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EDITORIAL

It is encouraging that Issue No 2 of Wiltshire Botany is appearing fifteen months after Issue No 1. The submission of sufficient articles to achieve this gives hope for long-term survival of the journal.

Jack Oliver's article on river channel flora provides a link with the previous issue, where survey work on riverside plants was reported. Recording was at the same sites on Wiltshire rivers for both articles, and the two together provide a comprehensive picture of the current vegetation.

Two other articles also relate to recording projects, but with two groups of plants that are less well-known. Rob Randall describes the early history of recording the many different species of bramble in Wiltshire. His account takes us up to the time of the First World War. It is hoped that a follow-up article will cover progress since then. Rod Stern summarises the current distribution of Bryophytes (mosses, liverworts and hornworts) in the Vc8 part of Wiltshire which is emerging during work on the projected Bryophyte Atlas for the County.

Recording requires identification, and John Presland provides a key for identifying Wiltshire Umbelliferae (also known as Apiaceae) which he hopes will make the process easier for what is often thought of as a difficult family.

In Issue 1, a selection of the Society's plant records for 1995 was included. In this issue, the same is offered for 1996. It was hoped to include 1997 records as well, but their analysis has been delayed by plans to apply a new system of recording to them. Many people have been involved in the compilation of this selection. Malcom Hardstaff has collected the records together, Louisa Kilgallen has combed through them to produce a list fitting our criteria for publication here, and our vice-county recorders Ann Hutchison and Dave Green have checked the information. This work all rests on the activity of many members and others who have sent in records. The enormous contributions of Jack Oliver and Roger Veall have been particularly helpful. Since many of their records have confirmed previous ones or been of relatively common plants, the extent of their contributions is not immediately apparent in the article.

Some articles are already promised for Issue No 3, but we shall need more for a full issue. Articles should be submitted to John Presland, 175c Ashley Lane, Winsley, Bradford-on-Avon, BA15 2HR, who will also be pleased to discuss proposed articles informally (Tel: 01225 865125). A leaflet is also available offering guidance to authors on the most helpful forms in which to submit articles.

AN EARLY HISTORY OF BATOLOGY IN WILTSHIRE

Rob Randall

Batology, the scientific study of brambles, began when Carl von Linné (Linnaeus 1753) published his 'Species Plantarum'.

Linnaeus there described all the British species in the Genus *Rubus*: viz. *R. idaeus* (Raspberry), *R. caesius* (Dewberry), *R. saxatilis* (Stone Bramble), *R. arcticus* (Arctic Bramble), *R. chamaemorus* (Cloudberry) and *R. fruticosus* (Blackberry). This list is complete only because he considered all the British blackberries to belong to one species. It is interesting to note that he made little attempt to unravel the many European forms with which he must have been familiar, and yet in the same publication he was happy to describe a North American blackberry, *R. canadensis*, as a distinct species.

The reason why the study of brambles has been deemed important enough to acquire a name of its own is the fact that the *R. fruticosus* of Linnaeus is now conceived of as a collection of many hundreds of distinct species. This is mainly because processes like hybridisation and chromosome doubling have made sexual reproduction difficult, so that much seed production now occurs without cross-fertilisation, and vegetative reproduction is also frequent. The resulting reduced opportunities for genes of different plants to interact means that each new variant usually reproduces copies of itself and can thus be regarded as a separate species. Where cross-fertilisation does occasionally occur, further variants are produced, which again do not normally reproduce by sexual means. Because of the large number of species and the fine differences in detail between them, the genus has long been treated as one for specialist study and popular botanical books generally cover the genus in much the same way as Linnaeus all those years ago.

The first British blackberry to be given a name was *R. nessensis*, which William Hall (1794) described from plants growing on the shores of Loch Ness. Interestingly, this species is closely related to *R. canadensis* and both are different from typical blackberries in having erect stems and large flaccid leaves.

In assessing progress in the study of Wiltshire brambles it will be useful to review the history of Batology in Britain as a whole as well as progress made locally. This will be done at appropriate points during the main account, so that the comments and decisions made by local botanists can be understood in the context of the knowledge of the genus at that time. My own comments and opinions are enclosed in square brackets. Accepted names and determinations are in italics, other names are in quotes. Where the identification of a species is supported by herbarium material, the herbarium initials are in bold type, and a

list at the end of the article gives the full names for **each set of initials**.

The birth of Batology in Wiltshire

The earliest known reference to a Wiltshire plant when Donald Grose was compiling his county flora was in a grant of land by King Cenwalh in 672 AD, probably at South Newton, which refers to a 'brember wudu'. Grose explains "the same Bramble Wood is mentioned in six of the Wiltshire Charters but the site is not determinable" (Grose 1957, p 223).

The first Wiltshire bramble records Grose could find include:

the Dewberry (*R. caesius*) "Repens fructu caesio prope Fairley Castle in Wiltonia", 1726, J J Dillenius (OXF);

the Raspberry (*R. idaeus*) "Woods at Box", 1839, R C Alexander (Babington 1839), as one might expect;

and also one Blackberry (*R. leucostachys*), "Rudloe Wood", C C Babington (Babington 1839).

Babington was born at Ludlow in 1808, but his parents moved to Broughton Gifford when he was ten, and to Bath four years later. At 18 he began his studies at Cambridge University, where he obtained a B.A. and became a Fellow of the Linnaean Society.

In the summer of 1831 he returned to Bath with the object of compiling a list of the local flora. This was duly published as 'Flora Bathoniensis' (Babington 1834). It covered an area within 4 miles radius of the Guild Hall in Bath and so hardly entered into Wiltshire and individual blackberry species were not differentiated, but this was followed by a supplement (Babington 1839) which extended the study area to a 7 mile radius and with it came the first record of an identifiable blackberry species in Wiltshire.

At that time the expert on British brambles was the Sussex botanist, William Borrer. He had provided the descriptions for blackberries in British floras by Smith (1790-1814; 1824) and Hooker (1830-1835). The description in Smith (1824) for *R. leucostachys* Schleicher has been taken as the basis for the plant from the South-east of England now known as *R. leucostachys* Schleicher ex Sm.

Babington's *R. leucostachys*' record was not that species but almost certainly *R. vestitus* Weihe, a much more widespread plant, common in the Cotswold woods and included under *R. leucostachys*

by British botanists at that time. Although the identification was wrong it signals the beginning of Batology in Wilts.

A few species, *R. leucostachys* Schleicher ex Sm. (1824), *R. echinatus* Lindley (1829) and *R. fissus* Lindley (1835) were described in the early 1800s but progress in the study of British brambles was slow until the latter half of the 19th century, when botanists had time to study Rubi Germanici' of Weihe & Nees (1822-27), containing descriptions of 42 German species.

By the 1840s British botanists had accepted that there were a number of distinct forms within *R. fruticosus* but that identifying individual species was not always easy, as indicated by some of Edwin Lees' early papers on *Rubus*:

"Remarks on the '*Rubus leucostachys*' of Lindley, Leighton (*Flor. Shrops*) and Lees, and '*Rubus nitidus*' of Babington and Leighton's Fasciculus" (Lees 1848).

"Note on *Rubus nitidus* of the '*Rubi Germanici*', and some specimens so named in the Smithian herbarium" (Lees 1849).

Early progress was often made as a direct result of botanists attempting to produce a full account of the botany of their districts, and a number of species were described in these publications. Most species, however, were described in the scientific journals of the day, and the papers mentioned above on Lindley's *R. leucostachys* and Babington's *R. nitidus* were prompted by Lees' realisation that Lindley's plant and Babington's plant were the same and neither of them was the same as *R. nitidus* Weihe & Nees or *R. leucostachys* Schleicher ex Sm., as represented in Smith's herbarium. The diplomatic solution Lees came up with was to describe Lindley's plant as a new species, *R. lindleianus* Lees (Babington had already been honoured by his very own bramble *R. babingtonii* by Bell Salter in 1845).

This kind of confusion was quite common and it was even more likely to occur as attempts were made to assign British plants to more of the names used in Rubi Germanici' and other European publications. To ensure that no confusion can arise it is common practice to include the author of a species when quoting a name, as in the preceding paragraphs, *R. lindleianus* Lees being the valid name for '*R. leucostachys* sensu Lindley, Syn. Brit. Fl., ed. 2:95 (1835)'. When a valid name is not known then an illegitimate name such as the latter can be used in the interim, in which case details of the publication are included to ensure there is no ambiguity.

With growing confidence Babington and others set to work on the task of unravelling the problems of identifying species within the genus:

'A Synopsis of British Rubi' (Babington 1846)
'A descriptive list of the British Rubi' (Lees 1853)
'The British Rubi' (Babington 1869).

In 1861 Babington had been appointed Professor of Botany at Cambridge. After Boner's death in 1862 and the publication of 'The British Rubi' it was Babington who was seen as the national expert.

Babington's monograph (1869, p 192) includes a record of a Wiltshire bramble, *R. rudis* Weihe', collected by E Forster at Great Ridge near Boyton. Babington's idea of *R. rudis* was not the same as that of Weihe, however, and the plant in question was undoubtedly *R. echinatus* Lindley. This was not the first time this plant had been collected in Wiltshire as there is an earlier specimen at DZS labelled 'R. rudis Weihe', Coulston, 7/1846. It is *R. echinatus* Lindley.

The collector is not recorded but may have been T B Flower, as Coulston is only a few miles from Seend, where Flower practised as a surgeon. In 1848 Flower commenced his project to produce a 'Flora of Wiltshire', the first attempt at a comprehensive study of the county's plants.

The bramble flora of Marlborough - 1863

The study of Wiltshire brambles was begun in earnest by Flower, and to some extent by T A Preston. Although publication of Flower's Flora began in 1857, it was in Preston's 'Flora of Marlborough' that Flower's bramble studies make their first appearance. The account of *Rubus* appears to be the result of a visit by Flower to Savernake Forest and two firm records contributed by Preston (Preston's other records were qualified by the comment "probably this species"). Preston does not mention the authority for any of these determinations but several of the names used suggest Arthur Bloxam or William Borrer. Most of these names have been superseded but the brambles of Savernake are well-known and so it is possible to suggest the species intended:

R. plicatus Wh. & N.' [Not accepted for later publications, but not unlikely]

R. rhamnifolius Wh. & N.' [*R. cardiophyllus* Lef. & P J Mueller]

R. discolor Wh. & N.' [*R. ulmifolius* Schott]
Mildenhall, T A Preston

R. leucostachys Sm.' [*R. vestitus* Weihe]

R. carpinifolius Wh. & N.' [*R. polyanthemus* Lindeb., ie. *R. carpinifolius* sensu Bloxam]

R. villicaulis Wh. & N.' [*R. pyramidalis* Kaltenb., ie. *R. villicaulis* sensu Bloxam]

R. mucronatus Blox.' [*R. mucronatiformis* (Sudre) W C R Watson]

R. macrophyllus Wh. & N.' [*R. subinermoides* Druce, ie. *R. pubescens* var. *subinermis* Rogers, syn. *R. macrophyllus* in Smith (1831-49)]

R. hystrix Wh.' [*R. rufescens* Lef. & P J Mueller, ie. *R. radula* var. *hystrix* sensu Bloxam]

R. radula Wh.' [Possibly this species but more likely *R. echinatoides* (Rogers) Dallman, *R. echinatus* Lindley or *R. rudis* Weihe; all grow in that area]

R. pallidus Wh.' [This species is found in the forest, but more likely it was *R. dasyphyllus* (Rogers) E S Marshall, ie. *R. pallidus* sensu Babington]

R. corylifolius Sm.' [ie. Section *Corylifolii*]

'var. *sublustris* (Lees)' [*R. pruinus* Arrh.]
Rabley Copse, T A Preston.

R. nemorosus Hayne'. [Possibly *R. nemorosus* Hayne & Willd., see below]

It would have been particularly interesting to discover who determined Flower's specimen of *R. nemorosus* because this name was not in general use in Britain at that time, the name *R. balfourianus* Bloxam ex Bab. being used instead. There is a separate entry for *R. nemorosus* in the 'Manual of British Botany', (Babington 1856), where it is treated as an aggregate species including a number of distinct forms, and his final comment was "a doubtful plant".

There may be a clue in 'The British Rubi' (Babington 1869, p 258). Under his account of *R. balfourianus*, he mentions a specimen which Borrer sent him from Henfield in Sussex. Borrer suggested his plant was *R. nemorosus* but Babington immediately recognised it as being *R. balfourianus*. It is now accepted that these names are synonymous, the former name taking priority. It is likely that Borrer had access to European publications and material to help him compile his account of *Rubus* in Smith's and Hooker's publications. Early botanologists would have sent material to Borrer for his comments and so there may be specimens of Flower's collecting in Boner's herbarium at Kew.

The fact that Borrer, Babington and others were likely to give different names to specimens submitted to them had an adverse effect on Flower's and Preston's enthusiasm for the genus, as can be seen by the account of *Rubus* in their respective county floras. J W White knew Flower well when he was "well on in years" and writes (1912) "The 'splitters' were an abomination to Mr. Flower". This is probably a reference to the botanists rather than the critical genera, brambles, willows and hawkweeds referred to, as Flower seems to have been quite keen on the plants themselves.

