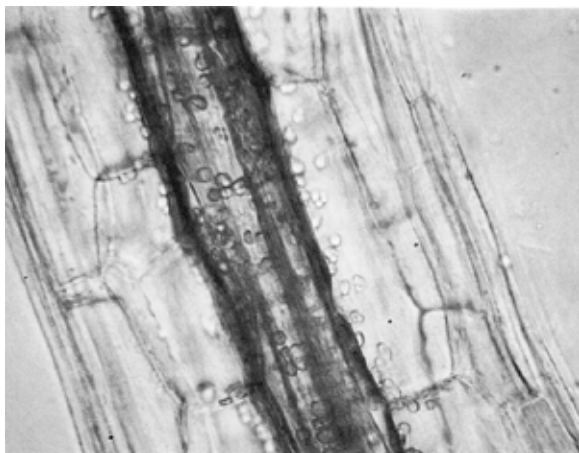
Figure 6 overleaf shows *L. minuta* cortex rectangular cells of the mid root shaft, approximately 50 x 30 microns but variable in size. The centre of the picture shows the central vascular cylinder or stele. As iodine was used, the black bodies indicate all starch deposits. These are a mixture of both algal chlorophyte endophytes and independent starch plastids (amyloplasts), usually in a ratio of about 1:3. There is in this microphoto a concentration of the black bodies around the stele, the “endodermal sheath”.

Figures 7 and 8 overleaf are black and white copies of “green” micro-photos of almost the same area inside the *L. minuta* root shaft showing cortex and stele. In Figure 8 the coverslip had been pressed down hard, causing some of the green bodies to burst out of the central vascular cylinder. All these bodies were green, mostly 1-5μm in diameter. As the stele is a cylinder, some of the green bodies apparently inside these vascular tissues could be in the near or far endodermal sheath; but the focussing comparisons indicate that many are actually inside the central vascular cylinder (see next subheading).

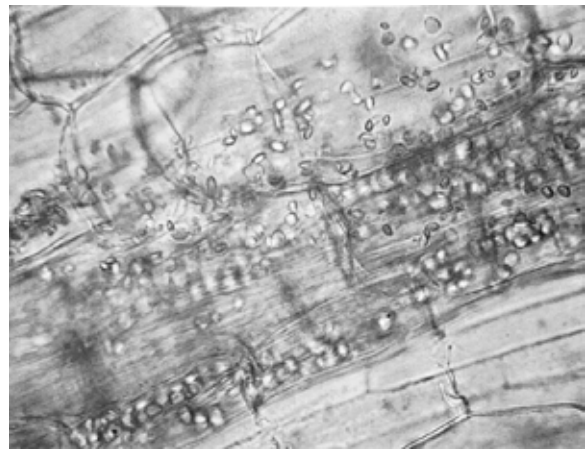
**Figure 6: Microphoto of the centre of the living root of *L. minuta*, stained with iodine. The main concentration of black bodies, both amyloplasts and Chlorophyte endophytes, is in the endoderm around the stele. They consist of both amyloplasts and chlorophyte endophytes.**



**Figure 7: Microphoto of the central part of the living root of *Lemna minuta*. The small irregularly circular bodies in and around the stele are the Chlorophyte endophytes which give the root its green colour**



**Figure 8: Microphoto of the central part of the *Lemna minuta* root (as in Figure 7), but with pressure on the coverslip causing extrusion of endophytes from the stele**



**Figure 9: Microphoto of a small part of the inside of the central part of the root of the Water Fern (*Azolla filiculoides*). The clump of irregularly shaped stippled green algae (30 microns across) is situated in the cortex tissues, but near the stele and therefore deep into the root.**

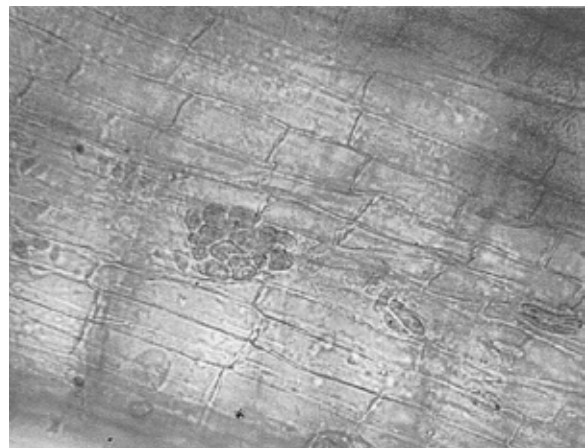


Figure 9 shows a clump of green algal endophytes inside the root cortex tissues of the Water Fern, *Azolla filiculoides*, near to the stelar boundary, therefore invading fairly deeply into the root. The clump measures 30m across, with the irregularly shaped speckled Chlorophyte endophytes individually from 2-8m. This clumping also can occur in the 3 *Lemna* species studied, but in general the distribution and scattering of small green endophytes is typical of the *Lemna* genus, whereas *Azolla* on the whole seems more resistant to multiple invasions.

Water-starwort and other waterweed roots were also examined, specifically *Callitriche obtusangula* and *Elodea nuttallii*. These do not look very green (unlike their underwater stems, rich in chloroplasts), unless coated with green epiphytes. Their roots are thicker and tougher than Duckweed roots, hindering my favoured techniques for searching for endophytes. Even so, occasional scatters of green bodies (0.25-3m) were seen within the root cortex of both species. The waxiness of the *Callitriche* root delayed iodine uptake, so I have 2 microphotos of identical parts of

the cortical tissues, the same rectangular cells and the same green bodies at 2 minutes and half an hour. There were, adjacent to the more familiar Chlorophyte endophytes, a number of the smallest green bodies which did not react with iodine, and did not stain, remaining green. This raises the probability that representatives from one of the other 14 main phyla of algae other than the *Chlorophycaceae* can also become endophytic within the root cortex cells of aquatic vascular plants.

### Within the central vascular cylinder (CVC)

As described in the preceding section, it is difficult in many microphotos (Figures 7 and 8) to be sure which endophytes are within the stelar vessels, and which are sitting on (or in) the near or far endodermal surface of the cylinder. Focussing within the gloom shows some bodies inside, mostly about 3-4m diameter. Two recent microphotos show them only inside, and 4 show the appearance of a streaming effect, as if they were floating. Penetration of the central vascular cylinder by presumed algal endophytes (these cannot be starch bodies or vascular plant chloroplasts) has been seen in *Lemna minuta*, *L. minor* and *L. trisulca*. The fronds of *L. trisulca* (Ivy-leaved Duckweed) float under water, so transportation within its vascular tissues could be much more sluggish than that of those Duckweeds with floating surface fronds which transpire. Figure 10 shows the inside of the *L. trisulca* root, drawn as if before the iodine staining. In this particular root, all the green bodies were inside the central vascular cylinder. They were of at least 2 types. Those labelled G were often irregularly-shaped green discs or ovals, which showed the starch-iodine reaction. They stained brown, indicating Chlorophyte endophytes. The 2 stippled circular bodies labelled DGS were dark green, and wholly unreactive to the iodine staining, suggesting endophytes of a different taxonomic class of algae whose carbohydrate storage chemistry does not include starch. A non-motile representative or stage of one of the Euglenophytes is just one of various possibilities.

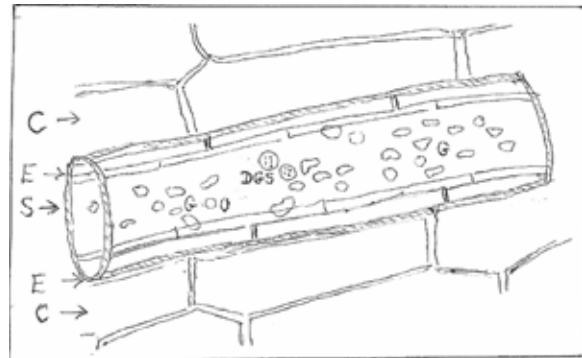
Most of the green endophytic bodies within the central vascular cylinders of *L. minor* and *L. minuta* were only visible as featureless discs, ovoids or spheres 2-3m across, as in Figures 7 and 8; but occasionally a green body with organelles can be discerned, as in Figures 5C, 5D & 5E.

### Discussion and conclusions

The alga *Chlorochytrium lemnae* occurs as green spots in dead or dying *Lemna* fronds. None of the green bodies seen in the young and living and

**Figure 10: Semidiagrammatic drawing of microphoto of the inside of the central part of the root shaft of *Lemna trisulca*. The central vascular cylinder was very dark and most of its cells have been omitted.**

*C* = cortex cells                      *E* = endoderm  
*S* = stele (central vascular cylinder)  
*DGS* = 2 dark green bodies, stippled (3-4 microns)  
*G* = numerous clear green bodies (3-5 microns)



growing *Lemna* roots, or within the root cap sheath, remotely resembles *C. lemnae*. Marine endophytic algae are well known, but these are to be found within the tissues of larger seaweeds (Graham & Wilcox 2000).

Algae are among the symbionts associated with fungi in lichens; and a number of liverwort, hornwort, moss, cycad and fern (*Azolla*) species are associated with nitrogen-fixing blue green alga. Indeed I have microphotos of the *Anabaena* chains from the underside leaf cavities of the same *Azolla* plants whose root endophytes were studied here (see earlier heading and Figure 9). This makes it conceivable that *Azolla* hosts 2 symbionts!

There are subaerial symbiotic green algae associated with the aerial roots of tropical cycads, and parasitic endophytic algae can cause disease in the leaves of a few tropical plants such as *Camellia* species. Mucilage-filled glands at the extreme base of *Gunnera* petioles harbour nitrogen fixing *Nostoc* colonies (for articles and pictures, see Clement 2003; Lund & Lund 1996). *Cephaleuros* (*Chrooderma*) *endophyticus* is found in the subcuticular layers of dead bramble stems at Bochym in West Cornwall (John et al, 2003).

Despite Internet and reference list searches, I can so far find few or no allusions to endophytic green (or blue-green or other groups of) algae within living and growing Angiosperm (water plant) roots. Perhaps the frequent root greenness was assumed to be always caused by epiphytic algae and/or intracellular Angiosperm chloroplasts, my initial assumptions.

The 2 expert professionals in the field of Phycology whom I have so far consulted say that this is an obscure field of research, hardly studied. The digital camera certainly facilitates the scrutiny of invading algal endophytes within living tissues.