Flower's Wiltshire brambles - 1866

The following account of *Rubus* has been extracted from 'The Flora of Wiltshire' (Flower 1866). In addition to the location and habitat information, a brief description was given for each species, a practice that Flower followed throughout his Flora.

R. rhamnifolius (W. et N.) [*R. cardiophyllus* Lef. & P J Mueller] Hedges, thickets and woods. Frequent in the districts. Area 1-5.

R. discolor (W. et N.) [*R. ulmifolius* Schott] Extremely common in thickets and hedges in the more open districts. Area 1-5.

R. carpiniifolius (W. et N.) [The description and habitat suggest *R. polyanthemus* Lindeb., ie. *R. carpiniifolius* sensu Bloxam] Hedges and open places in hilly districts. Area 1-5. Sparingly distributed throughout Wiltshire.

R. leucostachys (Smith) [*R. vestitus* Weihe] Woods, hedges and thickets. Area 1-5. Distributed throughout all the districts.

R. koehleri (W. et N.) [*R. dasyphyllus* (Rogers) E S Marshall or another species of Series *Hystrices*] Woods, hedges and thickets. Area 1-5. In all the districts.

R. corylifolius (Smith) [*R. conjungens* Bab., *R. pruinosus* Arrh. and other forms in Section *Corylifolii*] Hedges and thickets. Area 1-5. Throughout the districts.

At the end of his account of Wiltshire brambles Flower adds the following note explaining his rather short list (half that in the 'Flora of Marlborough') but at the same time encouraging further study.

"These are the only species I have ventured to introduce of this truly variable and intricate genus, owing to the difficulty that has been experienced in tracing with anything like *accuracy*, their distribution throughout the county. I would here however remark

that we appear to have many interesting and apparently distinct forms from those above described, and if any of my correspondents would kindly undertake to collect, and dry specimens of every Bramble which comes under their notice, in which any conspicuous differences are observable, I would gladly append to each description their opinions and remarks in a future paper which it is my intention of publishing on the *Rubi* of Wiltshire."

He obviously made every attempt to avoid incorrect determinations and this probably accounts for his selection of the most widespread and well-known species for inclusion in his flora. What remains of Flower's herbarium, nearly two thousand sheets, was recently located at Plymouth City Museum (Allen & Torrens 1985). So far, no Wiltshire brambles have been detected (comm. R Gould) so perhaps Flower eventually abandoned his studies.

Preston's Wiltshire Brambles - 1888

Despite twenty years of 'progress' in Batology, Preston was as cautious as Flower about publishing contentious records as can be seen from his introduction to the account of Wiltshire brambles in 'The Flowering Plants of Wiltshire' (Preston 1888).

"The recent revision of this genus by Professor Babington has made it impossible to make use of any hitherto published lists of *Rubi*, except such as have been verified by specimens still in existence. For this reason the lists in the first edition of the 'Flora of Marlborough' and in Mr. Flower's 'Flora of Wiltshire' have not been consulted. The present list is compiled from that in the second edition of the 'Flora of Marlborough', from a list and specimens supplied by the Rev. W Moyle Rogers, and from specimens in the Herbaria at Marlborough College and Devizes."

Following publication of 'The British Rubi' in 1869 there was a period of reflection. Although seen as the national expert, Babington was now in his 60s and did little or no field work. He was not always able to comment constructively, especially when presented with inadequate material or specimens collected late in the season. Nevertheless, Batology was flourishing and there were a number of very competent field botanists studying the brambles of their own areas, in many cases corresponding with each other and comparing and swapping specimens. Luckily for Wiltshire Batology, Rogers was vicar of Stapleford near Salisbury for four years. Like Flower, he was tempted to visit Savernake Forest and provided some useful new records.

Despite Preston's assurance that he had taken care to include only those records which were reliably determined, it would seem that he made no attempt to

study the material in his own herbarium but just copied the various determinations on the sheets, as his records for *R. radula*' and *R. rudis*' show below.

Some species now occur under new names:

R. ulmifolius Schott is not *R. discolor* Wh. & N.' but '*R. rusticanus* Merc.'

R. polyanthemus Lindeb. is not *R. carpinifolius* Wh. & N.' but '*R. maasii* Focke' (a name sometimes given to specimens of this species)

R. rosaceus W. & N.' is probably *R. rufescens* Lef. & P J Mueller, ie. *R. rosaceus* var. *infecundus* Rogers (*R. radula* var. *hystrix* sensu Bloxam.)

And there is a host of new names and species:

R. lindleianus Lees Savernake Forest, WMR.

'*R. pubescens* W. & N. (*R. thyrsoides* in Bab. Rubi)' Savernake, WMR. West Woods; Bedwyn, TAP. [A specimen in DZS from Bedwyn, collected 9/7/1873 and labelled It. *thyrsoides* Wimm.' and later '*R. pubescens* W. & N.' appears to be *R. anglocandicans* Newton, but the specimen is not good enough to be certain. Rogers' plant may have been *R. subinermoides* Druce, syn. *R. pubescens* var. *subinermis* Rogers.]

R. villicaulis Koehl.' Preshute; Bedwyn, TAP. [A specimen from Bedwyn in DZS is apparently infertile and probably a hybrid.]

R. macrophyllus W. & N.' Savernake, WMR. Salisbury, Hussey. [Probably *R. subinermoides* Druce, ie. *R. macrophyllus* sensu Smith (1831-49).]

R. praeruptorum Boul.' Axford, TAP. [*R. heterobelus* Sudre, ie. *R. praeruptorum* sensu Babington, and of Rogers (1892).]

R. echinatus Lindl. Savernake Forest, rather frequent, WMR.

R. rudis Weihe Savernake, WMR [probably correct]; West Woods; Mildenhall Woodlands; Rabley; Axford; Wan's Dyke, TAP. Great Ridge, near Boyton, E Forster (Bab. 'Brit. Rubi', p.192). [A specimen in DZS from West Woods, collected 26/8/1869 and labelled *R. rudis* Weihe' is *R. echinatus* Lindley, the likely identity of all but Rogers' record.]

R. radula Weihe' West Woods; Manton; Marlborough; Mildenhall; Axford, TAP. [Specimens in DZS, labelled *R. radula* Weihe', collected at Manton, 24/7/1870 and Marlborough 7/1876 are *R. echinatus* Lindley, the likely identity of the other records.]

'*R. koehleri* Weihe' Axford, TAP. [probably *R. dasyphyllus* (Rogers) E S Marshall or another member of Series *Hystrices*.]

'var. *e pallidus* Bab. (not W. & N.)' Folly Farm; Axford; Chilton Foliat, TAP. [A specimen in DZS from Axford, 2/7/1873 and labelled *R. pallidus* Bab.' belongs to Series *Hystrices* but probably not *R. dasyphyllus*, another from Chilton Foliat, 30/6/1877 is probably *R. rufescens* Lef. & Mueller.]

R. diversifolius Lindl.' Savernake, WMR [probably *R. tuberculatus* Bab.]

R. lejeunei Weihe' Westbury, H F Parsons; Westbury Down, Babington. [Specimens in DZS look like *R. rilstonei* W C Barton & Riddelsd., a species currently unknown in the county. Investigation of the area could provide an NCR]

R. bellardii Weihe' Savernake, WMR. [Probably *R. scaber* Weihe or *R. pedemontanus* Pinkw.]

R. hirtus W. & N.' Savernake, WMR [Possibly *R. tamarensis* Newton, which would then have been recorded as *R. hirtus* var. *rotundifolius* Bab.]

R. balfourianus Blox.' West Woods (a var.); Tan Coat Lane; Pewsey Road near Marlborough; Martinsell, TAP. [A specimen in DZS, collected at the foot of Martinsell Hill, 13/6/1873 is in Section *Corylifolii* but not *R. nemorosus* Hayne & Willd., syn. *R. balfourianus* Bloxam.]

R. corylifolius Sm.' Binck-knoll; West Woods; Marlborough; Savernake Forest; Poulton; Mildenhall; Axford; Pewsey Road near Marlborough; Wilcot; Alton Barnes, TAP. [Section *Corylifolii*, species unknown]

'var. *a sublustris* Lees' Rabley, TAP. Savernake Forest and near Savernake Station, perhaps frequent, WMR. [*R. pruinosis* Arrh., syn. *R. sublustris* Lees.]

R. deltoideus P J Mull. (in Bab. as *R. althaeifolius*)'. West Woods; Poulton (MBH: *R. corylifolius* var. *conjungens* Bab. det. WMR);

Mildenhall, TAP. (*R conjungens* (Bab.) Rogers in Rep. Marlborough Coll. Nat. Hist. Soc., 1934). [The specimen which was at Marlborough College has not been located. The other two records for 'R. deltoideus' were corrected in the Reports of the Marlborough College Nat. Hist. Soc. in 1934. Whether the plants concerned were actually *R conjungens* or other members of Section *Corylifolii* is not known.]

R. scabrosus P J Mull.' Mildenhall; Axford; Martinsell, TAP. [Section *Corylifolii*, either *R tuberculatus* Bab. or a relative. A specimen in DZS from Mildenhall, 31/8/1869, labelled *R. tuberculatus* Bab. is not that species.]

Murray's Flora of Somerset and the 'Set of British Rubi'

The eminent German botanist W O Focke (1877) published his 'Synopsis Ruborum Germaniae' and British botanists, in particular Rogers and T R A Briggs, began to seek his opinion on their specimens. Then J G Baker (1886) published an important paper "On the relation of British forms of *Rubi* to the Continental types" and in 1889 Briggs invited Focke to England for a field meeting, and together with Rogers, E S Marshall and E F Linton they did a tour of Southern England. Baker's paper and Focke's subsequent "Notes on English *Rubi*" (Focke 1890) gave the British botanists a firm foundation on which to build.

Sadly Briggs died in 1891 but Rogers, E F Linton, W R Linton and R P Murray, with the help of Augustin Ley and others arranged the collection of specimens to exemplify the *Rubus* flora of the British Isles into a 'Set of British Rubi'. About 50 more or less identical sets of this herbarium material were assembled and distributed to interested institutions and individuals in Britain and Europe between 1892 and 1897. They contained examples of 135 taxa, together with their currently accepted names, lists of synonyms, collection details and in some cases with extra specimens to show variations which had been observed. British sets are at **BM, BRISTM, CGE, E, K, LIV, MANCH, NMW, OXF, SLBI** and probably elsewhere.

Inevitably, with such a mammoth task there were some inconsistencies, but in the main these were restricted only to species that were not very well known at the time. This reference herbarium and similar exsiccatae distributed by European botanists are invaluable because they provide a snapshot of the understanding of the genus at a point in time. So far no British reference work had been published that included illustrations, and words are often inadequate

to describe the subtle character differences between species.

Just prior to this, Babington had retired and Rogers took up the reins as leading British botanist, becoming 'Rubus referee' for the Exchange Clubs. His 'An essay at a key to British Rubi' (Rogers 1892-3) and the distribution of the 'Set' meant that botanists with an interest in brambles could feel more confident about their identifications.

When collecting material for the 'Set', Murray and E F Linton visited the Stourton/Gasper area. At that time Gasper was still in Somerset and Murray was probably also doing field work for 'The Flora of Somerset' (Murray 1896). The material collected was sent to Rogers for identification or confirmation and either ended up in the 'Set' or in Rogers' herbarium (**BM**). David Allen and others have been able to check the validity of most of the records attributed to Murray and Linton.

Notable additions to the *Rubus* list include:

R. bertramii G Braun Near Pen Selwood, 1893, RPM (**BM**), det. WMR, conf. DEA.

R. nessensis W Hall Near the Convent, Stourton Woods, 1892, EFL & RPM (**BM**), *R. suberectus* Anders. det. WMR, *R. nessensis* Hall (Murray 1896), conf. DEA. [Material was also distributed as Set No. 52, *R. suberectus* Anders., from Stourton Woods and near Pen Selwood.]

R. plicatus Wh. & N.' Near Stourton, 1892, EFL, 1896, RPM (both **BM**), *R. plicatus* Weihe & Nees det. WMR, *R. bertramii* G Braun redet. WMR & ESM in J. Bot. 1918, conf. DEA; Blackslough, 1892, RPM (**BM**), *R. plicatus* Weihe & Nees det. WMR, *R. bertramii* G Braun det. DEA; Gasper Common (Murray 1896). [Probably also *R. bertramii*.]

var. 'hemistemon (P J Muell.)' Gasper Common with the type (Murray 1896). [Possibly *R. arrheniiformis* W C R Watson, requires confirmation]

R. scissus W C R Watson Thicket between Pen-selwood and Gasper, 1891, EFL & RPM (**BM**), det. WCRW, *R. fissus* Lindley det. WMR.

R. gratus Focke Plentiful and very characteristic in some bushy ground between Pen Selwood and Gasper (Murray 1896). [Probably correct as Murray's specimens from Castle Orchard were correctly determined, comm. DEA.]

R. lindleianus Lees Plentiful near Pen Selwood.

R. platyacanthus P J Mueller & Lef. Gasper Common, 1892, RPM, Set No. 28 (BM), det. DEA, *R. carpinifolius* Wh. & N.' det. WMR.

R. silvaticus Weihe & Nees Gasper Common, 1891, EFL (BM), det. DEA, '*R. carpinifolius* Wh. & N.' det. WMR; Pen Selwood (named with no mark of doubt by Dr. Focke), (Murray 1896).