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## Acknowledgements

My thanks to Malcolm Storey for his early suggestion of endophyte invasions; and to Joan and Brian Davies for their help with digital camera techniques and photographic illustrations, especially converting colour to black and white; also to Dr Hans Sluiman of the Royal Botanic Garden, Edinburgh; and Dr D M John of Natural History Museum, South Kensington. Richard Aisbitt kindly provided the original specimens of *Lemna trisulca*.

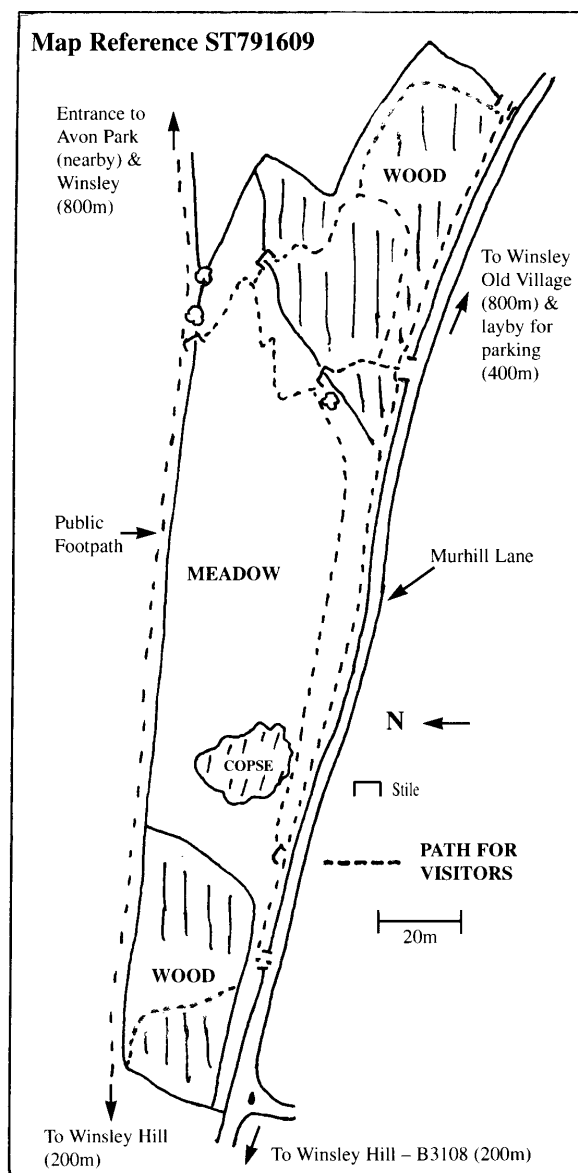
## EFFECTS OF THINNING ON AN ELM WOOD

By Ken Thwaite

### Introduction

Murhill Bank, the Winsley Parish Nature Reserve, was purchased from the Health Authority by the Parish Council in late 1997. It is a very steep site with an area of about 6 acres with its north boundary lying along a public footpath. The map shows its current shape and other features. There is a patch of woodland at each end and a mixture of grassland, trees and scrub in between.

### *Map of Murhill Bank nature reserve*



Following a professional survey and report (Chalkhill Environmental Consultants 1977), the site was developed as a nature reserve within walking distance of the village of Winsley, in which local people, including schoolchildren and community groups, can appreciate and enjoy the natural environment and

increase their knowledge of it and involvement in it. It is managed by a committee of three volunteers, who report annually to the Parish Council. The history and management of the project have been described elsewhere (Presland ongoing). Here, the concern is a particular issue in the management of the woodland at the west end of the reserve.

The west wood is, surprisingly, almost entirely of Elm. Elms are very difficult to identify, but it is reasonably certain that the ones here were Wych Elm (*Ulmus glabra*), unless they are hybrids between Wych Elm and some other species. Their precise age is unknown, but they appear to be mostly of a similar age and were around 40-50 feet in height at the beginning of the project reported here, ie in the year 2000. By April 2004, they had increased to something like 50-60 feet. They may die of Dutch Elm Disease before long - one has already died, though the cause is not certain. They were, initially, too closely packed to grow optimally, and the dense shade they cast appeared to have eliminated most vegetation other than a thick covering of Ivy, which, in turn, presented an obstacle to growth of woodland plants which were formerly found there.

There was a reluctance to do anything too drastic by way of management when the future of the trees was uncertain. Eventually, it was decided to thin the eastern half of the wood and leave the western half as it was. Comparisons could then be made between the subsequent development of both areas. This work was carried out in winter 2000/1. It is usually recommended that thinning is to 15 trees per acre for trees of moderate size, but in this small area that would have left only 4 to 5 trees, some of which may not have survived anyway. Thinning therefore was implemented so as to leave 25 trees in the eastern half, not counting saplings, coppice shoots and trees cut down to about 4 feet (where a fence obstructed sawing at the north edge) and sprouting at the top.

To explore the effects of thinning, a project was designed and implemented by the author. The rest of this article describes that project, presents its results and discusses their implications.

### Methodology

Five trees were selected on a random basis in each of the eastern and western halves of the wood. The girth (ie circumference) in millimetres of each tree selected was measured:

- on 10/05/01, before any significant growth could have occurred after thinning;
- on 02/04/02, approximately a year after thinning;
- on 23/04/03, approximately two years after thinning;

- on 06/04/04, approximately three years after thinning.

On each occasion, the following were calculated:

- the increase in girth over the previous measure;
- the percentage of the previous measure which this increase represented;
- the mean girth for the 5 trees in the thinned area and the 5 trees in the unthinned area, respectively;
- the mean increase in girth since the last measure for each of the two groups of trees;
- the percentage increases which these mean increases represented.

Finally, the same series of calculations was carried out for the total increases over the three-year period.

It may help to complete the picture to give the distance in inches of each tree to the nearest neighbouring tree. For the thinned half, these were:

1	2	3	4	5	Mean
74	88	110	92	92	91.2

and for the unthinned half:

6	7	8	9	10	Mean
53	14	40	33	22	32.4

Other effects of the thinning were explored by inspection of past records of the flora and comparing them with the present-day plant inhabitants. However, this was carried out purely from information to hand, and was not part of a planned project.

### Results of measurement

The results of measuring tree girths are shown in the table opposite, which should be self explanatory.

### Discussion of measurement results

With one exception (Tree No. 3 on 02/04/01), all measured increases in the thinned area were greater than any in the unthinned area. The same was true of the mean increases for each year. Over the three years of the project, all trees in the thinned area showed increases far in excess of any tree in the unthinned area. Again over three years, the mean increase of the trees in the thinned area was more than three times that in the unthinned area, while the mean percentage increase for the thinned area was more than double that in the unthinned area.

It might be objected that, since one tree in the unthinned area did not increase at all, it might have been dying and therefore the comparison would be

**Table showing measurements of tree girths**

	THINNED AREA						UNTHINNED AREA					
Tree No.	1	2	3	4	5	Mean	6	7	8	9	10	Mean
Girth in mm on 10.05.01	645	575	490	475	535	544	300	305	380	370	385	348
Girth in mm on 02.04.02	680	600	500	500	570	570	300	320	385	380	400	357
Increase	35	25	10	25	35	26	0	15	5	10	15	9
% increase	5.4	4.3	2.0	5.3	6.5	4.8	0	4.9	1.3	2.7	3.9	2.6
Girth in mm on 23.04.03	720	640	530	540	610	608	300	330	400	400	420	370
Increase	40	40	30	40	40	38	0	10	15	20	20	13
% increase	5.9	6.7	6.0	8.0	7.0	6.7	0	3.1	3.9	5.3	5.0	3.6
Girth in mm on 06.04.04	750	690	570	590	650	650	300	335	410	410	435	378
Increase	30	50	40	50	40	42	0	5	10	10	15	8
% increase	4.2	7.8	7.5	9.3	6.6	6.9	0	1.5	2.5	2.5	3.6	2.2
Increase in girth in mm over 3 years	105	115	80	115	115	106	0	30	30	40	50	30
% increase over 3 years	16.3	20.0	16.3	24.2	21.5	19.3	0	9.8	7.9	10.8	13.0	7.8

unfair. To allow for this, the means and mean percentages in the unthinned area were recalculated for only the four trees which did increase. This still showed a marked discrepancy, with the mean increase over three years being 37.5 mm as opposed to 106 mm in the thinned area, and the mean percentage increase over three years being 10.4% as opposed to 19.3% in the thinned area.

Another possible objection might follow from the method of selecting the trees. In the unthinned part of the wood, all the trees selected were further up the slope (ie to the north), than any of those in the thinned part, because those lower down were less accessible. This might have accounted for growth differences for reasons not investigated by the project. However, this seemed unlikely because:

- the lowest unthinned tree was only slightly further up the slope than the highest thinned tree and the distance between the highest and lowest tree was small in both halves;
- all the trees measured in the thinned half increased more than any of those in the unthinned half;
- inspection of trees generally in the unthinned half suggested that being further up the slope was not related to smaller size.

It should also be noted that the trees in the unthinned half were all smaller in girth than those in the thinned part at the outset. It is not clear whether this is likely to have biased the results.

### Information from plant records

A quick survey of the west wood in June 1986 found 6 species of tree, some only as seedlings or saplings, 2 climbers and 25 species of herbaceous plant. At that time, therefore, the vegetation was quite rich. By the time that the reserve was set up much of this had gone, and a thick layer of Ivy covered most of the area. When, in 1998, we cleared an area at the bottom of the wood and roughly surfaced it for car parking, woodland and meadow plants appeared in it and at the very edge of the wood adjacent to it. One herbaceous species not recorded in 1986 was found in that area in March 1999, another 4 in May 1999 and another 7 in July 2000. However, nothing resembling a full species list was compiled around that time either for the parking area or for the rest of the west wood.

In April/May and July 2004, species in the thinned and unthinned halves of the wood, but not in the parking area, were listed, omitting any that occurred

only at the edge adjacent to the parking area. By then, some of the Ivy had been raked away, so any changes could be partly due to that and partly due to the increased light.