R. erythrinus Genev.' Pen Selwood. [Probably *R. questieri* Lef. & P J Mueller, accepted for ST73 by Edees & Newton (1988).]

R. macrophyllus Wh. & N.' Gasper Common. [Possibly correct, but more likely *R. subinermoides* Druce.]

'var. schlechtendalii Wh.' Gasper Common (Murray 1896). [Probably *R. albionis* W C R Watson or *R. amplificatus* Lees]

R. rhombifolius Wh.' Stourton Woods near Blackslough, 1891, RPM (BM), *R. rhombifolius* Weihe ?' WMR, *R. rhombifolius* Weihe (Murray 1896), *R. rhodanthus* W C R Watson in Grose (1957). [Series *Sylvatici* but species unknown, comm. DEA.]

'*R. villicaulis* Koehl. (*R. calvatus* Blox.)' Pen Pits; Woods North-east of Alfred's Tower. "Our plant appears to belong to the variety *Selmeri* Lindeb." [ie. *R. nemoralis* P J Mueller], (Murray 1896). [Both *R. calvatus* Lees ex Bloxam and *R. nemoralis* P J Mueller grow in the area.]

R. curvisipinosus Edees & Newton Boggy ground between Pen Selwood and the [old] Wiltshire border, 1892, EFL, near Stourton, 1892, EFL & RPM (both BM), det. DEA, conf. AN, *R. dummoniensis* Bab. cont. WMR

R. polyanthemus Lindeb. Stourton Woods, 1891, EFL (BM), det. DEA, *R. pulcherrimus* Neuman' det. WMR; Gasper Common, as *R. pulcherrimus* Neuman' (Murray 1896).

R. sprengelii Wh. Plentiful near Stourton, 1891, EFL (BM), conf. WMR; common in bushy places near Pen Selwood and Gasper; Woods and bushy places near Blackslough (Murray 1896).

R. longus (Rogers & Ley) Newton Near Blackslough, 1891, EFL (BM), det. DEA, "form between *R. leucostachys* Sch. and *R. rusticanus* Merc." EFL, *R. leucostachys* Schleich. var. *angustifolius* W M Rogers (Murray 1896).

'*R. mucronatus* Blox.' Hedges near Pen Selwood [probably *R. mucronatiformis* (Sudre) W C R Watson.]

'? *R. acutifrons* Ley' [species unknown]. In fair quantity in some bushy ground between Pen Selwood and Gasper, EFL & RPM, 9/1891. "I think clearly not distinct specifically from the Herefordshire *R. lintoni*' (which Ley now wishes to call *R. acutifrons*, Rogers). "Not quite the same as the *R. acutifrons* of Herfs. " (Murray 1896).

R. glareosus Rogers Stourton Woods, 1891, EFL; woods below Blackslough, 1892, RPM and Set No. 48 (BM), det. AN, *R. hirtus* var. *kaltenbachii*' det. RPM; "*R. kaltenbachii* Metsch, very luxuriant in woodland between Stourton and Blackslough", (Murray 1896.) [Recorded wrongly as *R. diversus* W C R Watson in Grose (1957).]

R. lintoni Focke var.' det. WMR. [At least two forms in the Stourton area have been given this name.] Rough pasture near Stourton, 1894, RPM (BM), *R. biloensis* Newton & M. Porter det. DEA, conf. AN & MJP; Rough field between Stourton and Blackslough, 1892, EFL, Set No. 96 (BM), *R. euryanthemus* W C R Watson det. WCRW (Grose 1957), incog. AN.

R. dentatifolius (Briggs) W C R Watson Penselwood, 1891, RPM (BM), det. DEA, *R. infestus* Weihe det. WMR; Blackslough, 1891, EFL, and near Stourton in both counties, 1892, EFL (both BM), det. DEA, *R. borrieri* Bell Salt. det. WMR, *R. phaeocarpus* W C R Watson (Grose 1957).

R. bloxamii (Bab.) Lees Blackslough, 1892, EFL, Set No. 18 (BM), *R. fuscus* Weihe & Nees' det. EFL, *R. bloxamii* ? det. WMR, conf. AN; in quantity beside a cart-road near Penridge, 1892, EFL, 1894, RPM (BM), 'near *R. menkei*' Dr. Focke, *R. bloxamii* Lees det. WMR (Marshall 1914), conf. WCRW, AN.

R. flexuosus Mueller & Lef. Blackslough to Penselwood, 1891, EFL & RPM, Blackslough, 1892, RPM, and Set No. 43 (all BM), det. DEA, *R. foliosus* Weihe & Nees det. WMR.

R. fuscus Wh. & N.' Near Convent, Stourton Woods, 1892, EFL (BM), *R. fuscus* Weihe & Nees ?' EFL, "a var. of that but much less glandular than the common form" Dr. Focke, *R. fusciformis* Sudre det. WCRW. [Rather like *R. anglofuscus* Edees, but not that species,

comm. AN. Similar material from Gasper is in Herb. Grose at DZS.]

I?. *dasyphyllus* (Rogers) E S Marshall [as *R. koehleri* Wh. & N. var. *pallidus* Bab.] Roadside near Kilmington; About Gasper and Blackslough.

R. hystrix Wh. & N.' Woodlands at Blackslough. [probably I?. *hylocharis* W C R Watson.]

Rogers and Clarke Explore North-west Wiltshire

At the same time as Murray and Linton were exploring the Selwood Forest area in the South-west, Rogers made a number of visits to North-west Wiltshire, visiting W A Clarke at Chippenham on at least one occasion. Charles Bailey also paid a brief visit to the area and a few new records were made:

R. calvatus Lees ex Bloxam'. Near Langley Fitzurse, WAC & WMR (Preston 1890). [Possibly correct, but may have been *R. nemoralis* P J Mueller]

R. nemoralis P J Mueller Langley Fitzurse, 1895, 'R. villicaulis Koehl. var. *selmeri* (Linde^b.)' coll. & det. WMR (Tatum 1896). [Refound, 1997.]

R. rubritinctus W C R. Watson [as *R. erythrinus* Genev.] Banks of Canal between Limpley Stoke and Freshford, C Bailey (Rogers 1893). [Still grows in the Avon valley.]

Rogers and Tatum Explore South Wiltshire

In 1885 Preston moved to Thurcaston Rectory in Leicestershire but continued to report additions to the Wiltshire bramble flora in the Journal of Botany until E J Tatum took over in 1892. Tatum was based in Salisbury and was very active in the 1890s. He concentrated his efforts on the Vale of Wardour but made a number of trips to other important bramble localities.

R. divaricatus P J Mueller Landford, 1890, EJT (BM), det. HJR, conf. DEA, *R. nitidus* Weihe & Nees' det. WMR.

R. fissus Lindley Wardour, 1895, FAR (BM), conf. DEA, *R. rogersii* Linton det. WMR.

R. plicatus Weihe & Nees Wardour, 1895, WMR (Tatum 1896). [Requires confirmation.]

R. albionis W C R Watson Dinton, FAR & WMR, 1895 (K), det. WCRW, conf. DEA,

R. schlechtendalii Weihe' det. WMR; Wardour, 1895, FAR (BM), det. DEA, *R. schlechtendalii* Weihe' det. WMR.

R. macrophyllus Weihe & Nees' Hurdcott; Dinton; East Knoyle (Tatum 1896a). [Requires confirmation.]

R. oxyanchus Sudre Dinton, 1895, WMR (BM), det. WCRW, conf. DEA, *R. nemoralis* Mueller' det. WMR.

R. platyacanthus P J Mueller & Lef. Landford, 1889, EJT (BM), det. DEA, *R. carpinifolius* Weihe & Nees' det. WMR.

R. pyramidalis Kaltenb. Clarendon Park, EJT, 1890 (BM), conf. AN; Grimstead, EJT (Preston 1890); Wardour, WMR (Tatum 1896a).

R. silvaticus Weihe & Nees' Landford, EJT (Preston 1890). [Probably *R. amplificatus* Lees or *R. subinermoides* Druce.]

R. argentatus var. *robustus*' Clarendon Park, 1895 (Tatum 1896), "perhaps var. *robustus*" WMR, 'R. propinquus' det. WCRW (Grose 1957). [Probably I?. *armipotens* W C Barton ex Newton]

R. conspersus W C R Watson Salisbury Race Plain, 1889, EJT (BM), det. DEA, conf. AN, "curious form of *R. vestitus*" Dr. Focke.

R. longus (Rogers & Ley) Newton Grimstead, 1889, EJT (BM), det. DEA, conf. AN, *R. lasiocladus* Focke var. *angustifolius* Rogers det. WMR.

R. mucronatiformis (Sudre) W C R Watson Grimstead and East Knoyle, 1889, EJT; Swallowcliffe to Ansty, 1895, WMR (all BM), det. DEA, *R. mucronatus* Bloxam' det. WMR. [Other records in Grose (1957) of *R. mucronatus* are probably this species.]

R. diversus W C R Watson Compton Chamberlayne, 1889, EJT (BM), det. DEA, *R. kaltenbachii* Metsch.' det. WMR.

R. radula Weihe' Alderbury, 1891, EJT; Wilbury; Hurdcott, 1891, EJT; Downton, 1891, WMR, Bentley Wood; Redlynch; Landford; Plaitford, 1892, EJT. [*R. leightonii* Lees ex Leighton det. WCRW in Grose (1957). Probably that species.]

R. micans Godron East Knoyle and Alderbury, 1889, EJT; Swallowcliffe, 1895, WMR (all BM),

det. DEA, *R anglosaxonicus* Gelert det. WMR; Compton Chamberlayne, EJT (Preston 1890); Ansty; Dinton; Wardour, WMR (Tatum 1896a).

R. leyanus Rogers Southley [Southleigh] Wood, EJT, 14/8/1890 (BM), det. B&R, lectotype des. BAM, 'R. drejeri G Jensen' det. Focke & WMR.

Rogers' Handbook and the Next Generation of Batologists

A second visit by Focke in 1894 to study brambles in the Midlands, Welsh Borders and North Wales, and trips to Scotland, Ireland and Mid-Wales by Rogers, E S Marshall and others, resulted in the discovery and description of a number of additional species, making a new reference work necessary. At the age of 65, Rogers (1900) published his 'Handbook of British Rubi', a small but effective volume, cheaply produced. It included 101 species, 29 subspecies and 4 varieties assigned to 14 groups based on the characters of the stem armature (and to some extent the leaves and panicle). A partial key to the members of each group was included to guide the user more quickly to the most likely species. Individual descriptions were cross-referenced to 'Set' numbers when applicable and any aberrant material in the set was indicated. A vice county distribution list was included in an appendix. It was very popular and is still widely available at antiquarian book sales, selling at a much lower price than most county floras.

Meanwhile the French botanist Henri Sudre had been studying the 'Set' and subsequently (Sudre 1904) published his "Observations sur 'Set of British Rubi'" in which he raised a number of taxa from variety or subspecies to specific rank and described as new species a number that had been wrongly identified with European forms, rewarding R P Murray for his efforts by naming *R. murrayi* Sudre in his honour.

Rogers remained active despite his advancing years, describing a number of new species, the final contribution being published posthumously (Rogers & Riddelsdell 1925).

West Wilts Plant Notes for 1903

E S Marshall was educated at Marlborough College and Oxford, and between 1902 and 1904 was the Vicar of Keevil. Whilst at Keevil he contributed 'Wiltshire Plant Notes' (Marshall 1904) to the Journal of Botany. Those for 1903 include *Rubus* records. The area visited, Great Ridge Wood, had not been investigated before, and has had little attention from batologists since, so some of his records remain unconfirmed:

'*R. mollissimus* Rogers'. Downs below the Ranche, Great Ridge Wood. [Rather unlikely - requires confirmation.]

R. rhombifolius Weihe ex Boenn. Great Ridge Wood (BM), det. DEA, *R. leucandrus*' det. WMR, 'possibly *R. armipotens*' AN.

R. raduloides (Rogers) Sudre Downs between Chicklade and Wylve (BM), det. AN, *R. griffithianus* Rogers' det. WMR.

R. babingtonii Bell Salt.' Halfway between Chicklade and Wylve. [Specimen not located, possibly *R. adamsii* Sudre, *R. biloensis* Newton & M Porter or *R. phaeocarpus* W C R Watson]

Augustin Ley's Visit to Wiltshire

The Rev. A Ley is well known for his knowledge of the brambles of Wales and the Welsh borders but appears to have visited Wiltshire on only one occasion. It is extraordinary then that of the four records that are supported by specimens two were new Vc records. Although one, *R. sulcatus* Kalt., was unlocalised the other records suggested it was collected in the Chippenham area and after a search of the most likely places it was rediscovered in 1997.

R. sulcatus Vest. Recorded for Vc 7 without locality (Rogers 1915), (BM) conf. DEA. [Found at Hey Wood, 1997, growing with the two following.]

R. pyramidalis Kaltenb. High Wood, near Hardenhuish, A Ley, 1910 (BM), conf. AN. [Colony refound at Hey Wood, 1997.]

R. silvaticus Weihe & Nees High Wood, near Hardenhuish, A Ley, 1910 (BM), conf. DEA. [Colony refound at Hey Wood, 1997.]

R. asperidens Sudre ex Bouvet (syn. *R. milesii* Newton) Langley Burrell, A Ley, 1910 (BM), det. DEA, '*R. koehleri* var. *cognatus*' det. Ley, '*R. adenolobus*' det. WCRW (Grose 1957).

Miss Todd and the brambles of Aldbourne

Emily Sophia Todd amassed a formidable herbarium, now at Swindon Museum and Art Gallery (SDN), including numerous bramble specimens from around the country, but she very rarely travelled more than a few miles from her home at Aldbourne when collecting Wiltshire material. *Rubus* specimens were seen by Riddelsdell, and sometimes a second opinion was sought from Rogers. When Donald Grose was preparing the account of brambles for his Flora in 1948-9 he invited Watson to Wiltshire for some field

work. During this period Watson checked the brambles in the Todd herbarium.

R. acclivatum W C R Watson Woodsend Lane, Aldbourne, 8/1913 (SDN), det. WCRW, conf. RDR; Lane, Aldbourne, 8/1916 (SDN), det. WCRW, conf. RDR, 'R. godroni' det. HJR, 'probably under var. robustus' - WMR.

R. cissburiensis W C Barton & Riddelsd. Stock Close, Aldbourne, 1917 (BM), det. HJR, conf. DEA; Waste ground and wood, Stock Lane, Aldbourne, 8/1927 (SDN), *R. argenteus* forma glandulosa' (later *R. cissburiensis*) det. HJR, *R. separinus*' det. WCRW.

R. macrophyloides Genev. ' Woods, Ramsbury, 1913 (SDN), det. HJR. [Series *Vestiti*, rather like *Radscitus* Genev.]

R. subinermoides Druce Hedge near Chilton Foliat, 8/1926 (SDN), conf. RDR, *R. pubescens* var. *subinermis* Rogers det. HJR.

R. armipotens W C Barton ex Newton Border of wood near Standen Manor, 7/1913 (SDN), det. RDR, 'nearer *R. robustus* than type godroni, though not quite good' - HJR, *R. pseudo-bifrons*' det. WCRW.

R. raduloides (Rogers) E S Marshall' Stock Lane corner, 8/1913 (SDN), *R. raduloides* and fairly good' - HJR, *R. heterobelus* Sudre det. WCRW. [Could be the latter, but *R. norvicensis* Bull & Edees is more likely.]

R. babingtonii Bell Salt.' Standen Manor, Berks., 7/1913 (SDN), "R babingtonii, a form with narrow, elongated leaflets", HJR, *R. moylei* W C Barton & Riddelsd. det. WCRW. [*R. babingtonii* does not have narrow leaflets, it is probably *R. adamsii* Sudre or *R. phaeocarpus* W C R Watson rather than *R. moylei*.]

R. echinatoides (Rogers) Dallman Hedge between Woodsend and Stock Lane, Aldbourne, 7/1914 (SDN), det. WCRW, conf. RDR; Hedge, Woodsend, 7/1917 (SDN), *R. radula* ssp. *echinatoides* Rogers det. HJR, conf. RDR; Woodsend Common, 1918 (BM), det. HJR, conf. AN.

R. radula Weihe ex Boenn.' Hedge between Woodsend and Stock Lane, 7/1914 (SDN), det. WCRW. [Specimen is probably *R. echinatoides*.]

R. corylifolius var. *purpureus*' Lane, Aldbourne, 7/1913 (SDN), "It is not very close to *R. mucronatus* var. *nudicaulis*, certainly not

R. infestus", HJR. [Section *Corylifolii* but not *R. conjungens* (Bab.) Rogers.]

R. conjungens (Bab.) Rogers' Lane near Standen Manor, Berks., 7/1913 (SDN), det. WCRW. [Poor material - requires confirmation.]

R. dumetorum agg.' Lane between Stock Lane and Woodsend, 7/1914 (SDN), "R. dumetorum agg. nearest *R. raduliformis*", HJR. [Looks very like *R. bagnallianus* Edees - requires confirmation.]

R. tenuiarmatus Lees' Hedge, Stock Lane, 7/1913 (SDN) det. WCRW. [Not that species but possibly *R. bagnallianus* Edees - requires confirmation.]

Donald Grose tackles Brambles !

Botanical studies more or less came to an end with the advent of the First World War. Post-war Botology was entered into by Francis Rilstone and later by Donald Grose and his helpers as part of his project for a new Wiltshire Flora. It is hoped to cover this stage in the story in a later issue.

Abbreviations

agg. aggregate of forms
conf. confirmed by
des. designated by
det. determined by
incog. unknown to me

AN A Newton
BAM B A Miles
B&R W C Barton & H. J. Riddelsdell
DEA D E Allen
EJT E J Tatum
FAR F A Rogers
HJR H J Riddelsdell
RDR RD Randall
TAP T A Preston
WAC W A Clarke
WCRW W C R Watson
WMR W M Rogers

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their extensive libraries; and finally Alan Newton for encouraging my study of brambles in the first place, and patiently checking hundreds of determinations over the last thirteen years.

Herbaria consulted

BM: British Museum (Natural History), London: H J Riddelsdell; W M Rogers; 'Set of British Rubi'; consulted by D E Allen, A Newton, etc.

DZS: Museum of the Wiltshire Archaeological & Natural History Society, Devizes: T A Preston

K: Royal Botanic Gardens, Kew: W C R Watson

MBH: Marlborough College Natural History Society; consulted by Donald Grose

OXF: Botany School, University of Oxford: J J Dillenius; consulted by Donald Grose

PLY: T B Flower; consulted by Ray Gould

SDN: Museum & Art Gallery, Swindon: Miss E S Todd

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BRYOPHYTES IN WILTSHIRE

Rod Stern

Introduction

Bryophytes comprise mosses, liverworts and hornworts (the last usually being grouped with liverworts for convenience because there are very few of them). There are two main types of moss:

- *Acrocarps*, consisting of a single leafy stem growing upright, often in dense tufts and patches, eg. *Atrichum undulatum* (Catherine's Moss).
- *Pleurocarps*, much branched, creeping along the substrate and often closely attached to it; eg. *Thuidium tamariscinum* (Tamarisk Moss).

Both have rhizoids like roots but for anchorage only, not for uptake of nutrients.

Liverworts can be thallose, without stem and leaves, eg. *Conocephalum conicum* (Lemon-scented Liverwort) or leafy, often rather like some mosses but with several characters in which they differ, eg. *Lophocolea bidentata* (Two-toothed Liverwort). Liverworts differ from mosses in their capsules (containing spores) which are usually spherical and short-lived, while those of mosses are usually complex structures, lasting several weeks at least. Capsules are often not produced and it is necessary to examine the vegetative parts. More detail on the structure and life histories of mosses and liverworts can be found in Watson (1971) and also in the following books for identifying species: Watson (1981), Smith (1978, 1990), Jahns (1980), Perry (1992).

Microscopic examination is frequently needed to determine the species of both mosses and liverworts, but many are easily identified in the field with, or often without, a x8 or x10 hand lens.

Bryophytes in Great Britain

We are fortunate in Britain to have a rich bryoflora with 700 species of mosses and 300 of liverworts, about 40% of all those in Europe. This is mainly because of the wide climate differences, with some Mediterranean species in the south of England, arctic-alpines on the northern mountains, and the very important Atlantic element on the western side. We also have a relatively large number of active field bryologists compared with most other countries and so our knowledge of bryophyte distribution is good (Hill, Preston and Smith 1991-94).

The situation in Wiltshire

Although bryophyte floras and/or atlases have been published or are in the course of preparation for most vice-counties in South England, there has been no

systematic work in Wiltshire until recently. Indeed, the first published work was not until 1892 when J Saunders produced a list of mosses recorded near Salisbury. C P Hurst (1917-1931), living at Great Bedwyn until 1930, published records of bryophytes (and several other groups of wildlife) near where he lived, and the Dunston brothers published further records in the south-west corner of Wiltshire until the 1940's (1942 and 1948). From the 1950's, Dr Francis Rose and the late E C Wallace visited various sites in Wiltshire, as did one or two other bryologists. There is still much unexplored country in Vc7, but at the end of 1989, I started a systematic survey of Vc8. The intention is to publish an Atlas for Vc8 on a 10km square basis with locations of the rarer species (say those with 12 or fewer records).

Habitats on the chalk

Much of Vc8 consists of arable land on chalk. Depending on agricultural practice, this can be of some interest for mosses (much less for liverworts). There is an assemblage of small acrocarpous species, some of them reproducing vegetatively by gemmae (specialised vegetative reproductive structures) or tubers on the rhizoids, often brightly coloured, associated particularly with fallow fields, eg. *Bryum rubens*. Chalk grassland has generally been regarded as favourable for bryophytes, but in South Wiltshire it is mostly disappointing; it seems that cattle grazing does not suit the mosses and liverworts, except for a few common species, although it is satisfactory for vascular plants. On Salisbury Plain Training Area, the grass is generally too long, but there are a few small disturbed areas which have some tiny ephemeral mosses in the autumn and winter, eg. *Phascum curvicolle* (Swan-necked Earth-Moss).

Other habitats

The richest areas for bryophytes in Vc8 are on the more acid soils, the best sites being in the south-east corner which is now partly in Hampshire and includes a part of the New Forest. A recent find here is *Splachnum ampullaceum* (Flagon-fruited Collar-Moss), which grows on cattle dung, only known in lowland England from the New Forest. There are also some good sites on the extensive Upper Greensand woodlands in the South-west, and on the Oolitic limestones near Bath. The Kimmeridge and Oxford Clay areas are mostly boring improved pasture, but there are a few interesting woodlands on them.

Wiltshire specialities

The only species protected (against destruction and collection) under Schedule 8 of the Wildlife and Countryside Act 1981 in the county is the small moss *Didymodon glaucus*, which occurs very sparingly

near Swindon, its only site in Britain. The rarest moss in South Wiltshire is *Brachythecium appleyardii*, a British endemic, occurring on limestone walls in the South-west, and known elsewhere only in Yorkshire and Somerset.

Other bryophytes of interest in Wiltshire

Because of the shortage of suitable habitat, bog-mosses (*Sphagnum species*) are uncommon, but 16 have been recorded, nearly all at the southern end of the county. The two which are least uncommon are *S. palustre* and *S. auriculatum*. The aquatic moss *Octodiceras fontanum* grows on stonework of the Kennet and Avon Canal at Devizes, one of the very few sites for this plant south of the Midlands. The small leafy liverwort *Cololejeunea rossettiana* is on limestone rocks at Limpley Stoke, otherwise known in South England only from the Isle of Wight. Another leafy liverwort which is very rare in Lowland England (except the New Forest) is *Frullania fragilifolia*; this occurs on a few old oaks near Hamptworth and in Savernake Forest. The extraordinary thallose liverwort *Cryptothallus mirabilis*, cream-coloured and totally without chlorophyll, grows buried underneath *Sphagnum*; it is in a woodland near Redlynch and also near Furzley. From a conservation point of view, the main threats in general are loss of habitat through development of one kind or another and unsympathetic agricultural practices; collection is not usually a problem, but some care may be needed.

The Future

Since 1989, I have added about 40 species to the Vc8 list, which now totals 393 mosses and liverworts. The richest square 41/22 has 232. I hope to publish the Atlas in about two years' time. I intend to continue having an annual meeting on bryophytes for Wiltshire Botanical Society and hope some members will contribute records and perhaps take up bryology. It goes well with vascular plants and has the advantage that one can do field work in the seasons when there aren't many flowers out.

The British Bryological Society has a network of Regional Recorders, those for Wiltshire being:

Vc8: R C Stern, 15 Selham Close, Chichester P019 4BZ.

Vc7: R D Porley, English Nature, Foxhold House, Crookham Common, Thatcham, RG19 8EL.

The British Bryological Society also has regional groups which have local meetings, which are open to non-members; there is a Southern Regional Group

which sometimes meets in Wiltshire and a Cotswold and Chilterns Group which has had at least one meeting in the county. One of the intentions is to encourage people to become more familiar with this fascinating group of attractive and interesting plants.

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IDENTIFYING WILTSHIRE UMBELLIFERAE

By John Presland

A difficult family?

The *Umbelliferae* (sadly now increasingly referred to by the less picturesque name of *Apiaceae*) are commonly regarded as difficult to identify. The difficulties are reflected in many of the popular local names which have been given to its members (Grigson 1975). Cow Parsley, for instance, has commonly been called "Keck", but this name has also been used for Hogweed, Fool's Parsley, Hemlock and Wild Angelica. Other local names for Cow Parsley confuse it with other members of the family - it's been called Cicely, Cow Chervil, Hemlock, Wild Caraway and Wild Parsley. The scientific names also often reflect past confusions. Calendars and encyclopaedias sometimes misidentify members of the family. People have been poisoned by confusing, for instance, Hemlock Water-dropwort and Wild Celery.

In many ways, the family's "difficult" image is misleading. Most plants in the family are fairly easily identified as belonging to it. They hardly ever hybridise (Stace 1975), so that there is little confusion from intermediate forms - one Cow Parsley looks much like another Cow Parsley. The parts of the inflorescence used to distinguish between species are mostly simple and obvious once learned - unlike some other families where petals, sepals or stamens are joined together or grow in odd ways not always easy to describe in an identification book. Historically, it has not daunted botanists. It was probably the first family to be given a name - in 1586, and it was the first to have its classification systematically studied - in 1672 (Constance 1971). Wider understanding of the family is important, because it contains a high proportion of the world's plant species. Heywood (1978) states that there are 2,500 to 3,000 species worldwide, and Stace (1997) lists about 90 species which have been recorded in the British Isles.