Overall, 12 species were found in the unthinned half and 26 in the thinned half. Species found in the thinned area but not the unthinned, all more than one and mostly frequent or abundant, were:

Red Campion (*Lychnis dioica*)  
Hemp Agrimony (*Eupatorium cannabinum*)  
Cow Parsley (*Anthriscus sylvestris*)  
Hogweed (*Heracleum sphondylium*),  
Spear Thistle (*Cirsium arvense*)  
Broad-leaved Dock (*Rumex obtusifolius*)  
Great Hairy Willow-herb (*Epilobium hirsutum*)  
Burdock (*Arctium* sp)  
Enchanter's Nightshade (*Circaea lutetiana*)  
Ramsons (*Allium ursinum*)  
Garlic Mustard (*Alliaria petiolata*)  
an unidentified grass  
Herb Robert (*Geranium robertianum*)  
Sanicle (*Sanicula europaea*)  
Ploughman's Spikenard (*Inula conyzae*)  
Ground Ivy (*Glechoma hederia*)  
Early Dog-violet (*Viola reichenbachiana*)  
Dog's Mercury (*Mercurialis perennis*).

There was also a single Wild Rose (*Rosa* sp).

A few species were found only in the unthinned half - single specimens of:

Black Bryony (*Tamus communis*)  
Bluebell (*Hyacinthoides non-scripta*)  
Creeping Buttercup (*Ranunculus repens*)

and several Old Man's Beard (*Clematis vitalba*).

Species in both halves were:

Wych Elm (*Ulmus glabra*) or its hybrid (mature trees and saplings)  
Ash (*Fraxinus excelsior*)

Elder (*Sambucus nigra*)  
young Sycamore (*Acer pseudoplatanus*)  
Cleavers (*Galium aparine*)  
Stinging Nettle (*Urtica dioica*)  
Cuckoo Pint (*Arum maculatum*)  
Bramble (*Rubus* sp)  
Stinking Iris (*Iris foetidissima*)  
Wood Avens (*Geum urbanum*)  
Hawthorn (*Crataegus monogyna*).

The general appearance of the flora was very much richer in the thinned half. Particularly noticeable in the thinned area at this time was the extensive development of elm coppice from around the stumps of the felled trees. Other notable changes were the spread of Sanicle (*Sanicula europaea*) and Dog's Mercury (*Mercurialis perennis*) from the car park edge into the wood, since these are plants particularly typical of woodland.

### Implications

While this was not a rigorous scientific investigation, enough data was collected to give encouragement to the policy which had been pursued. There had clearly been a development, in the thinned part of the wood, of a more normal woodland pattern consisting of coppice, standards and a more varied ground flora, but no sign of any of this in the unthinned part. It provides a basis for decisions about whether more of the wood should be thinned, whether thinning should be more intensive, and how much more Ivy should be reduced. As a first step, it has been decided to thin a further area.

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## **GREAT GIRTH TREES IN WILTSHIRE: ACERACEAE**

### **Their Size, Seedlings and Spread**

**Jack Oliver**

### **Introduction**

Following the article on the Fagaceae in the previous issue of this journal (Oliver 2003), this is the second on large Wiltshire trees. There are 2 genera in the *Aceraceae*, *Acer* and *Dipteronia*. *Dipteronia* only has two species, in Central and South China; these are shrubby and seldom grown elsewhere. By contrast there are 111 *Acer* species (Mabberley 1997). These are mainly distributed in the North Temperate regions of the world, and are much favoured by landscapers, horticulturists and gardeners worldwide, especially in Europe, North America and Japan. There may be 3 or 4 times as many subspecies, variants and cultivars as the 111 species. However most of these taxa are too small or rare (or both) to be considered here.

### **Acers in the British Isles**

Stace (1997) gives 6 species in his key as native, naturalized or semi-naturalized in Britain. These are *Acer campestre*, (Field Maple, native), *A. platanoides* (Norway Maple), *A. cappadocicum* (Colosseum or Cappadocian Maple), *A. pseudoplatanus* (Sycamore), *A. saccharinum* (Silver Maple) and the dioecious *A. negundo* (Ashleaf Maple or “Box Elder”). Of these Acers, only the Colosseum Maple spreads by root suckering as well as self-sown seeds.

Stace lists a further six *Acer* species which sometimes seed themselves locally in shrubberies, parks or garden, but are not yet known to have spread widely. These are *A. mono* (Mono Maple), *A. tataricum* (Tartar Maple), *A. rufrinerve* (Grey-budded or Honshu Maple), *A. opalus* (Italian Maple), *A. rubrum* (Red Maple) and *A. saccharum* (Sugar Maple).

Nine of the twelve *Acer* species described and listed by Stace are considered in the ensuing tables together with five further *Acer* species (and also 5 further common variants) which have girths of over 1 metre (generally at 5ft above ground level). Some of these have been self-seeding in Wiltshire, most but not all corresponding with those outlined by Stace (see Table 2 and the Seeding & Spread subheading).

### **Native and well naturalized Acers (Table 1 overleaf)**

Field Maple has a 98% 10km square coverage in Wiltshire, according to the most recent Wiltshire Flora (Gillam 1993). The Savernake Hollow Field Maple (No. 13 on Table 1) compares in girth with some of the largest in Britain (Johnson 2003).

Sycamore also has a 98% 10km square coverage in Wiltshire, again according to the recent Flora (Gillam 1993). The largest-girth Wiltshire tree at Batts Farm (No. 1 on Table 1) compares well with the largest

**TABLE 1. The 3 common native and well-naturalized *Acer* species in Wiltshire which spread vigorously by seeding (Field Maple, Sycamore and Norway Maple). Also included are three distinctive cultivars which seed, but which do not reliably breed true.**

Types, Sites & Map Referencess &/or Codes.	Girth in cms	Year meas- ured	Comments and Special Features, Records, History, situations.
<b><i>A. pseudoplatanus</i> Sycamore</b>			
1) Batts Farm, Clench Common [SU 181.649]	555 ( at 5ft) 770 ( at 1ft)	2004	Tall, shapely tree. Originally a conical outline, recently spreading.
2) South of Netheravon [SU 144.483]	515 (at 5ft)	1999	Old tree. Loss of a main branch on one side.
3) Savernake Forest Fringe, near the Durley Road [No.01375 at SU 248.654]	500 (at 5ft) 675 (at 1ft)	2004	Heavily ivied. The biggest and oldest of a fieldside line. Hollow.
4) Tottenham House [No. 1948 at SU 245.645]	465 (at 5ft) 770 (at 1ft)	1999	Tall tree with much enlarged base (see 7 below)
5) Froxfield Churchyard [SU 295.680]	460 (at 5ft) 830 (at 1ft)	2004	Heavily ivied. Large & very irregular ancient coppice base, engulfing 2 graves. "This was a big tree when I was a boy in 1939".
6) Tottenham House [No. 1949 at SU 51.641]	455 (at 5ft)	1999	Fine tall tree.
7) Tottenham House [TROBI 39457]	443 (at 5ft) 750 (at 1ft)	1984	TROBI record. Possibly the same tree as (4) preceding, but no map reference or description.
8) Tottenham House [No. 1944 at SU 51.641]	440 (at 5ft)	1999	Fine tall tree, arising from a jungle of <i>Prunus</i> <i>laurocerasus</i> & <i>P. lusitanica</i> .
9) 'Variegatum', Stourhead [TROBI 45344]	408 (at 5ft)	1980	TROBI record. 2003 print-out.
10) 'Variegatum', Stourhead No. 701 at ST 773.339, SW of the Bristol Cross.	386 (at 5ft)	2003	Numbers of these variegated Sycamores were planted at Stourhead by Richard Colt Hoare in 1791.
11) 'Purpureum', Stourhead [No. 686 at ST 771.338]	333 (at 5ft)	2003	A fine large Purple Sycamore.
12) 'Purpureum', Stourhead [No. 505, at ST 772.343]	288 (at 5ft)	2003	Over 27m high in 1991.
<b><i>A. campestre</i> Field Maple</b>			
13) The Savernake Hollow Field Maple [No. 09475, at SU 2274.6605]	375 (at 5ft) 400 (at 6ft)	2000	Wiltshire Champion, and one of the largest girth Field Maples in the British Isles. See TROBI Newsletter 10 (2001)
14) Marlborough College [SU 181.684]	290 (at 5ft)	2004	Behind a tall <i>Leylandii</i> hedge, north of the Preshute tennis courts. Hollow.
15) Savernake Forest [No 09478, at SU226.661]	264 (at 5ft)	2000	Octant IV in Savernake Forest.
16) Savernake Forest [SU 214.671]	260 (at 5ft)	2002	Octant VII in Savernake Forest, near tree No. 08891.
17) Marlborough College [No. 1671 at SU 182.684]	250 ( at 5ft) (400 (at 1ft))	2002	Old coppice with 5 trunks, west of foot bridge of R. Kennet towards the Preshute tennis courts.
18) Marlborough College [No. 1634 at SU 176.686]	233 (at 5ft, largest trunk) 620 (at 1ft)	2002	Old linear coppice with 6 trunks; possibly 2 or more old boundary trees coalesced into one elongated large basal bole.

(continued opposite)

Types, Sites & Map References &/or Codes.	Girth in cms	Year meas- ured	Comments and Special Features, Records, History, situations.
<i>A. platanoides</i> Norway Maple			
19) Marlborough College [No. 1491, at SU.179.688]	350 (at 5ft)	2004	In hedgerow east of Littlefield House.
20) Marlborough College [No. 1491B, at SU 179.688]	315 (at 5ft)	2004	In hedgerow east of Littlefield House.
21) 'Goldsworth Purple', Holt, The Courts	129 (at 5ft)	1988	TROBI record; 2003 print-out.

English trees, but some Scottish Sycamores in particular have girths over 7 metres (Johnson 2003).

Norway Maples were unrecorded in Wiltshire Floras before the 1993 Flora. This species nevertheless had a 67% 1 km square coverage in Wiltshire by 1991 (Gillam 1993). By 2001, in some parts of Wiltshire, for instance parts of Savernake Forest, the succession of Norway Maple seedlings to saplings was progressing more densely and more rapidly even than Sycamore regeneration. Johnson (2003) gives measurements only for 4 large Norway Maples in Ireland, Wales and Scotland, and these girths were measured at low or uncertain heights. The two Marlborough College Norway Maples (Table 1, Nos. 19 and 20) may well be 2 of the largest, at least in England.

#### Less common Acers (Table 2 overleaf)

Comparisons with the girth records in 'Champion Trees of the British Isles' (Johnson 2003) reveal that the Colosseum (Cappadocian) Maples at Marlborough College (Table 2, Nos. 1-3) are exceptional trees, seemingly three of the largest girths in England and perhaps Britain. The same goes for No. 4, the Golden Colosseum Maple at Pinkney Park.