A new key for Wiltshire umbellifers

Recorders often find existing keys difficult to use. Sometimes this is because of reliance on fruit characteristics, which is not helpful in the absence of fruits. Sometimes it is because of ambiguities in the distinctions suggested for step-by-step identification. The close similarities between members of a numerous family are, of course, always an underlying difficulty in constructing user-friendly and reliable identification keys.

An attempt is made here to simplify identification of Wiltshire umbellifers by including, initially, only members of the family which are likely to be encountered by more than an occasional recorder, treating rarer species as departures from the main key, and leaving out species not yet recorded in Wiltshire. Plants occurring in 6 or more of the 3,659 kilometre

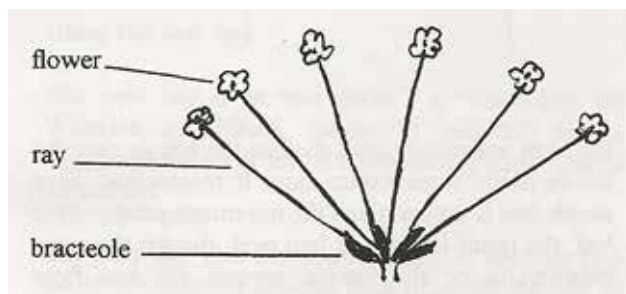
squares in the latest Wiltshire Flora (Gillam, Green and Hutchison 1993) were included in the main key. Species recorded in Wiltshire (either for the Flora or subsequently) but not meeting this criterion were omitted from the main key, and treated as departures from it. Aided by the resulting simplification of the task, strenuous efforts have been undertaken to make all distinctions unambiguous, and fruits have been used in the main key only once, and only in a supplementary way. It is not intended to replace other keys in print, and those provided by Rose (1981), Stace (1997) and Tutin (1980) are recommended for use outside the County, for the rare species which are not included in the key, and as a step forward from using the key offered here. The key to an even more restricted sample of common umbellifers given by Gilmour and Walters (1969) can also be helpful in the early stages of developing expertise.

In developing this local key, much use has been made of the descriptions provided by Tutin (1980), supplemented by the descriptions of Stace (1997), the illustrations of Ross-Craig (1958, 1959) and my own photographs. It has been checked by following the key for every species on the basis of Tutin's descriptions and by using it with plants of all the species encountered recently in the field. The main key has been checked in the field for all species except Giant Hogweed (*Heracleum mantegazzianum*) and River Water-dropwort (*Oenanthe fluviatilis*). Problems with the first are not expected. The key is unlikely to be used with River Water-dropwort, since it rarely flowers and is usually encountered with only submerged leaves in inaccessible parts of running watercourses.

Characters used in the new key

The characteristic inflorescence in the Umbelliferae is the *umbel*. A *simple umbel* (shown in Figure 1)

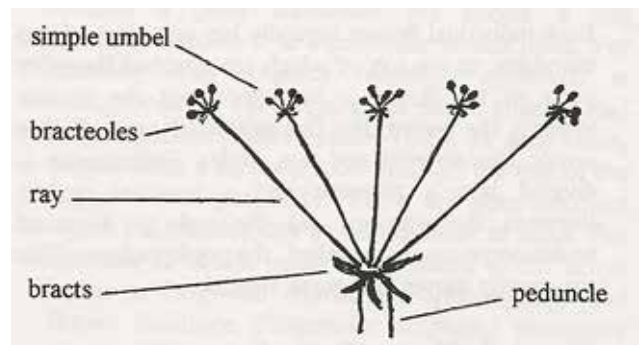
Figure 1: Simple umbel



consists of a number of flower stems, called *rays*, which all originate from the same point at the end of a common stalk, each ending in a *flower*. At the point of origin of the rays, there is typically a number of small leaflike structures which it is simplest to call *bracteoles*. British umbels, however, mostly have a

compound umbel (Figure 2), in which each simple umbel is itself at the end of a ray and all these rays

Figure 2: Compound umbel



have a common point of origin at the end of the supporting stalk, known as the *peduncle*. It is, in effect, an umbel of umbels. The leaflike structures at the point of origin of the lower rays are called *bracts*. The photographs (slightly doctored) in Figures 3 and 4 show more of what one member of the family - Cow Parsley (*Anthriscus sylvestris*) - would look like in three dimensions, rather than the two in the . diagrams. Note that this species has no bracts, but

Figure 3: Compound umbel of Cow Parsley from above

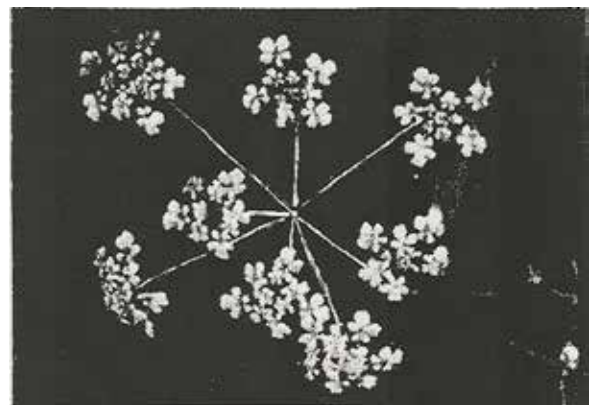
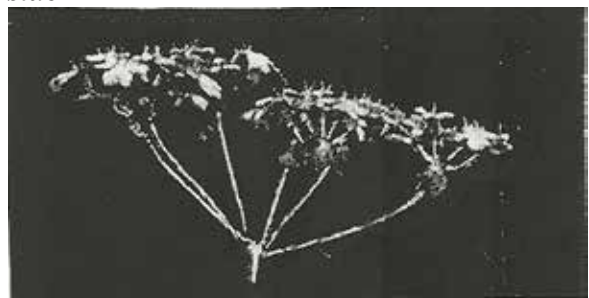


Figure 4: Compound umbel of Cow Parsley from the side



otherwise illustrates all the main features. In the key, the term *ray* is always used to refer to the main rays of the whole inflorescence, not those of the component simple umbels.

Each individual flower typically has an *ovary* of two chambers, to the top of which are attached the other parts of the flower - in order from the outside towards the centre, the five *sepals* (if present), five *petals*, five *stamens* and two *styles*. Each stamen is divided into a *filament* and a terminal *anther*. Between the stamens and the style is a raised nectar-secreting ring called the *stylopodium*. This structure is shown in Figures 5 and 6.

Figure 5: Flower from above

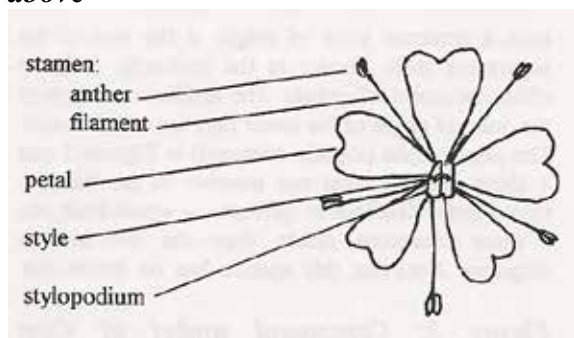
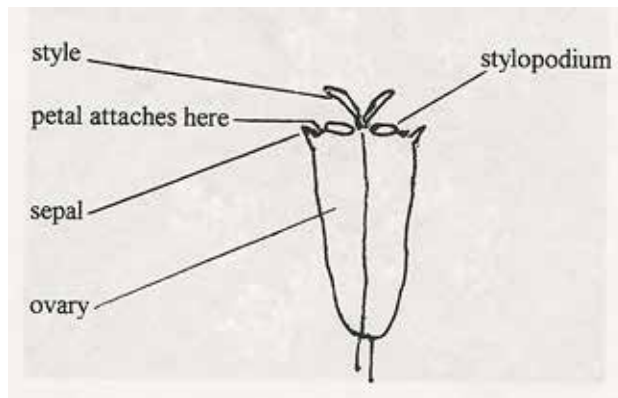
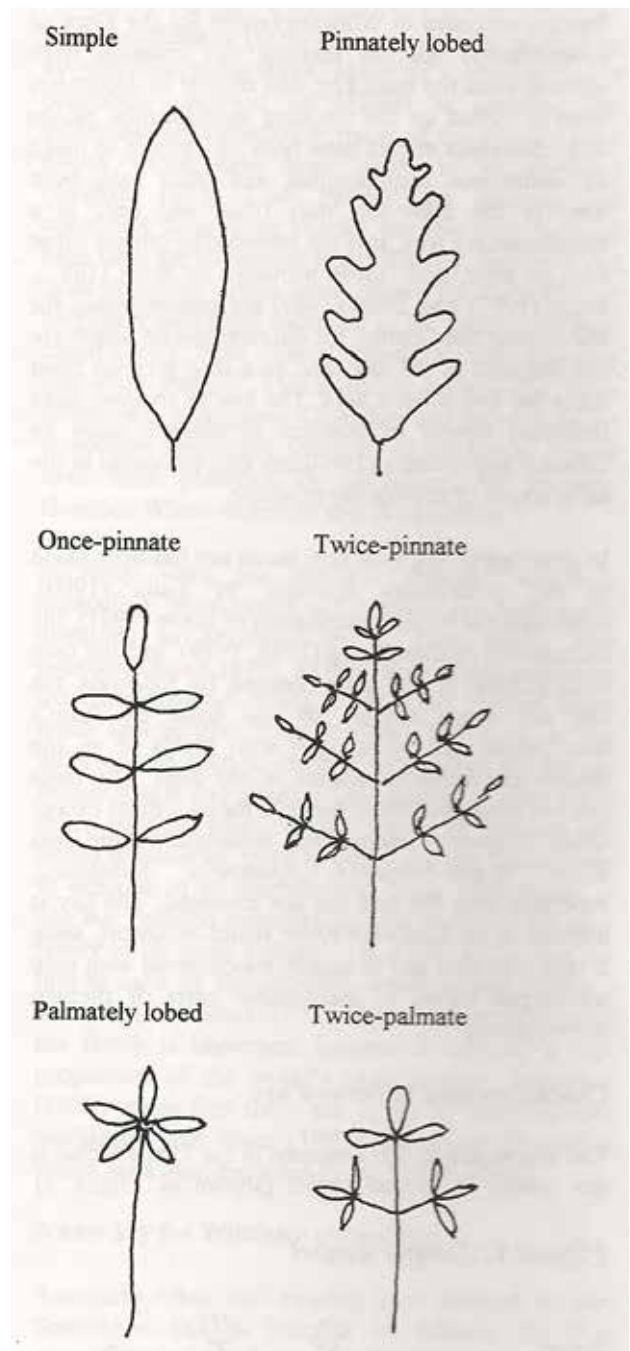


Figure 6: Flower from side with petals removed



Leaf characteristics are also important in the key. Figure 7 shows the main types of leaf referred to. The term *simple* refers only to the undivided nature of the leaf - not to its shape. *Pinnately lobed* implies clear division into lobes which are not separate from one another. Marginal teeth or undulations alone do not qualify - the term simple would still be used. When the lobes are separate from each other, the term *pinnate* is used. If the lobes are themselves further divided in a pinnate fashion, the leaf is said to be *twice pinnate*; if there is no further complete division, the leaves are *once pinnate*. Leaves can also be *three-times-pinnate* - or more. Hopefully, the other leaf types are clear from the

Figure 7: Main leaf forms in Umbelliferae



illustrations. However, the term *irregularly oval* used in the key to describe leaves needs some explanation. It means that, if a simple line is drawn round the outermost points of the leaf, the result is more or less oval, though the many indentations of the margin prevent the leaf from looking like any simple shape.

Umbellifer or not?

Before using the new key, it is necessary to decide whether or not a plant *is* an umbellifer. Almost all Wiltshire members of the family have the compound

umbel described above, though sometimes there is no peduncle separating it from the plant stem, and bracts and bracteoles are not always present. Only the following do not have it:

- Marsh Pennywort (*Hydrocotyle vulgaris*) has simple umbels too small to see easily, but is easily recognizable as the only British plant of water or marsh apart from water-lilies which has circular leaves with leaf-stalks attached centrally.
- Sanicle (*Sanicula europaea*), which has simple umbels.
- Knotted Hedge-parsley (*Torilis nodosa*), which has the flowers in each umbel in a dense cluster at the base of a leaf stalk, with the peduncle and rays virtually invisible, but the umbellate structure discernible by looking underneath, and the fern-like leaves so often found in members of this family.

Some plants which are not umbellifers may be misidentified as such because they appear to have umbels as their inflorescences. It is important to look at this feature very carefully, since this often reveals that the "rays" do not all arise at exactly the same point, so that true umbels are not actually present. Genuine umbels are present in relatively few non-umbellifers, the main examples being:

- some members of the *Caprifoliaceae* and *Rosaceae* - but they are all shrubs or trees, whereas no Wiltshire umbellifers are;
- some species in the genus *Allium* - but their floral parts are in threes or sixes, whereas Wiltshire umbellifers all have five petals;
- Cowslip (*Primula veris*) - but the flowers droop at the end of the "rays", which happens in no Wiltshire umbellifer;
- some members of the *Euphorbiaceae* - but they are distinguished by the unmistakable spurge inflorescence;

Using the new key

The new key is in two parts - a "Main key for Wiltshire umbellifers" (pages 21 and 22) and a "Supplementary key for rare Wiltshire species" (pages 23 and 24).

The main key is a dichotomous key. It consists of a series of numbered choices, each requiring the user to choose which of two alternatives (a or b) applies to the plant under consideration. Each choice either identifies the plant or refers the user to a new numbered choice point. The procedure is simply to begin at Choice 1 and continue until the plant is identified. It is wise to confirm the identification

against illustrations and descriptions in other works, such as those quoted above.

In some species, because of variation within that species, a plant sometimes fits choice a and sometimes choice b at a particular choice point. For instance, Wild Angelica (*Angelica sylvestris*) at choice point 16 sometimes has bracts absent (16a) and sometimes bracts present (16b). In such cases, there is then a separate route through the rest of the key for each possibility. There are also instances where a distinction can be very difficult to make. For instance, at choice point 7, the forms of the lower leaves in Hogweed (*Heracleum sphondylium*) and Burnet Saxifrage (*Pimpinella saxifraga*) sometimes create difficulties for deciding whether they are once-pinnate or twice-pinnate. Again, in such instances, both choices lead to routes through the key.

It is possible that, where alternative routes exist for a species, they will sometimes recombine later in the key, which may occasionally mean having to make the same distinction twice, which could be disconcerting but for this warning. For instance, at choice point 16, Upright Hedge Parsley (*Torilis japonica*) can sometimes fit one choice (bracts absent) and sometimes the other (bracts present). For "bracts absent" plants, a decision has to be made about the arrangement of the bracteoles at choice point 17. "Bracts present" plants miss this because they go by another route. The two routes recombine at choice point 26, when the same decision has to be made a second time for "bracts absent" plants, because it needs to be made for the first time for "bracts present" plants.

There may also be instances where, for reasons not anticipated, it seems impossible to choose between the alternatives at a particular choice point. It may be because all possible variations in a plant have not been taken into account. It may even be because the plant is poorly developed or damaged. If, for instance, the lowest leaves have withered away during a drought or been bitten off by animals, the distinction required at choice point 7 as to whether they are once-pinnate or twice-pinnate cannot be made. Where this problem occurs, it is best to follow through the key each alternative in turn and see which one works out most convincingly.

The above "trouble-shooting" points have to be made, but it is hoped that they will rarely crop up in practice. The key has been designed to work.

If an identification made with the key does not correspond with descriptions or illustrations elsewhere, it may well be that the plant under

investigation is one of the rarer ones not included in the key. When using the key with such a plant, a point will be reached at which it is misidentified as some plant in the main key. Capital letters are found at these points. They refer the user to points in the supplementary key for rarer species. In this supplementary key, each capital letter is followed by the characteristics which distinguish each rare species at the corresponding main key endpoint from the main key plant there. This is followed where relevant by notes on distinguishing the different rare species at that endpoint from each other. Users with no time pressures may wish to check all the rarer possibilities when a capital letter is encountered.

Warnings

It is hoped that the key is accurate, but a word of warning is called for. The enterprise revealed a rather surprising mistake in the descriptions of Cow Parsley (*Anthriscus sylvestris*) by both Stace and Tutin. The outermost flowers of each simple umbel in this species are larger than the inner, a condition called "radiating" by Tutin, who, however, says it does not occur in this species. Stace says the flowers are "actinomorphic" (radially symmetrical), whereas radiating flowers are "zygomorphic" (bilaterally symmetrical), which amounts to the same error. That the petals radiate is shown quite clearly in the drawings of Hutchinson (1955) and Ross-Craig (1958), as well as by photographs of my own (eg. Figure 3). Furthermore, such sources may not always note the full range of variation in a species. For instance, both Stace and Tutin state that the lowest leaves of Stone Parsley (*Sison amomum*) and Corn Parsley (*Petroselinum segetum*) are simply pinnate, yet I have seen plants of both species in which some of the leaflets have some distinct "subleaflets". While these examples of misleading information in my main sources have been spotted and allowed for in the key, one must wonder what other errors lurk undetected

within the same pages.

It is also probable that I have made errors myself, or have not tried out the key sufficiently in practice. It has certainly not been tried out as much as I would have liked. It is hoped that users will let me know of any difficulties or any lack of clarity, so that any further work needed on the key can be carried out.

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Main key for Wiltshire umbellifers

- 1a.** Petals distinctly yellow
Wild Parsnip (*Pastinaca sativa*) **A**
- 1b.** Petals white, yellowish white, pink or purplish (beware stylopodium, whose colour may confuse) **2**
- 2a.** All leaves undivided and circular in outline
Marsh Pennywort (*Hydrocotyle vulgaris*)
- 2b.** Lowest leaves divided at least into lobes **3**
- 3a.** Enormous plant with 50 or more rays in the compound umbel and leaves very large with very broad divisions
Giant Hogweed (*Heracleum mantegazzianum*)
- 3b.** Compound umbel with fewer than 50 rays, or, if 50 or more, leaves with many small oval or irregularly oval divisions **4**
- 4a.** Plant of still or running water with submerged leaves with narrow and hair-like divisions and, when flowering, aerial leaves with irregularly oval divisions
River Water-dropwort (*Oenanthe fluviatilis*) **B**
- 4b.** Plant of still water or terrestrial, which may have submerged leaves with narrow and hair-like divisions, or aerial leaves with irregularly oval divisions, but not both **5**
- 5a.** Lowest leaves once or more palmate or palmately lobed (if apparently pinnate, a careful look shows a division into 3 stalked lobes, each lobe being subdivided into 2 or 3 broadly oval leaflets) **6**
- 5b.** Lowest leaves distinctly once or more pinnate or pinnately lobed **7**
- 6a.** Lowest leaves with lobes radiating from a central point but joined at the base
Sanicle (*Sanicula europaea*)
- 6b.** Lower leaves with 3 stalked lobes radiating from a central point and usually further divided into 2 or 3
Ground Elder (*Aegopodium podagraria*) **C**
- 7a.** Lowest leaves once-pinnate or distinctly once-pinnately lobed (though the lobes sometimes have incomplete further division and sometimes each of the lowest pair of leaflets has just one distinct pair of "subleaflets" at the base) **8**
- 7b.** Lowest leaves clearly at least twice-pinnate (except sometimes near the tip); or, if once-pinnate, a water plant with 4 or fewer compound umbel rays which are shorter than the peduncle **16**
- 8a.** No bracts or bracteoles
Burnet Saxifrage (*Pimpinella saxifraga*) **D**
- 8b.** Bracts or bracteoles present **9**
- 9a.** Bracts almost all with 3 divisions or Pinnately lobed
Lesser Water-parsnip (*Berula erecta*) **E**
- 9b.** Bracts almost all simple or absent **10**
- 10a.** Plant terrestrial and at least one compound umbel ray markedly shorter than the others on most umbels (half or less the length of the longest ray in the same umbel in at least some umbels); flowers too small for their individual parts to be distinguished with the naked eye **11**
- 10b.** Plant growing in water or soil which is waterlogged long-term; or compound umbel rays all the same length or nearly so (no ray as little as half the length of another in the same umbel in mature umbels), or both; in most cases, individual parts of the flowers distinguishable with the naked eye **12**
- 11a.** Anthers purple
Corn Parsley (*Petroselinum segetum*)
- 11b.** Anthers white
Stone parsley (*Sison amomum*)
- 12a.** Compound umbel peduncle shorter than rays or absent
Fool's Water-cress (*Apium nodiflorum*)
- 12b.** Compound umbel peduncle equal to or longer than rays
13
- 13a.** Compound umbel with 2-6 rays **14**
- 13b.** Compound umbel with 7 or more rays **15**
- 14a.** Bracts absent
Tubular Water-dropwort (*Oenanthe fistulosa*) **F**
- 14b.** Bracts present
Stone Parsley (*Sison amomum*) **F**
- 15a.** Terrestrial plant; with hairs on at least some parts
Hogweed (*Heracleum sphondylium*) **G**
- 15b.** Plant of water or very wet ground; hairless
Lesser Water-parsnip (*Berula erecta*) **H**
- 16a.** Bracts absent **17**
- 16b.** Bracts present on at least some compound umbels **26**
- 17a.** Bracteoles of each marginal simple umbel usually 3-4, on outer side of flower only, at least some of them very long, thread-like and drooping
Fool's Parsley (*Aethusa cynapium*)
- 17b.** Bracteoles of each marginal simple umbel absent, or with none or only some of the characteristics in 17a **18**

- 18a.** Within the great majority of the fully open outermost flowers of compound umbel, the longest outermost petal much longer than the shortest innermost (in at least some flowers, nearly twice as long or more) **19**
- 18b.** Within the great majority of the fully open outermost flowers of compound umbel, the longest outermost petal not or only slightly longer than the shortest innermost (not even nearly twice as long) **21**
- 19a.** Compound umbel rays 2-4; plant hairless
Tubular Water-dropwort (*Oenanthe fistulosa*) **I**
- 19b.** Compound umbel rays 10 or more and/or at least some parts of plant hairy **20**
- 20a.** Leaves with broad divisions, not at all fern-like; outermost petals of compound umbel divided into two long lobes
Hogweed (*Heracleum sphondylium*)
- 20b.** Leaves with narrow divisions, fern-like in appearance; outermost petals of compound umbel notched but not divided into two long lobes
Cow Parsley (*Anthriscus sylvestris*) **J**
- 21a.** Compound umbel rays 15 or more **22**
- 21b.** Compound umbel rays 14 or fewer **25**
- 22a.** Ultimate leaf divisions broadly oval with only small teeth (whole leaf looking like an Ash leaf)
Wild Angelica (*Angelica sylvestris*) **K**
- 22b.** Ultimate leaf divisions long and narrow or deeply toothed (whole leaf looking nothing like an Ash leaf) **23**
- 23a.** Bracteoles absent
Burnet Saxifrage (*Pimpinella saxifraga*) **L**
- 23b.** Bracteoles present **24**
- 24a.** Plant hairy or bristly
Rough Chervil (*Chaerophyllum temulum*) **M**
- 24b.** Plant hairless
Pepper Saxifrage (*Silaum silaus*) **N**
- 25a.** Bracteoles absent
Burnet Saxifrage (*Pimpinella saxifraga*) **O**
- 25b.** Bracteoles present **26**
- 26a.** Bracteoles of each marginal simple umbel 3-6, on outer side of flower only in most umbels **27**
- 26b.** Bracteoles of marginal simple umbels not restricted to outer side or, if so, fewer than 3 **28**
- 27a.** At least lower part of stem purple spotted
Hemlock (*Conium maculatum*)
- 27b.** Stem not purple spotted
Fool's Parsley (*Aethusa cynapium*)
- 28a.** Most bracts with 3 divisions or **pinnately** lobed **29**
Most bracts simple, or bracts absent **30**
- 29a.** Plant hairless **Hemlock** **Water-dropwort**
(*Oenanthe crocata*) **P**
- 29b.** Plant hairy **Wild Carrot** (*Daucus carota*)
- 30a.** Ultimate leaf divisions broadly oval with only small and regular teeth (whole leaf looking like an Ash leaf)
Wild Angelica (*Angelica sylvestris*) **K**
- 30b.** Ultimate leaf divisions very narrow, or narrowly oval and deeply toothed, or broad with irregular shape, lobes or teeth (whole leaf looking nothing like an Ash leaf) **31**
- 31a.** Plant hairless **32**
- 31b.** Plant hairy or bristly **35**
- 32a.** Ultimate leaf divisions (the smallest that are still fully separate) no more than twice as long as broad
Hemlock Water-dropwort (*Oenanthe crocata*) **Q**
- 32b.** Ultimate leaf divisions much more than twice as long as broad, at least on upper leaves **33**
- 33a.** Within each of the outermost flowers of compound umbel, the longest outermost petal much longer than the shortest innermost (in some flowers, twice or more as long); or plant growing in water or permanently wet soil; or both
Corky-fruited Water-dropwort (*Oenanthe pimpinelloides*) **R**
- 33b.** Within each of the outermost flowers of compound umbel, the longest outermost petal not or only slightly longer than the shortest innermost (never as much as twice as long) ; plant terrestrial **34**
- 34a.** Petals pure white; ultimate segments of upper leaves hairlike
Pignut (*Conopodium majus*) **S**
- 34b.** Petals yellowish white; ultimate leaf segments long and narrow but not hairlike
Pepper Saxifrage (*Silaum silaus*) **T**
- 35a.** Leaves with broad divisions, not at all fern-like; outermost petals divided into two lobes whose free parts are much longer than broad
Hogweed (*Heracleum sphondylium*)
- 35b.** Leaves with narrow divisions, fern-like in appearance; outermost petals not lobed or with lobes whose free parts are not longer than broad **36**
- 36a.** Stem spotted, blotched or entirely purple, at least in lower half; fruits without spines; petals pure white
Rough Chervil (*Chaerophyllum temulum*) **U**
- 36b.** Stem normally green until fruits form; then fruits rough with spines; at least some petals pinkish or purplish white
Upright Hedge-parsley (*Torilis japonica*) **V**

Supplementary key for rare Wiltshire species

A Fennel (*Foeniculum vulgare*) has very fine hair-like leaf divisions (rather than broad).