The other large-girth tree by national standards is the Stourhead Paperbark Maple (Table 2, No. 6), possibly one of the two largest in England, although there is one much larger Paperbark Maple in Wales.

#### Seeding & spread by less common Acers

The Marlborough College Colosseum Maples have spread over several hundred square yards by dense masses of red root-suckers, occluding most or all other plants in these areas. However, I have not found

any Colosseum Maple seedlings anywhere in Wiltshire. Indeed for all the Table 2 species, I have found seedlings of only the Oregon Maple, and only on the Rushmore Estate. Were it not for the intensive sheep grazing, these would progress to saplings. All this is in sharp contrast to the vigorous seeding and spread of the three Table 1 Acer species.

Interviews with gardeners and estate managers resulted in the information that Ash-leaved, Smooth Japanese and Silver Maples often produce seedlings in the vicinities of the parent trees. These are sometimes dug up for growing-on elsewhere, especially in the case of the Japanese Maples.

#### Discussion and conclusions

For size, seeding and spread there seem to be good data for the three native and naturalized Acers, except for the excessive representation of large specimens in the NE of Wiltshire. By contrast, it is likely that more large-girth less common Acers will come to light, whether or not represented on Table 2. I would also suspect that more than 4 species of the latter group produce healthy seedlings at some sites in Wiltshire.

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**TABLE 2. Non-naturalized *Acer* species with girths of over 1 metre (mostly measured at 5ft above ground). Seedlings noted for Nos. 8 & 10, but reported also for Nos. 13, 16 & 22.**

Types, Sites & Map References &/or Codes.	Girth in cms	Year measured	Comments and Special Features, Records, History, Situations.
1) <i>A. cappadocicum</i> (Colosseum or Cappadocian Maple), Marlborough College, by R. Kennet [No. 1778 at SU 186.685]	266 (at 5 ft)	2004	Extensive and widespread masses of dense red root suckers.
2) <i>A. cappadocicum</i> , Marlborough College, by R. Kennet. [No. 1780 at SU 186.685]	241 (at 5 ft)	2004	Extensive and widespread masses of dense red root suckers.
3) <i>A. cappadocicum</i> , Marlborough College, by R. Kennet. [No. 1751 at SU 186.686]	305 (at 3 ft)	2004	Extensive and widespread masses of dense red root suckers. Forks at 5 ft.
4) <i>A. cappadocicum</i> 'Aureum' (Golden Colosseum Maple), Pinkney Park	289 (at 3 ft)	2002	TROBI record. Johnson (2003)
5) <i>A. davidii</i> (Pere David's Maple), Longleat Drive [TROBI 12464]	119 (at 2ft)	1986	TROBI record. 1999 print-out.
6) <i>A. griseum</i> (Paperbark Maple), Stourhead [No.401], near the entrance kiosk, east of the Temple of Flora	136 (at 4ft)	2003	Paperbark Maples introduced from Central China to Stourhead in 1901.
7) <i>A. macrophyllum</i> (Oregon Maple), Rushmore Estate, [SU 957.195]	219 (at 5 ft)	2003	Near gatehouse, the largest Oregon Maple on the Estate (or in Wilts).
8) <i>A. macrophyllum</i> (Oregon Maple), Rushmore Estate, [SU 958.194]	213 (at 5 ft)	2003	Part of a grand avenue. Seedlings noted, but eaten by sheep.
9) <i>A. macrophyllum</i> Rushmore Estate, [SU 958.194]	205 (at 5 ft)	2003	Part of a grand avenue.
10) <i>A. macrophyllum</i> (Oregon Maple), Rushmore Estate, [SU 958.194]	191 (at 5 ft)	2003	Part of a grand avenue. Seedlings noted, but eaten by sheep.
11) <i>A. negundo</i> (Ash-leaved Maple or "Box Elder"), Rood Aston [TROBI 51776]	229 (at 5 ft)	1981	TROBI record. 2003 print-out.
12) <i>A. negundo</i> , Ramsbury Church [TROBI 51804]	220 (at 5 ft)	1983	TROBI record. 1999 print-out.
13) <i>A. opalus</i> (Italian Maple), Stourhead [No. 738], near the Temple of Flora.	119 (at 5ft)	2003	Italian Maples introduced to Stourhead in 1752.
14) <i>A. palmatum</i> (Smooth Japanese Maple), Oare House [No. 9]	105 (at 5ft)	2003	SE corner of Arboretum No. 4.
15) <i>A. palmatum</i> (Smooth Japanese Maple), Tottenham House [SU 249.638]	96 (at 5 ft) 190 (at 1 ft)	1999	S. wall of Tottenham House, by the ruined orangery.

Types, Sites & Map References &/or Codes.	Girth in cms	Year measured	Comments and Special Features, Records, History, Situations.
16) <i>A. palmatum</i> 'Purpureum' (Smooth Copper Japanese Maple), Stourhead [No. 405A]	93 (at 5ft, largest trunk) 168 (at 1ft)	2003	North east of main lake.
17) <i>A. palmatum</i> 'Elegans' (Fine-leaved Smooth Japanese Maple, Stourhead [No. 533]	105 (at 5ft)	2003	South of Pinetum.
18) <i>A. rubrum</i> (Red Maple), Stourhead [TROBI 45167]	198 (at 4ft))	1965	TROBI record. 2003 print-out.
19) <i>A. rubrum</i> 'October Glory' (Red Maple), Oare House [No. 219]	106 (at 4ft)	2003	Towards North-east of the Arboretum No. 1.
20) <i>A. rufinerve</i> f. <i>albolimbata</i> (Grey-budded Snake-bark Maple, Stourhead [TROBI 45526]	119 (at 4ft)	1977	TROBI record 2003 print-out.
21) <i>A. saccharinum</i> (Silver Maple), Longleat [TROBI 45167]	295 (at 5ft)	1971	TROBI record 2003 print-out.
22) <i>A. saccharinum</i> , Stourhead [No. 433], east of lake, north of Temple of Flora.	233 (at 5ft)	2003	Silver Maples introduced to Stourhead from N America in 1725.
23) <i>A. truncatum</i> (Shandong Maple), The Park, Swindon.	144 (at 5ft)	2004	A rare Maple, this one 9m tall (D. Alderman).
24) <i>A. truncatum</i> (Shandong Maple), Oare House [No. 157]	108 (at 5ft)	2003	Towards the SE of the Arboretum No. 2.

## **ORNITHOGALUM PYRENAICUM IN WINSLEY**

**John Presland**

### **Bath Asparagus nationally and locally**

The status of *Ornithogalum pyrenaicum* (Spiked Star-of-Bethlehem or Bath Asparagus) has been summarised by Green (1993), Hill and Price (2000) and Rose (2002). It is widespread on the European mainland, but was noted in the 1976 *Atlas of the British Flora* in only 22 10 km squares in Britain. Eleven of these were in Wiltshire and a further six in adjacent squares in Somerset, Gloucestershire and Berkshire. In Wiltshire, it was spread out from the Bristol Avon valley from the western county boundary to around Bradford-on-Avon, and also occurred near Wroughton, south of Devizes, east of Little Bedwyn and near Farley. Its main habitats were along lanes, in hedgerows and in woods. Grose's (1957) flora recorded virtually the same distribution as the more recent one, and there is little evidence that the plant spreads readily from one location to another. Indeed, one wonders how it acquired a distribution at all, unless it was by extensive cultivation in particular areas

More detailed local information is available from several sources. Aisbitt (1991; 2004) reported how the plant survived both in deep shade and in lighter areas in Clouts Wood near Wroughton in Wiltshire. Coppicing to let in more light did not affect its numbers, but more plants flowered and seeded. The *Wiltshire Trust for Nature Conservation* (1986) carried out a survey in Slittems Wood on the western border of Wiltshire near Midford. They selected 15 square metres at random in a coppiced area and 15 in an uncoppiced area and recorded the number of plants in each from their vegetative parts in April 1986. A total of 290 plants were recorded in the coppiced area and 256 in the uncoppiced area, indicating a very large population for the whole wood. Recording from vegetative parts in additional and marked metre squares in April 1986 found an average of 21 plants per square in closed canopy woodland and an average of 15 plants per square in a mixture of coppiced and cleared wood. A return visit to the marked squares in August 1986 found no flowering spikes whatever. Hackman (undated in late 1990s) described the Bath Asparagus Project, whose 1995 survey showed the main concentrations in the Wansdyke area of the then county of Avon were around Bath and Keynsham, preferring shady roadside verges, open woodland and along hedgerows. Rose (2002) reports on work in several sites in the Bath area, including Slittems Wood and also Inwood Wood and Upper Conkwell, both adjacent to or within the parish of Winsley (exact locations withheld at request of the landowners).

### **A parish survey**

The study reported here took place in the parish of Winsley, which is west of Bradford-on-Avon. Both

Green and Hackman quoted Thomas Johnson in his *Mercurius Botanicus* in 1634 as saying "it growes in the way betweene Bathe and Bradford not fare from little Ashley", which sounds as though it was known in the parish of Winsley (to which Little Ashley belongs) at that time. If it arrived with the Romans, which is not unlikely, it could have been there hundreds of years earlier. The work reported here was designed to provide a picture of the present occurrence of the plant along roadsides in the parish. To my knowledge, there is no earlier published study of it in this habitat in Wiltshire. Observations in other habitats in the parish have also been made, to place the roadside records in some sort of context.

The parish of Winsley comprises the villages of Winsley and Turleigh and the hamlets of Great Ashley, Little Ashley, Haugh, Hartley and Conkwell. The River Avon marks its southern and western boundaries, the remaining boundaries being in an agricultural area not distinct in character from neighbouring land. The Kennet and Avon Canal follows the bottom of the valley of the Bristol Avon at around 30 metres above sea level. The agricultural area is a plateau representing the highest part of the parish varying from about 120 to about 150 metres above sea level and bounded to the south by the B3108 and the village of Winsley from which the ground dips sharply southward and westward to the canal. This sloping part is predominantly woodland to the west and a mixture of residential, agricultural and woodland to the south. Road and field boundaries were originally mostly drystone walls made of the limestone which lies beneath, but these have been removed in many places and then consist either of herbage and scrub at various levels or of hedgerows.

## Methodology

In Winsley, Bath *Asparagus* is common along the verges and hedgerows of country roads and in field borders adjacent to these roads. The systematic survey concentrated initially on these habitats. However, it was subsequently thought to be of interest to sample other habitats in a less precise way.

Counting Bath *Asparagus* plants is not a straightforward matter. The leaves have mostly died down before flowering spikes open, so a choice has to be made as to which are to be counted. Leaves are difficult to distinguish from the rest of the vegetation, except on woodland floors. Furthermore, since reproduction is sometimes by offsets from the bulbs which are close to the parent, it can sometimes be uncertain how many plants one cluster of leaves represents. Flowering spikes are much easier to see, and there is normally one spike per bulb, so that the number of spikes can be said to represent the number

of plants sending them up. However, not all plants flower every year, so the count will not necessarily represent the true number of plants present. It was decided, in this case, to count the number of spikes initially, so that it would be simply the flowering population which was measured.

Between 26 June and 8 July 2002 spikes of Bath *Asparagus* were counted along roadsides within the parish. Only country roads were surveyed. The following were excluded:

- Y the B3108, much of which was a recently constructed bypass and the rest largely bounded by limestone walls which provided hardly any habitats for the plant
- Y predominantly residential roads or parts of roads
- Y drives to houses, farms, etc, since these provided virtually no suitable habitats.

Roads with hamlets or widely scattered houses were included, as was a private road to a number of houses.

Each location was a length of road defined by a grid reference at each end. The end of a length was taken as one of:

- Y any road junction
- Y onset of a predominantly residential area
- Y the parish boundary

The distance occupied by each length was measured to the nearest tenth of a mile with a car mileometre. All spikes seen along or from each length of road were counted. However, no attempt was made to look for plants concealed from the road in adjacent fields.

Habitats other than roads were studied between 5 and 9 July 2002 and between 22 April and 26 May 2003. It was not possible to do this systematically. Many of the areas where the plant might have been found were not negotiable - either because they consisted of thick woodland or because they were field boundaries where tall crops intermingled at the margins with overgrown and thorny hedgerows. Surveying in 2002 was therefore restricted to public footpaths which were negotiable and either passed through woodland or followed hedgerows or strips of uncultivated field boundary. Where footpaths crossed arable land or pasture, the plant was never seen, so recording there was not attempted. The number of footpaths involved was very few, and one of these was followed inaccurately, though it was still a valid sample. In April-May 2003, a more intensive sampling of woodland was undertaken, including areas where permission was required. The plant was not in flower at this point, so any counting was of leaf clusters. For the most part, however, counting was too difficult a task to undertake. At all these sites, the length of path covered was estimated from the map, and must normally be an underestimate since not all twists and turns are shown on the maps used.

### Results and analysis for roadsides

Results of the roadside survey are given in Table 1. Precise locations are available on request to members of relevant organisations.

**Table 1: Flowering spikes by and near roadsides 2002**

Site No.	Length in miles	No. of spikes	Spikes per 1/10 mile
1	0.9	326	36
2	0.7	168	24
3	0.4	85	21
4	0.3	199	66
5	0.3	5	2
6	0.3	75	25
7	0.3	48	16
8	0.3	80	27
9	0.3	56	19
10	0.2	92	46
11	0.2	0	0
12	0.2	10	5
13	0.2	0	0
14	0.9	142	16
15	0.2	31	15
16	0.6	125	21
17	1.1	200	18
18	0.4	10	2
19	0.2	56	28
20	0.2	0	0
21	0.5	4 S	1
<b>Total</b>	8.7	1,712	20

Overall, then, 1,712 spikes were seen along 8.7 miles of road, an average of 20 per tenth of a mile. The rate for different roadside stretches varied from 0 to 66. Systematic investigation of the differences was not undertaken, but it was apparent that the plant occurred hardly at all where roads were bordered by stone walls with little or no verge, but was often frequent where there was a significant width of verge or a hedgerow. It also occurred often at the edges of fields adjacent to the roads.

### Results and analysis for other habitats

The results from habitats other than roadsides in June-July 2002 are shown in Table 2. A further 847 spikes were seen in these samples of habitats other than roadsides. Significant numbers were found only along footpaths following field hedges and uncultivated boundary strips. Spikes were virtually absent from 0.3 miles of woodland paths, and totally absent from 1.4 miles of canal towpath. Even less structured observations of extensive woodland margins seen from canal towpaths failed to find any spikes at all.

**Table 2: Flowering spikes in other habitats 2002**

Site no.	Char-acter	Length in miles	No. of spikes	Spikes per 1/10 mile
22	path with hedges	0.1	0	0
23	canal towpath	0.3	0	0
24	path with hedges	0.3	0	0
25	field path with hedges visible	0.1	0	0
26	field hedges	0.2	203	101
27	field hedges and uncultivated borders	0.4	505	126
28	field path with hedges visible	0.1	0	0
29	path with hedge(s) and field hedge	0.2	5	2
30	path with hedge(s) and field hedge	0.1	18	18
31	field hedge	0.1	5	5
32	canal towpath	0.5	0	0
33	woodland path	0.1	0	0
34	woodland path	0.2	1	0
35	canal towpath	0.6	0	0
<b>Total</b>		3.4	847	

The results for April-May 2003 are shown in Table 3 opposite. No plants were found in the two revisited woodlands, confirming the likelihood that the plant was virtually absent from these woods, rather than just non-flowering. The newly visited woods varied greatly. There was a general pattern of the plant either being abundant in a particular wood or part of a wood or virtually absent. The numbers and the terrain made accurate counting too daunting a task, but the number present was at least several thousand.

**Table 3: Leaf clusters in woodland 2003**

Site No.	Length (miles)	No. of leaf clusters
<b>Re-visits</b>		
33	0.1	0
34	0.2	0
<b>New sites</b>		
36	0.3	0
37	0.3	180+
38	0.2	100s, probably 1000s
39	0.3	0
40	0.2	Locally abundant
41	2.0	None
42	0.4	1000s E end to absent W end
43	0.3	100s E end to absent W end
45	0.1	0
46	0.1	0
47	0.1	0
48	0.2	Locally abundant
<b>Total</b>	4.8	At least several 1000s

### Further analysis and conclusions

Plainly, the numbers counted or estimated do not show the total population of the parish. Even along the roadsides, where sampling of the defined type was 100%, there would undoubtedly be some plants which were not visible from the road. Furthermore, the earlier studies quoted show that plants do not always flower, so that the number of spikes may well be less than the total number of plants. Habitats other than roads were surveyed incompletely, particularly off-road hedgerows and parts of woods away from paths because of their inaccessibility, and there is little doubt that larger numbers would have been recorded had surveying been more comprehensive. What can be said with confidence is that a visitor looking for the plant alongside roads in late June and early July would encounter it very frequently and often in large local colonies. The same can be said for some off-road hedgerows and some woods not open to the public. Plainly, this nationally scarce plant is locally very common. However, searches along the canal would be almost totally unrewarding.

The less structured observations also allow some conclusions. Along roads, a substantial width of hedge or of uncultivated verge was needed before the plant became at all common. It was virtually absent from arable crops or from grazed fields and from the hedges of grazed fields unless they were inaccessible to stock. However hedgerows or uncultivated boundary strips of fields not disturbed by grazing or cutting harboured very large numbers.

The absence of plants along the canal paths is puzzling, since there is no obvious reason why they should not be as hospitable as roadsides or field verges. It was presumably not due to altitude, since it was locally abundant in Site 40, which is lower than the canal, and previous research has found no such association. One possibility is that the limestone in the valley bottom is likely to have been overlaid with silt, whereas the plant usually grows on clayey soils. Barron (1976) states that the River Avon has cut through the limestone at this point to form a gorge, but it is not clear what surface results at the valley bottom. Water content of the soil is another possible factor – it was noticeably absent from the river banks as well. Yet another possibility is that it is found in numbers only where the habitat has been undisturbed for hundreds of years, rather than subject to the widespread quarrying very common in the area in the past, canal construction, or intrusive woodland management or farming. It was conspicuously absent from woods on heavily quarried slopes, though also from some other areas. The woods in which it was abundant did not, for the most part, show much evidence of quarrying.

Overall, the plant has a confusing distribution in the parish. The slow rate of spread and the history of land management in specific areas may play some part in explaining this, but the study reported here does no more than raise suggestions about how it may have operated.

### References

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## **MONITORING *ORNITHOGALUM PYRENAICUM* AT CLOUTS WOOD – TO 2004**

**Richard Aisbitt**

### **Continuation of earlier recording**

A study of Bath Asparagus (*Ornithogalum pyrenaicum*) in a coppiced woodland was reported in the previous issue of *Wiltshire Botany* (Aisbitt 2004). The data went up to summer 2002. I have now added data up to summer 2004. This is shown in the first three charts. Figure 1 opposite shows that the number of plants does not vary much in the two extra years. Figure 2 shows a 'best ever' year for Bath Asparagus seeding. This was in an area coppiced the previous year. Figure 3 on page 33 shows that the increase in the number of seed pods on each flowering stalk was maintained in the recently coppiced area

### **A new study**

Figure 4 on page 33 is the result of a fortnightly survey in 2003 which followed the plants through the production of flower buds, flowers, and seedpods. The 'Overgrown coppice' and the 'Cut coppice' are the south and north transects which featured in Figures 1 to 3. The first was coppiced in 1997, but had regenerated poorly and developed a vigorous growth of nettles and thistles, whilst the second had been coppiced about 18 months before and was relatively unshaded. The ground layer in the mature coppice is in deep shade.

As seen, the cut coppice develops and maintains a high number of flower stalks, whilst the mature coppice produces a similar number of buds to start with, but the number falls over the summer.