B Lesser Marshwort (*Apium inundatum*) grows in still water or mud (rather than running water) and the compound umbel has 4 or fewer rays (rather than 5 or more).

C Alexanders (*Smyrnium olusatrum*) has flowers which appear yellow (rather than white) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull).

D Great Burnet Saxifrage (*Pimpinella major*) has the stem distinctly ridged or angled (rather than smooth and round or only weakly ridged).

Wild Celery (*Apium graveolens*) has the stem strongly grooved (rather than smooth and round or only weakly grooved) and the compound umbel peduncle shorter than the rays (rather than longer). The shorter compound umbel peduncle also distinguishes it from **Great Burnet Saxifrage**.

E Bullwort (*Ammi majus*) is terrestrial (rather than aquatic) and the bracteoles have papery edges (rather than green throughout).

F Parsley Water-dropwort (*Oenanthe lachenalii*) grows in water or permanently wet soil and has all rays in a compound umbel more or less the same length (rather than terrestrially and one ray markedly smaller than the others in the same compound umbel like **Stone Parsley**); and has compound umbels with 5 or more rays (rather than 2-4 like **Tubular Water-dropwort**). **Spreading Hedge-Parsley** (*Torilis arvensis*) is hairy (rather than hairless like all the other species here).

G Great Burnet Saxifrage (*Pimpinella major*) has no bracteoles (as opposed to usually some) and, within the outermost flowers of the compound umbel, all petals more or less the same length (rather than the outermost petal twice or more as long as the inner in some of these flowers).

H Parsley Water-dropwort (*Oenanthe lachenalii*) has its leaf divisions long, narrow and more or less parallel sided (rather than broad and deeply toothed).

I Shepherd's Needle (*Scandix pecten-veneris*) is terrestrial (rather than aquatic) and the upper leaves are twice-pinnate (rather than once). It soon develops long needle-like fruits which are different from those of any other British umbellifer.

Fine-leaved Water-dropwort (*Oenanthe aquatica*) has upper leaves twice-pinnate (rather than once) and almost always more than 4 compound umbel rays (rather than 2-4). The latter also distinguishes it from **Shepherd's Needle**, whose distinctive fruits also separate the two.

J Fine-leaved Water-dropwort (*Oenanthe aquatica*) is aquatic (rather than terrestrial) and hairless (rather than hairy).

K Great Burnet Saxifrage (*Pimpinella major*) has the broad base of the leaf stalk narrowing gradually into the upper part (rather than a very broad base contacting suddenly into a very much narrower upper part).

Alexanders (*Smyrnium olusatrum*) has flowers which appear yellow (rather than white, pink or purplish) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull), characteristics which also distinguish it from **Great Burnet Saxifrage**.

L Caraway (*Carum carvi*) has leaves hairless (rather than at least some of them hairy).

Alexanders (*Smyrnium olusatrum*) has flowers which appear yellow (rather than white) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull), characteristics which also distinguish it from **Caraway**.

M Golden Chervil (*Chaerophyllum aureum*) has a smooth stem (rather than rough).

N Fine-leaved Water-dropwort (*Oenanthe aquatica*) is aquatic (rather than terrestrial) and its petals are white (rather than yellowish white).

Caraway (*Carum carvi*) has fewer than 5 bracteoles (rather than 5 or more) and its petals are white (rather than yellowish white). It is distinguished from **Fine-leaved Water-dropwort** by being terrestrial (rather than aquatic) and having the compound umbel peduncle longer than the rays (rather than shorter).

Alexanders (*Smyrnium olusatrum*) has flowers which appear yellow (rather than white) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull), characteristics which also distinguish it from **Fine-leaved Water-dropwort and Caraway**.

O Caraway (*Carum carvi*) has the uppermost leaves with the broad leaf stalk shorter than the rest of the leaf (rather than longer).

Alexanders (*Smyrniolum olusatrum*) has flowers which appear yellow (rather than white) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull), characteristics which also distinguish it from **Caraway**.

P Bullwort (*Ammi majus*) has no sepals (rather than very small sepals just below the petals); and grows terrestrially (rather than in water or permanently wet soil).

Q Bur Chervil (*Anthriscus caucalis*) has the compound umbel peduncle shorter than the rays (rather than longer), 3-6 compound umbel rays (rather than 7-40) and 4-5 bracteoles (rather than 6 or more).

Alexanders (*Smyrniolum olusatrum*) has flowers which appear yellow (rather than white) from the colour of the stylopodium, even though the petals are yellowish white, and glossy leaves (rather than dull), characteristics which also distinguish it from **Bur Chervil**.

Fine-leaved Water-dropwort (*Oenanthe aquatica*) has leaves with a delicate tracery of tiny divisions (rather than with broad, large, separated divisions). It differs from both **Bur Chervil** and **Alexanders** by growing in water or permanently wet soil (rather than terrestrially).

R Fine-leaved Water-dropwort (*Oenanthe aquatica*) has 4-8 bracteoles (rather than 12-20).

S Bur Chervil (*Anthriscus caucalis*) has the divisions of all its leaves irregularly oval (rather than those of the upper leaves narrow and hair-like).

Fine-leaved Water-dropwort (*Oenanthe aquatica*) is aquatic (rather than terrestrial) and has the compound umbel peduncle shorter than the rays (rather than longer) and tiny sepals beneath the petals (rather than no sepals). The latter characteristic also distinguishes it from **Bur Chervil**, as does its aquatic (rather than terrestrial) habitat.

Parsley Water-dropwort (*Oenanthe lachenalii*) has tiny sepals beneath the petals (rather than no sepals), which also distinguishes it from **Bur Chervil**. It is distinguished from **Fine-leaved Water-dropwort** by having the compound umbel peduncle longer than the rays (rather than usually shorter).

Caraway (*Carum cam*) has the rays in a compound umbel markedly unequal in length (rather than more or less the same length), which also distinguishes it from the other species here.

T Fine-leaved Water-dropwort (*Oenanthe aquatica*) is aquatic (rather than terrestrial) and has white (rather than yellowish white) petals.

Bur Chervil (*Anthriscus caucalis*) has the leaf divisions irregularly oval (rather than long and narrow with no indentations) and the compound umbel peduncle shorter than the rays (rather than longer). It is distinguished from **Fine-leaved Water-dropwort** by having the undersides of its leaves hairy (rather than hairless).

U Bur Chervil (*Anthriscus caucalis*) has the compound umbel peduncle shorter than the rays (rather than longer); and the fruits are spiny (rather than spineless).

Spreading Hedge-parsley (*Torilis arvensis*) has tiny pointed sepals beneath the petals (rather than none); and the fruits are spiny (rather than spineless). The sepals also distinguish it from **Bur Chervil**, which has none.

Golden Chervil (*Chaerophyllum aureum*) has a smooth stem (rather than rough). It is distinguished from **Bur Chervil** and **Spreading Hedge-parsley** by having 12-25 compound umbel rays (rather than 3-6).

V Spreading Hedge-parsley (*Torilis arvensis*) has fewer than 4 bracts (rather than 4 or more).

Bur Chervil (*Anthriscus caucalis*) has the compound umbel peduncle shorter than the rays (rather than longer). This also usually distinguishes it from **Spreading Hedge-parsley**, but the absence of sepals (as opposed to small pointed sepals) is more reliable.

Golden Chervil (*Chaerophyllum aureum*) has 0-3 bracts (rather than 4 or more). It is distinguished from **Spreading Hedge-parsley** and **Bur Chervil** by having 12-25 compound umbel rays (rather than 3-6).

Knotted Hedge-parsley (*Torilis nodosa*) has the flowers in each compound umbel in a dense cluster at the base of a leaf stalk, with the compound umbel peduncle and rays virtually invisible (rather than normal compound umbel with obvious peduncle and rays), which also distinguishes it from all the other rare species here.

WILTSHIRE RIVER CHANNEL FLORA IN THE 1990s

Jack Oliver

Introduction

Members of WBS were involved in recording river and stream flora in Wiltshire between 1992 and 1996, with the aim of providing a baseline for this habitat against which future changes could be monitored. This could help the process of managing waterways in ways that are consistent with conservation. The recording differentiated between riversides and the river channels. The channels were defined as those parts of the river, winterbourne, stream or ditch below the average winter water levels. Above the channels, the riversides included marshy edges, fringes, and the sloping (or sometimes vertical) parts of the banks. A previous paper (Oliver 1997) described the work and its results for the riverside species, and also identified some changes which had occurred since earlier surveys were published. The current paper presents a similar account and analysis in relation to the river channels.

Outline of study

The 20 WBS volunteers surveyed 129 sites. The forms used required four seasonal reassessments, to ensure that plants obvious only at certain times of year were not overlooked. Details of site selection are dealt with fully in the earlier paper and a map provided showing where they were. Locations on most of the Wiltshire rivers were studied, except for the Wylye and two tributaries of the Thames, the Ray and the Cole. The Kennet, Ebbles, Till, main Bristol Avon, Sherston and Tetbury Avons, and Marden were more generously surveyed than the others.

A river channel site was linear, and at least 50m long. Quite often extra 50m stretches were surveyed at the same site, comprising extra subsites. A 100m site would therefore constitute 2 subsites. Subsites were usually contiguous, but not always so at confluences or complex sites such as those with parallel channels. In all, 201 channel subsites were surveyed.

Three types of site were categorised by size of the river as follows:

- locations on rivers more than 10 metres across; mainly River Thames, Bristol Avon, Salisbury Avon, lower Kennet and River Nadder near Uxford (46 sites, 79 river channel subsites);
- rivers and streams less than 10m across, but flowing throughout the year (63 sites, 89 river channel subsites);
- winterbournes and channels only flowing for a quarter to half of the year (20 sites, 33 river channel subsites).

For each and every species, quantitative estimates were made at each site and subsite. Grose's (1957) scoring system was used - at each site, each plant species was given a score according to whether it was abundant (10), frequent (6), occasional (3), or simply present (1). All the scores for each plant were totalled to give an overall frequency score for each of the three categories of sites, and for all sites combined. Young trees and other woody perennials growing in the river channel were not included, because they are regularly removed as part of flood control precautions.

To assist in the analysis of the results, several "habitat-types" of plant, classified by the situations in which they usually occur, were identified, based on guidelines provided by Spencer-Jones and Wade (1986) and Preston and Croft (1997). Some plants are adapted to survive as only one of these habitat-types, while others can occur as two or more, depending on the conditions. At each site or subsite, a note was made of the habitat-type assumed by each species. The main habitat-types were:

- Submerged aquatics, such as filamentous algae, stoneworts, Nuttall's Waterweed, some water crowfoots, etc.
- Floating aquatics, such as duckweeds, water-lilies, Blanket Weed, some pondweeds, etc;
- Emergent aquatics, growing from the water, such as reeds, Common Club-rush, Watercress, Branched Bur-reed, water forget-me-nots, etc;
- Terrestrial plants invading channel edges from the banks, or on mud, during falling water levels, or most commonly in winterbournes and upper reaches. For some of the data analysis, this habitat-type is divided into two, which are:
 - Plants characteristic of wet or marshy soil, here found at river channel margins, such as Great Willow-herb, some sedge species, Comfrey, etc;
 - Fully terrestrial plants, mostly agricultural and wayside weeds or common plants favouring damp places, such as Lesser Celandine.

Additional habitat-types used in some of the analyses are:

- Species which are normally floating or submerged, but can persist on wet mud;
- Terrestrial climbers or scramblers invading or even crossing the river channels on reeds or other emergent species.

There are some limitations in the methodology. Firstly, for submerged plants, regular recording relied at each subsite mainly upon what could be seen from the surface, rather than systematic underwater sampling, and this prevented accurate recording for some members of this group. Secondly, the recorders did not have the knowledge, experience or access to sources needed for accurate recording of algae, even the more visible filamentous green algae from the genera *Cladophora*, *Enteromorpha*, *Vaucheria*, *Spirogyra*, *Mougeotia* and *Zygnema* most of which can aggregate in surface masses popularly called "Blanket Weed", nor for other difficult or lesser known groups such as stoneworts (*Chara* species), and aquatic liverworts and mosses.

Results: I. Overview

The records included 190 species or 200 taxa (including hybrids and subspecies). The relative proportions and relative abundances of the five habitat-types of plant indicated above are shown in Table 1 on the next page.

It will be noted that about half the species were plants which are normally fully terrestrial, but that about half of the total scores measuring abundance were taken by aquatic emergents. Even so, fully terrestrial plants accounted for about a quarter of channel vegetation, while the submerged and floating plants, ie. those most fully adapted to aquatic life, excluding of course the Algae, were relatively less common, especially upstream. Algae could be abundant, however, in slow-flow or stagnant upper reaches.

The more detailed results are presented in Results sections II to VIII below. Section II provides an analysis of the data for the 40 species with the highest frequency of occurrence for all types of site combined. Sections III to VII go into more detail for each of the five main plant habitat-types identified, extending coverage to species outside the top 40 and including informal observations made during the course of the study. Section VIII deals briefly with species and plant groups characteristic of chemically over-enriched sites.