As in the previous study, stalks growing in the open produced more seedpods per stalk than stalks in deep shade, as shown in the table below

### ***Counts of stalks and seedpods***

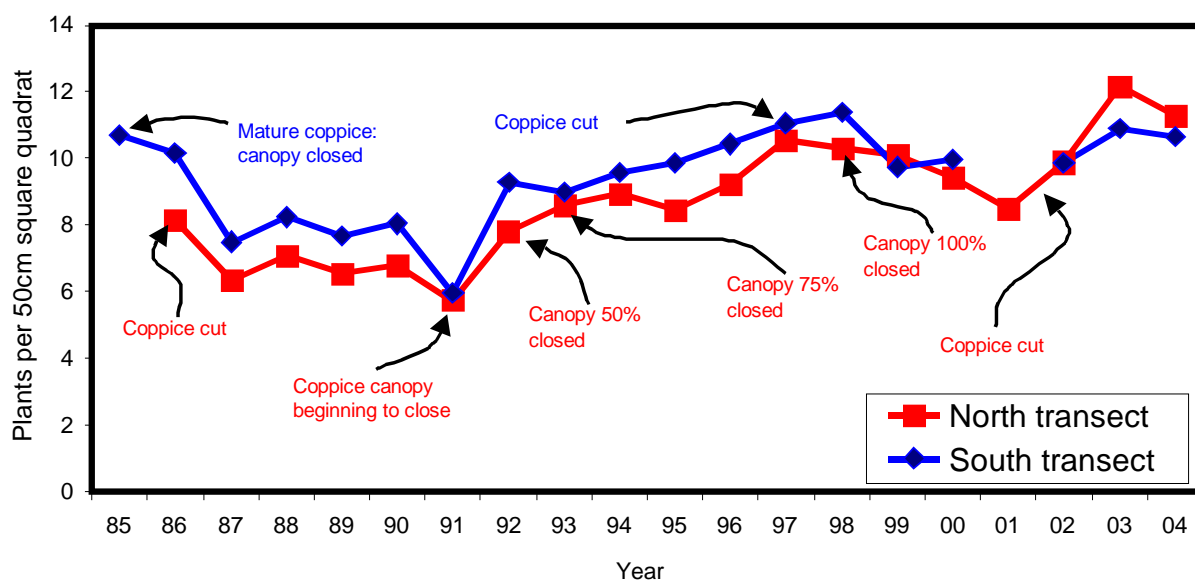
Area	Average seed pods per stalk	Number of stalks
Cut coppice (open)	18.6	65
Mature coppice (shady)	8.5	19

### **Discussion**

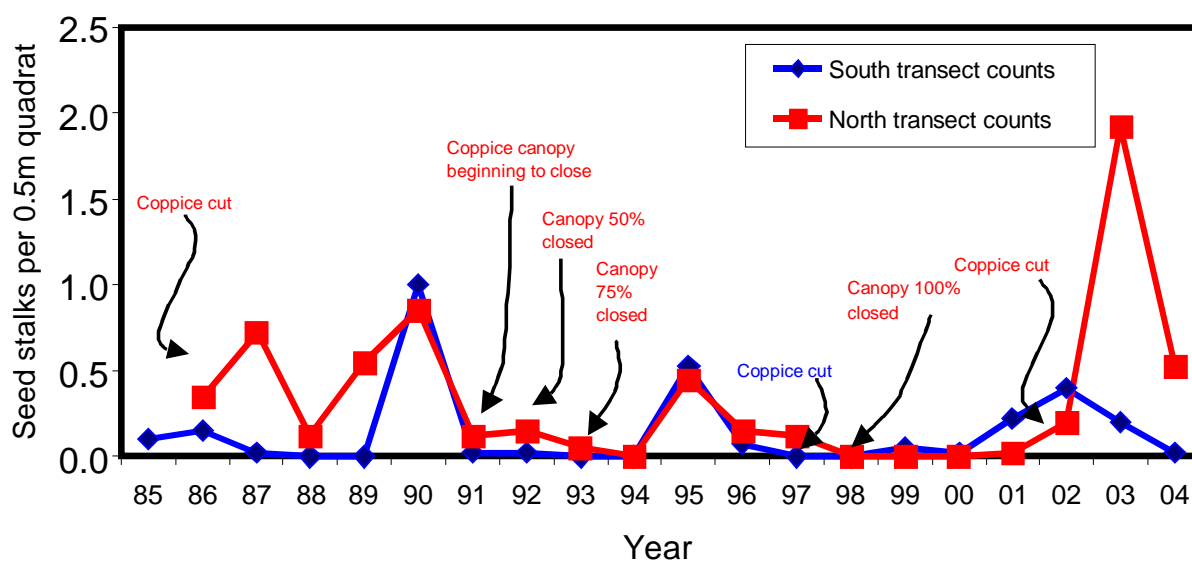
This study confirms previous observations that *Ornithogalum pyrenaicum* produces flower buds in deep shade, but that few of these develop to open flowers or seedpods. Conversely, more flower buds in the coppiced area survive to produce seed.

*(Continued on page 34)*

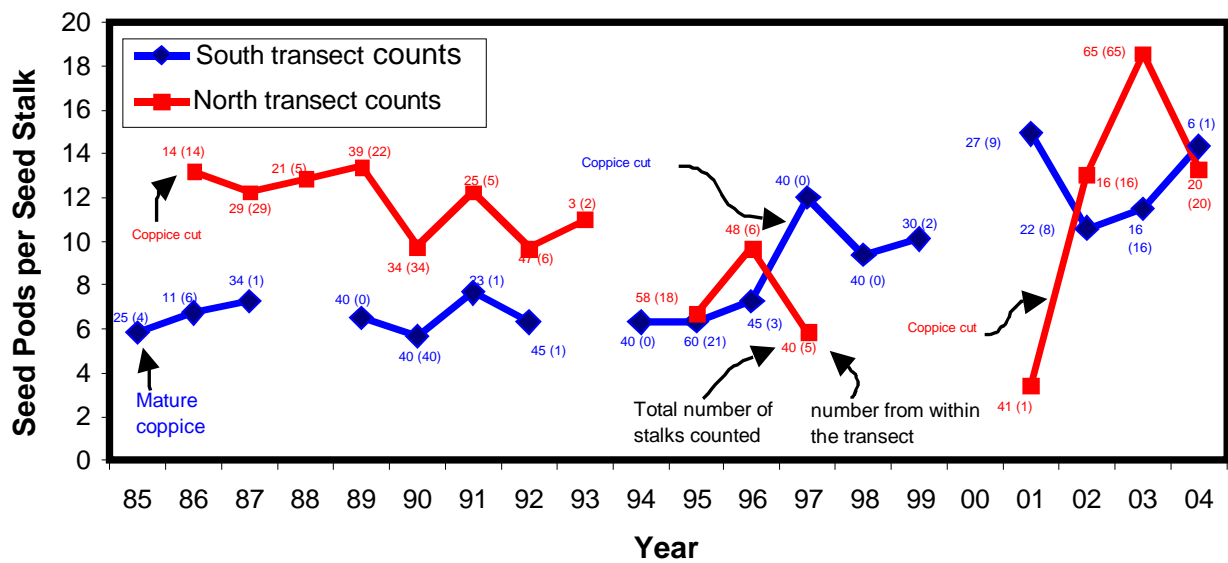
**Figure 1: Counts of *Ornithogalum pyrenaicum* plants in hazel/ash coppice**



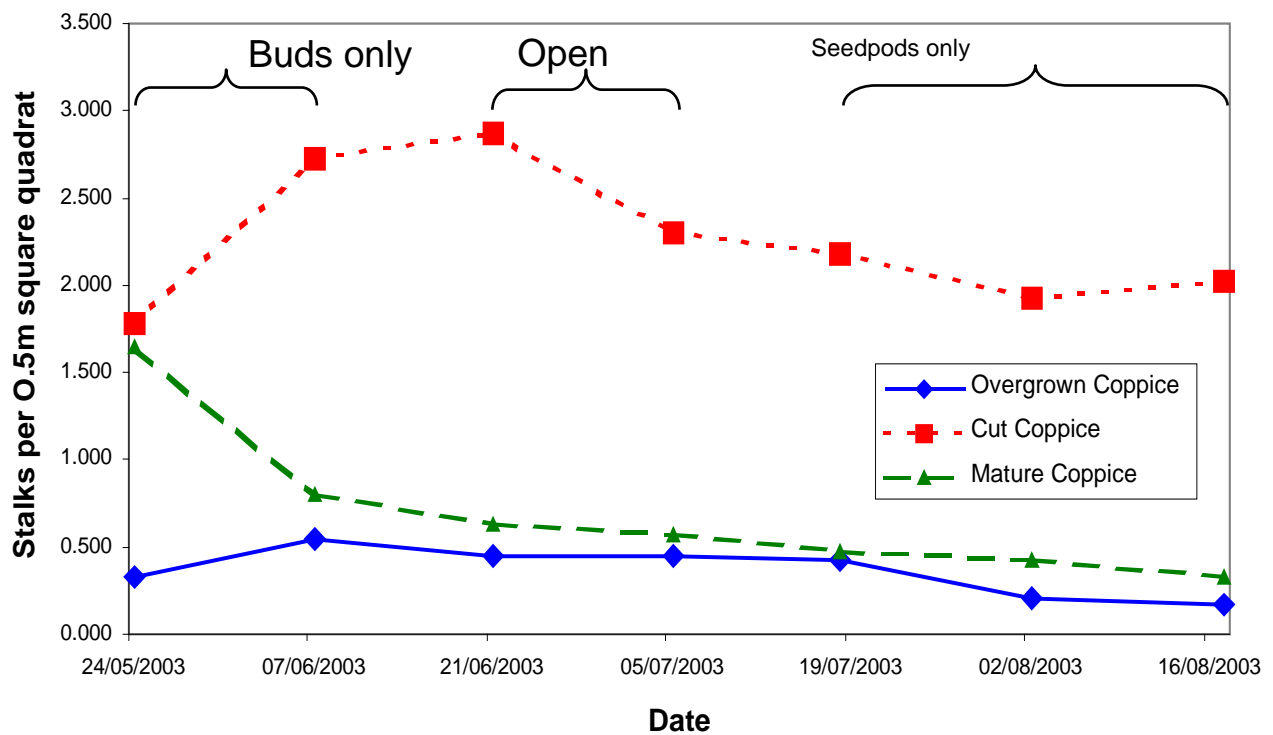
**Figure 2: Counts of seed stalks of *Ornithogalum pyrenaicum***



**Figure 3: Counts of seed pods per seed stalk (1985-2002)**



**Figure 4: Numbers of Bath Asparagus flower stalks in three different areas**



The reasons for failure to reach the flowering stage in mature coppice are not certain: however, the fate of some failing stalks was observed. Six out of the 34 of the stalks which were lost between 5/05/2003 and 07/06/2003 had turned yellow and were either drooping or had fallen to the ground. Other stalks may have done the same in the interval between surveys. Also, the upper buds of the scape often fail to develop in deep shade.

The rosette of leaves dies back before flowering. The remaining scape and the seed capsules which develop on it are deep green and form the only re-

maining photosynthetic organs. It is possible that photosynthesis in these parts contributes to the development of flowers and seeds. This might allow more plants to flower and set seed in open, recently cleared areas than in deep shade. It could also explain why surviving stalks in shaded areas have fewer seedpods.

#### References

Aisbitt R (2004) The survival of *Ornithogalum pyrenaicum* in a coppiced woodland. *Wiltshire Botany* 6: 23-27

## PLANT RECORDS 2003

### Explanatory notes

- Y The following is a selection from the records of Wiltshire Botanical Society received in 2003. Records of common species and updates of the 1993 Wiltshire Flora are not included unless there is some special reason. Unconfirmed records have been omitted.
- Y Where the actual observation was earlier than 2003, the year is inserted in brackets after the name of the recorder.
- Y An asterisk indicates that the species is not native to Wiltshire.
- Y Where a record is identified as being a new 10 km square record, this refers to the period since the flora mapping in the 1980s and 1990s for the 1993 Wiltshire Flora and recorded there. Comprehensive earlier records of this kind are not available locally.
- Y For first county and vice-county records, an unqualified statement means that it is the first record ever, as far as is known. Where the word "recent" is inserted, it means that it is the first since the flora mapping, but had been recorded before this period.
- Y Where a recording square is partly in Wiltshire and partly outside, any comment on the status of a record in that square applies only to the part within Wiltshire.
- Y Recorders are identified by initials as follows:

AD - Tony Dale  
AH - Ann Hutchison  
Aha - Ann Harris  
BG - Beatrice Gillam  
BL - Barbara Last  
CBG - Cambridge Botany Group, U3A (excursion)  
DH - Diana Hodgson  
DJW - Jeremy Wood  
DOG - Daphne Graiff  
ECa - Edwin Carter  
ER - Eileen Rollo  
GN - G Nicholls  
GY - Gwyneth Yerrington  
JDa - Joan Davis  
JEO - Jack Oliver  
JMa - John Martin  
JMc - James MacPherson  
JN - Joy Newton  
JNo - John Notman  
JP - John Presland  
JRM - John Moon  
JTr - J Tripp  
JW - Jean wall  
LM - Liz McDonnell  
LDa - Liz Dack  
LWa - Lesley Wallington  
MBI - Monica Blake  
MP - Maureen Ponting

MSa - Michael Sammes  
 MWa - Marjorie Wallace  
 NHa - Neil Harris  
 NW - Nick Wynn  
 PD - Paul Darby  
 RCh - R Chapman  
 RDi - R Dickens  
 WBS - Wiltshire Botanical Society (excursion)

## Vc 7 records

**Acer pseudoplatanus** \* - JEO, Lockeridge, heterophyllous variant, 1/3 of leaves like Sweet Chestnut, 1/3 intermediate.  
**Ailanthus altissima**\* - MWa, Chippenham, riverside and roadside, suckers and seedlings. 1st county record.  
**Ambrosia artemisiifolia** \* - JN, Ramsbury, garden. 1st recent vc record.  
**Anchusa arvensis** - JN, Stanton Fitzwarren, Stanton Park, Great Wood, waste ground. 1st 10km square record.  
**Antirrhinum majus** \* - JEO, Marlborough, wall-pavement angles, self-seeded; Chippenham, wall-pavement angles. 1st 10km square record.  
**Berberis darwinii** \* - JEO/MBI, Chippenham, 5 self-seeded young plants on stonework. 1st county record.  
**Blackstonia perfoliata** - JP, Kingsdown, golf course, disused bunker, abundant.  
**Bromus commutatus** - JN, Cricklade, North Meadow, scattered. 1st 10km square record.  
**Buddleja globosa** \* - JP, Bromham, hedgerow, one large shrub nowhere near gardens. 1st county record.  
**Campanula portenschlagiana** \* - JP, Turleigh, stone steps in front of house. 1st 10km square record. JEO, East Kennett, walls.  
**Campanula poscharskyana** \* - JEO, Lockeridge, riverbanks, walls. 1st 10km square record.  
**Catapodium rigidum** - GY, Bradford-on-Avon, widespread in pavement cracks and walls.  
**Centaurium pulchellum** - BG, Purton, Red Lodge.  
**Convallaria majalis** - JEO, Marlborough, colony coming up through tarmac and concrete from underground rhizomes. 1st 10km square record.  
**Conyza canadensis** \* - JEO, Marlborough, West Overton, both in pavements and road cracks; JP, Chippenham, waste ground and pavements.  
**Cornus sericea** \* - WBS, Swindon, Coate Water, lake margin; JEO, Chippenham, suckering down to river. 1st 10km square record.  
**Cotoneaster bullatus**\* - JEO, Swindon, 2 plants seeded near canal. 1st 10km square record.  
**Cotoneaster integrifolius** \* - JEO, Swindon, Coate Water, bird-sown on stonework. 1st vc record.  
**Cotoneaster linearifolius** \* - JEO, Swindon, Coate Water, bird-sown on stonework. 1st county record.  
**Cotoneaster salicifolius** \* - JEO Marlborough, bird-sown on wall-top. 1st county record.

**Cotoneaster sternianus** \* - JEO, Chippenham, seeded in cracks of stonework by river. 1st 10km square record.  
**Cyclamen hederifolium** \* - JEO, Oare, Oare House, extensive local spread. 1st records for two 10km squares.  
**Cystopteris fragilis** - WBS, Chippenham, edge of gratings above basement window. 1st 10km square record.  
**Dactylorhiza praetermissa** - MSa, Brinkworth, Echo Lodge Nature Reserve. 1st 10km square record. JN, Mildenhall, Axford watermeadows. 1st 10km square record.  
**Daphne laureola** - PD, Little Somerford, well over 50 plants on bridlepath.  
**Doronicum pardalianches** \* - JP, Murhill, Wood, one patch. 1st 10km square record.  
**Elodea nuttallii** \* - JEO, Swindon, abundant in canal. 1st 10km square record.  
**Epilobium obscurum** - JEO, Swindon, Coate Water, whorled variant. 1st recent unambiguous county record for the species. JN, Snap, near Aldbourne. 2nd unambiguous recent county record. JEO Marlborough, college grounds. 1st 10km square.  
**Erigeron karvinskianus** \* - JP, Bradford-on-Avon, abundant on wall; JEO, Chippenham, wall-pavement angles. 1st 10km square record.  
**Fallopia baldschuanica** \* - JEO, Chippenham, river edge for 40 yards. 1st 10km square record.  
**Fumaria densiflora** - LM, Standlynch, downland.  
**Galium uliginosum** - JEO, Marlborough, college grounds; JP, Bowden Hill, boggy ground; Bowden Hill, one plant at edge of woodland ride in damp ground.  
**Gentianella anglica** - JN, Aldbourne, High Clear Down, 3500 plants - the highest count ever.  
**Geranium pratense** - JEO, Lockeridge, roadside verges, many with pale silvery-blue and pure white flowers; Wroughton, roadside verge, 4 plants with pale silvery-blue flowers; Berwick Bassett, roadside verge, 3 plants with pale silvery-blue flowers.  
**Geranium robertianum** - JEO, Ogbourne St George, vertical sarsen walls and pavement-wall angles, white flowers.  
**Geranium sanguineum** \* - JP, Kingsdown, roadside, one small patch. 1st recent vc record.  
**Geranium x versicolor (G. oxonianum x endressii)** \* - JEO, Great Bedwyn, woodland edge and roadside. 1st 10km square record.  
**Glyceria notata** - WBS, Swindon, Coate Water, lake margin.  
**Gnaphalium sylvaticum** - JN, Great Bedwyn, Cobham Frith, 1 spike and 3 non-flowering rosettes on grassy path. 1st recent vc record.  
**Helleborus orientalis** \* - JEO, Clatford, dumped soil. 1st county record.  
**Hesperis matronalis** \* - JEO, Clatford, 2 plants in rough field.

**Hyacinthoides hispanica** \* - JEO, Great Bedwyn. 1st 10km square record.

**Hyacinthoides hispanica x non-scripta** \* - JEO, Great Bedwyn, one clump by roadside. 1st 10km square record.

**Hypericum calycinum** \* - JEO, Chippenham, wall-pavement angles, roadsides. 1st 10km square record.

**Impatiens glandulifera** \* - WBS, Chippenham, river edge.

**Inula conyzae** \* - WBS, Chippenham, one plant on cleared river bank.

**Lactuca serriola** \* - WBS, Chippenham, wall-pavement angles and roadsides. 1st 10km square. JEO, Clatford Junction, fields.

**Lagarosiphon major** \* - JEO, Swindon, 2 large masses and detached fragments in canal. 1st 10km square record.

**Lamium album** - JP, Bowden Hill, rough grassland, a number of plants with pale pink flowers.

**Lemna minuta** \* - JEO Chippenham, river.

**Lemna trisulca** - JEO, Chippenham, river.

**Leycesteria formosa** \* - JEO, West Overton, 3 plants germinated from bird-droppings on sarsen wall, and wall-pavement angle. 1st 10km square record. JEO, Lockeridge, field edge.

**Linaria purpurea** \* - JEO, Marlborough, wall top, 10 normal form, 15 pink-flowered, 2 purple with white bosses.

**Lobelia erinus** \* - WBS, Chippenham, waste ground and wall-pavement angles, self-sown. 1st 10km square record.

**Lolium x boucheanum (L. multiflorum x perenne)** - JEO, Marlborough, college grounds.

**Lonicera pileata** \* - WBS, Chippenham, 1 self-seeded young plant on stonework. 1st county record.

**Narcissus poeticus ssp. poeticus** \* - JEO, Clatford, roadside, scattered. 1st 10km square record. JEO, Savernake Forest, large clump. 1st 10km square record.

**Ononis spinosa** - CBG, between Calne and Devizes, Morgan's Hill, downland.

**Ophrys apifera** - JN, Cherhill, downland, several.

**Ophrys apifera var. chlorantha** - JN, Cherhill, downland, one specimen among plants of normal type. 1st unambiguous vc record.

**Papaver somniferum ssp. somniferum** \* - JEO, Wroughton, 100s of plants in field; Devizes, 1000s in field.

**Petasites fragrans** \* - DH, Christian Malford. 1st 10km square record.

**Pilosella aurantiaca agg.** \* - JEO, Ogbourne St George, garden weed and abundant on short grass roadside verges, also on stonework; Marlborough, roadside verges.

**Populus x canadensis (P. deltoides x nigra)** \* - WBS, Swindon, Coate Water, lake margin.

**Potamogeton crispus** - JEO, Swindon, very common in canal.

**Potamogeton natans** - JEO, Swindon, very common in canal.

**Potamogeton pectinatus** - JEO, Swindon, abundant in canal. 1st 10km square record.

**Potamogeton pusillus** - JN, Aldbourne, large pond.

**Quercus x rosacea (Q. petraea x robur)** - WBS, Swindon, Coate Water, track; JEO, Oare Park Copse.

**Robinia pseudoacacia** \* - JEO, Chippenham, suckers and seedlings in alleyways and rough ground.

**Rosa tomentosa** - JN, Snap, near Aldbourne. 1st 10km square record. MP, Marlborough, college grounds. 1st 10km square record.

**Rubus ulmifolius** - WBS, Swindon, Coate Water, lake margin. 1st 10km square record. JEO, Marlborough. 1st 10km square record.

**Rumex hydrolapathum** - JEO, Swindon, a few patches in Canal.

**Salix elaeagnos** \* - JEO, Chippenham, river edge.

**Scandix pecten-veneris** - JRM, All Cannings, edge of Oil Seed Rape field.

**Sedum album** - JEO, West Overton, walls, wall-pavement angles, roofs; JP, Corsham, The Ridge, abundant on disused tarmac road.

**Smyrniolus olusatrum** \* - JEO, Clatford.

**Soleirolia soleiroliae** \* - JP, Winsley, wall base. 1st 10km square record. JP, Turleigh, wall base.

**Solidago canadensis** \* - JEO, Chippenham, riverside and rough ground. 1st 10km square record.

**Solidago gigantea** \* - JEO, Chippenham, riverside and rough ground. 1st 10km square record.

**Symphytum x uplandicum (S. asperum x officinale)** \* - JW, Chippenham, between road, path and river. 1st 10km square record.

**Trifolium hybridum** \* - CBG (2002), between Calne and Devizes, Morgan's Hill downland. 1st 10km square record.

**Trifolium micranthum** - ECa/JEO, Marlborough, college grounds, abundant on permanently close-cut lawns; JN, Chiseldon, churchyard. 1st 10km record.

**Valerianella carinata** - GY, Bradford-on-Avon, roadsides. 1st 10km square record. JP, Winsley, locally abundant at base of walls, where it seems to be the only Valerianella species. 1st 10km square record. This plant has gradually increased and spread nationally since the days of flora mapping for the 1993 Flora.

**Veronica agrestis** - JMa/AHa, Whiteparish, Moor Farm. 1st 10km square record.

**Vicia faba** \* - JP, Bradford-on-Avon, refuse tip, one plant. 1st county record.

**Viscum album** - JN, Ramsbury, 1 large spray in flower on old Crataegus monogyna; JEO, East Tytherton, on Apple and Hawthorn.

**Vulpia myuros** - WBS, Chippenham, path by river.

## Vc 8 records

**Acer macrophyllum** \* - JEO, Tollard Royal, Rushmore Estate, numbers of seedlings from 2 trees, but being eaten by sheep. 1st county record.  
**Aesculus carnea** \* - WBS, Great Bedwyn, Wilton Brail. 1st vc record.  
**Agrimonia procera** - DOG, Porton Range. 1st 10km square record.  
**Alchemilla filicaulis subsp. vestita** \* - JEO/ER, Great Bedworth, Wilton Brail. 1st 10km square record.  
**Ambrosia artemisiifolia** \* NW of Westbury, single plant as garden weed, thought to be from birdseed. 1st 10km square record.  
**Asplenium adiantum-nigrum** - JRM, Ludgershall, disused railway bridge.  
**Blechnum spicant** - JEO, Great Bedwyn, Wilton Brail, many plants.  
**Borago officinalis** \* - JRM, Upper Chute, edge of stubble, 50 plants. 1st 10km square record.  
**Briza minor** - LDa/NHa, Whiteparish, a very large amount in a margin near a copse. 1st ?recent county record. (The only previous record at Lopshill, Hants, 1955 was "doubtful").  
**Butomus umbellatus** - BG, Urchfont, dewpond, one flower spike. 1st 10km square record.  
**Carex pallescens** - ER, Great Bedwyn, Wilton Brail.  
**Carex pilulifera** - ER/DJW - Wilton Brail.  
**Centaurium pulchellum** - BG, Tidworth, Sidbury Hill, strip lynchets. 1st 10km square record.  
**Cephalanthera damasonium** - RDi, Standlynch, edge of wood; BL, Charlton, 9 plants under beeches.  
**Cicerbita macrophylla** \* - BL, Odstock; Berwick St James.  
**Cuscuta epithymum** - AD, Winterbourne Stoke, Parsonage Down NNR, on ant hill, on Thyme; JRM, Tidworth, Sidbury Hill, patch 1m x 1m, mostly on Galium verum. 1st 10km square record.  
**Dryopteris affinis** - WBS, Great Bedwyn, Wilton Brail.  
**Dryopteris carthusiana** - GN (2002), Porton Down, plantation.  
**Dryopteris x complexa (D. affinis x filix-mas)** - WBS, Great Bedwyn, Wilton Brail. 1st county record.  
**Epilobium palustre** - BL, Teffont, ditch. 1st 10km square record.  
**Erysimum cheiranthoides** \* - BL, Berwick St James. 1st 10km square record.  
**Geranium pratense** - JEO, Pewsey, roadside verge, one plant with silvery-blue flowers.  
**Helleborus foetidus** - JNo, Salisbury, Clarendon, few.  
**Hyacinthoides hispanica x non-scripta** \* - JEO, Tollard Royal, Rushmore Estate, small colonies in wild area fringing wood, pink flowers. 1st 10km square record.

**Hyoscyamus niger** - JRM, Shipton Bellinger, Perham Ranges, amongst pheasant cover, 8 plants. 1st 10km square record.  
**Hypericum androsaemum** \* - JEO, Stourhead, woodland. 1st 10km square record.  
**Juglans regia**\* - JEO, SW of Salisbury, ?natural seedlings not far from road edges. 1st vc record.  
**Kickxia spuria** - JMa/AHa, Whiteparish, Moor Farm; BL, Berwick St James.  
**Lactuca serriola** \* - BL, Berwick St James; RD, Broade Chalke, Middleton Down. 1st 10km square record.  
**Lamium album** - JP, Winterslows, Bentley Wood, plant with pale pink flowers.  
**Lathyrus linifolius var. montanus** - LWa, Wilton Brail.  
**Legousia hybrida** - DOG, Newton Tony; JMa/AHa, Whiteparish, Moor Farm; BL, Berwick St James, several scattered plants.  
**Lemna minuta** \* - JEO, Stourhead, lake margins. 1st 10km square record.  
**Lepidium draba** \* - BL, Amesbury, road verge.  
**Leycesteria formosa** \* - JEO, Stourhead, stableyard weed (birdsown?) on stonework. 1st vc record.  
**Lotus glaber** - BG, Compton, single plant on Ridgeway verge. 1st 10km square. BG, Imber, extensive on roadsides. 1st 10km square record. BG, Larkhill Ranges, extensive on sides of track and brow of hill.  
**Malva neglecta** - RDi, Grovely, riding school circle.  
**Melittis melissophyllum** - RDi, Standlynch, edge of field, one of only two records in Flora and still there.  
**Narcissus x incomparabilis (N. poeticus x pseudo-narcissus)** \* - JEO, Great Bedwyn, Wilton Brail, very common in wood.  
**Narcissus poeticus** \* - JEO, Tollard Royal, Rushmore Estate, small colonies in wild area fringing woods. 1st recent vc record.  
**Narcissus pseudonarcissus subsp. major** \* - JEO, Great Bedwyn, Wilton Brail, very common in wood.  
**Neottia nidus-avis** - JTr (2002), West Grimstead, Pepperbox Hill, shady site along track.  
**Ononis spinosa** - AD, Winterbourne Stoke, Parsonage Down NNR.  
**Ophioglossum vulgatum** - ER, Great Bedwyn, Wilton Brail.  
**Ophrys apifera** - AH, Odstock, Hospital; RDi, Tisbury, old allotments.  
**Ornithogalum angustifolium** - RDi, Downton, Wickland, 3 plants (some years 100's). 1st 10km square record. BL, Stapleford, edge of path.  
**Osmunda regalis** - JEO, Stourhead, several places by lake, one a 1st 10km square record.  
**Papaver argemone** - BL, Berwick St James, 4 plants, unsprayed edge of cereal crop. 1st 10km square record.  
**Papaver hybridum** - RCh, Figheldean; BL, Berwick St James.

**Pentaglottis sempervirens** \* - JNo, Salisbury, Clarendon, 2 plants.

**Platanthera chlorantha** - JNo, Winterslows, Bentley Wood, 61 spikes.

**Prunus cerasifera** \* - BG, Warminster, Norton Down, widespread, hedges. 1st 10km square record.

**Pulmonaria officinalis** \* - ER, Great Bedwyn, Wilton Brail, woodland edges.

**Quercus x rosacea (Q. petraea x robur)** - JEO/JDa, Great Bedwyn, Cobham Frith, one older tree and one sapling.

**Ranunculus penicillatus ssp. pseudofluitans** - BL, Teffont Magna, river. 1st unambiguous 10km square record.

**Rosa rubiginosa** - JN, Warminster, Cley Hill, chalk downland, 2 old bushes. 1st 10km square record.

**Silene noctiflora** - JNo, Salisbury, Laverstock, arable edge, 7 plants; JMa/AHa, Whiteparish, Moor Farm. 1st 10km square record.

**Torilis arvensis** - AD, Odstock. 1st 10km square record.

**Tragopogon porrifolius** \* - RDi, Tisbury, footpath. 1st 10km square record.

**Trifolium fragiferum** - BG, Brinkworth, protected road verge and scrambling over bare area.

**Veronica polita** - JMa/AHa, Moor Farm.

**Viscum album** - BL, Dinton, 12 bunches on beech; JEO, Rushmore Estate, extensive and numerous colonies on Whitebeams.

**Zelkova carpinifolia** \* - JEO, Tollard Royal, Rushmore Estate, 3 trees suckering extensively in surrounding hedgerows. 1st county record.