Results:II. The commonest river channel plants

The top 40 vascular plant species, those found in the greatest quantities in the river channels, are listed in order of overall frequency scores in Table 2 on the next page but one.

Table 2 provides, in its six columns, the following information:

- Column 1 - the name of the species.
- Column 2 - its habitat-type, i.e., whether it occurs as:
 - E - an emergent aquatic;
 - F - a floating aquatic;
 - S - a submerged species, growing under the water surface;
 - M - a commonly floating or submerged species, but capable of persisting on wet mud;
 - T - a common terrestrial species (including both fully terrestrial and wet soil and marsh species), but here invading the river channel;
 - C - a terrestrial climber or scrambler invading or **even** crossing the river channels on reeds or other emergent aquatics.

Bracketed symbols indicate unusual, uncommon or exceptional habitat-types, for instance the wiry green turf of Stream Water-crowfoot on midstream mudbanks as water levels fall; or the dwarf underwater form of Fool's Water-cress previously described only for Wiltshire.

- Column 3 - provides for each species, three numbers separated by dots. These show, for sites classified as upper winterbournes or having 6 months without flow, in the order of occurrence (from left to right):
 - the overall frequency score of the species;
 - the number of subsites at which it was recorded;
 - the number of sites at which it was recorded.

- Column 4 - provides the same kinds of information as Column 3 for streams or rivers less than 10m across.
- Column 5 - provides the same kinds of information as Column 3 for rivers more than 10m across.
- Column 6 - provides the same kinds of information as Column 3 for all categories of site combined.

The results showed that, in the top 40, there were only two commonly found obligate submerged aquatic species, though 7 more species had alternative underwater forms. There were 5 species which are primarily floating aquatics, and 4 which have floating and terrestrial forms, and 2 with both floating and submerged forms. There were 20 species occurring usually or always as the emergent habitat-type. Twelve species were primarily terrestrial, but capable of invading the river channels, especially upstream and in farming areas.

The most abundant submerged aquatic, at 2nd place overall, was Stream Water-crowfoot (*Ranunculus penicillatus* ssp *pseudofluitans*). It was largely confined to flowing water, though occasionally recorded on adjacent wet mud as a shorter, rigid turf. The only other true submerged aquatic in the table was the Nuttall's Waterweed (*Elodea nuttallii*), seriously under-recorded both in this study and previously, at 37th, which favoured continuously inundated and deeper flow sites. Also sometimes occurring as the submerged habitat-type were Common Water-starwort (*Callitriche stagnalis*) at

Table 1: Habitat-types in the river channels: 200 taxa (190 species)

HABITAT TYPE	CODES ON TABLES 2, 3 & 4	% OF ALL CHANNEL TAXA (200)	% OF QUANTITIES
Terrestrial species, mostly common and widespread, including agricultural and garden weeds	T C	51	23
Plants of wet soil and marsh	T	16	4
Emergent aquatic species	E	18	48
Floating aquatics	F	9	18
Submerged aquatics	S	6	7
All		100	100

Table 2: Data for the 40 commonest river channel plants

1 SPECIES	2 HABITAT TYPE(S)	3 UPPER WINTER- BOURNES OR 6-9 MONTHS WITH- OUT FLOW [330.33.20]	4 STREAMS OR RIVERS (less than 10m across) [890.89.63]	5 SITES AT LARGER RIVERS (more than 10m across) [790.79.46]	6 TOTALS, ALL SITES [2010.201.129]
Phalaris arundinacea	E(T)	126.16.12	241.42.42	238.49.36	605.107.90
Ranunculus penicillatus ssp. pseudofluitans	(F)S(M)	0.0.0	254.44.27	277.48.28	531.93.55
Rorippa nasturtium-aquaticum (including R. x sterilis)	E	19.9.6	276.51.43	229.41.27	524.101.76
Callitriche stagnalis	FS(M)	17.6.4	160.33.24	311.52.30	488.91.58
Glyceria maxima	E	1.1.1	130.22.22	272.40.31	403.63.54
Apium nodiflorum	E(S)	45.11.6	206.47.36	151.33.21	402.91.63
Epilobium hirsutum	ET	71.17.13	122.36.36	208.52.44	401.105.93
Urtica. dioica	T	237.30.20	113.27.27	50.24.24	400.81.71
Mentha aquatica	E(T)	21.6.5	177.42.38	164.36.23	362.84.66
Agrostis stolonifera	F(S)T	119.23.16	128.28.28	102.36.35	349.87.79
Myosotis scorpioides	E	4.1.1	141.38.38	200.44.29	345.83.68
Poa trivialis	(E)S)T	164.27.18	71.16.16	54.19.19	289.62.53
Lemna minor	F(M)	8.3.2	127.32.24	151.50.32	286.85.58
Solanum dulcamara	ETC	91.24.17	62.25.25	110.43.35	263.92.77
Sparganium erectum	E	0.0.0	103.27.20	130.35.21	233.62.41
Veronica beccabunga	E	3.2.2	73.26.24	157.33.21	233.61.47
Rumex obtusifolius	(E)T	102.20.17	75.24.24	29.18.18	206.62.59
Veronica anagallis-aquatica (including V. x lackschewitzii)	E	22.9.7	103.34.41	80.19.11	205.62.49
Oenanthe crocata	E	2.1.1	108.23.23	77.29.29	187.53.53
Galium aparine	TC	140.24.18	17.9.9	8.6.6	165.39.33

(continued)

Table 2 continued

1 SPECIES	2 HABITAT TYPE(S)	3 UPPER WINTER- BOURNES OR 6-9 MONTHS WITH- OUT FLOW [330.33.20]	4 STREAMS OR RIVERS (less than 10m across) [890.89.63]	5 SITES AT LARGER RIVERS (more than 10m across) [790.79.46]	6 TOTALS, ALL SITES [2010.201.129]
Glyceria notata	F(T)	34.9.6	120.26.15	4.3.3	158.38.24
Schoenoplectus lacustris	E(F)(S)	0.0.0	13.4.3	138.22.17	151.26.20
Nuphar lutea	FS	0.0.0	27.5.4	110.17.12	137.22.16
Lemna minuta	F(M)	0.0.0	20.4.4	110.32.19	130.36.23
Calystegia sepium	TC	90.17.16	20.5.5	10.5.5	120.27.26
Ranunculus repens	T	44.13.13	60.21.21	9.6.6	113.40.40
Carex riparia	E(T)	0.0.0	14.5.5	99.16.14	113.21.19
Persicaria amphibia	FT	46.10.6	50.13.13	16.12.12	112.35.31
Phragmites australis	E	0.0.0	30.7.7	82.14.11	112.21.18
Iris pseudacorus	E	0.0.0	59.12.12	48.19.17	107.31.29
Ranunculus peltatus	FS(M)	1.1.1	96.16.13	10.5.3	107.22.17
Typha latifolia	E	11.2.2	49.8.8	43.6.6	103.16.16
Rumex conglomeratus (including R. x ruhmeri)	T	33.9.7	49.20.20	12.8.8	94.37.35
Glyceria fluitans	F(T)	8.3.2	80.20.15	4.4.4	92.27.21
Arrhenatherum elatius	T	74.11.11	10.5.5	3.1.1	87.17.17
Elytrigia repens	T	63.17.17	16.6.6	1.1.1	80.24.24
Elodea nuttallii	S	0.0.0	9.2.2	69.17.14	78.19.16
Carex acutiformis	E(T)	0.0.0	0.0.0	72.17.6	72.17.6
Ranunculus ficaria	T	59.18.13	6.2.2	4.4.4	69.24.19
Lolium perenne	T	30.10.10	34.8.8	5.3.3	69.21.21

4th, Fool's Water-cress (*Apium nodiflorum*) at 6th, Creeping Bent (*Agrostis stolonifera*) at 10th, Rough Meadow-grass (*Poa trivialis*) at 12th, Common Club-rush or Bulrush (*Schoenoplectus lacustris*) at 22nd, Yellow Water-lily (*Nuphar lutea*) at 23rd and Pond Water-crowfoot (*Ranunculus peltatus*) at 31st.

Of the 5 species which are primarily floating aquatics, the two most common were Common Water-starwort (*Callitriche stagnalis*) at 4th and Common Duckweed (*Lemna minor*) at 13th. Both were widely distributed, from the uppermost reaches to the widest and faster-flow stretches downstream, although favouring continuous slow-flow sites. They also persisted in algal stagnant stretches or pools, on damp mud, or even in overgrown ditches, with strong competition from invading agricultural weeds. By contrast, Yellow Waterlily (*Nuphar lutea*) at 23rd was confined to continuously inundated deeper flow sites, while Plicate Sweet-grass (*Glyceria notata*) at 21st favoured slow streams and slow narrower rivers. The 4 species occurring both as floating and terrestrial habitat-types were Creeping Bent (*Agrostis stolonifera*), at 10th common throughout, and three which were less common in larger rivers - Amphibious Bistort (*Persicaria amphibia*) at 28th, Plicate Sweet-grass (*Glyceria notata*) at 21st and and Flote-grass or Floating Sweet-grass (*Glyceria fluitans*) at 34th. Pond Water-crowfoot (*Ranunculus peltatus*) at 31st was nearly always found with floating and submerged leaves together, but Stream Water-crowfoot (*Ranunculus penicillatus ssp pseudofluitans*) at 2nd had only the submerged capillary leaves, but these usually floated up to just below the surface, even in fast flows.

Of the 20 species occurring as emergent aquatics, there were 17 for which it is their most typical form. The most common was Reed Canary-grass (*Phalaris arundinacea*), the river channel plant found in greatest overall abundance throughout Wiltshire, also recorded at most subsites. It occurred upstream and downstream, in stagnant pools or high-flow stretches, in fairly deep water, anoxic mud or sun-dried winterbournes, in open stretches or in tangles of Cleavers and Bellbine. Also common in most types of site were Water-cress (*Rorippa nasturtium-aquaticum*), Fool's Water-cress (*Apium nodiflorum*) and Great Willow-herb (*Epilobium hirsutum*), the 3rd, 6th and 7th most common plants in river channels generally. By comparison, most of the remaining emergents were less adaptable, seldom, for instance, being found upstream (Column 3). These were Reed Sweet-grass (*Glyceria maxima*) at 5th, Water Mint (*Mentha aquatica*) at 9th, Water Forget-me-not (*Myosotis scorpioides*) at 11th, Branched Bur-reed (*Sparganium erectum*) at 15th, Brooklime (*Veronica beccabunga*) at 16th, Water Speedwell (*Veronica anagallis-*

aquatica) at 18th, Hemlock Water-dropwort (*Oenanthe crocata*) at 19th, Common Club-rush or Bulrush (*Schoenoplectus lacustris*) at 22nd, Common Reed (*Phragmites communis*) at 29th, Yellow Flag (*Iris pseudacorus*) at 30th, Great Reedmace or Bulrush (*Typha latifolia*) at 32nd and the two aquatic sedges Greater Pond-sedge (*Carex riparia*) at 27th and Lesser Pond-sedge (*Carex acutiformis*) at 38th.

The remaining "emergents" were plants which are normally terrestrial but sometimes assume the emergent habitat-type. They were Rough Meadow-grass (*Poa trivialis*) and Bittersweet (*Solanum dulcamara*), both common at all river levels, and Broad-leaved Dock (*Rumex obtusifolius*), which favoured low flow sites and winterbournes through farmland.

Of the 12 terrestrial invaders, the most common was the Common Stinging-nettle (*Urtica dioica*) at 8th, followed by Creeping Bent (*Agrostis stolonifera*) at 10th, Rough Meadow grass (*Poa trivialis*) at 12th, Bittersweet (*Solanum dulcamara*) at 14th and Broad-leaved Dock (*Rumex obtusifolius*) at 17th. There are 3 more farmland grass species in the top 40 - False Oat-grass (*Arrhenatherum elatius*) at 35th, Common Couch (*Elytrigia repens*) at 36th and Perennial Rye-grass (*Lolium perenne*) 40th, mostly confined to winterbournes or upstream farmland sites and well illustrating the ability of fully terrestrial plants to colonise channels at any point where they dry out, but then to survive short-lived inundations. There is also another dock - Clustered Dock (*Rumex conglomeratus*) at 33rd, Creeping Buttercup (*Ranunculus repens*) at 26th and Lesser Celandine (*Ranunculus ficaria*) at 39th, all also preferring upstream and low flow sites. Finally, there are 2 more climbers/scramblers - Cleavers (*Galium aparine*) at 20th and Greater Bindweed (*Calystegia sepium*) at 25th, both again favouring upstream and low flow sites. These invaders, particularly the tall and/or vigorous agricultural weeds, scramblers and grasses, now invade the channels from the banks at every opportunity, providing strong competition for the long-accustomed fringing and emergent chalk-stream species.

Results: III. Submerged aquatics

Table 3 on the next page lists, in order of overall frequency scores, data for those plants most completely adapted to aquatic existence, excluding algae and submerged forms of floating aquatics. These excluded species, and others which may also have submerged forms, are noted in Tables 2 and 4 or in the text. Numbers for *Elodeas* may not be completely accurate, since *E. nuttallii* was probably sometimes mistakenly recorded as *E. canadensis*.

Systematic recording for this group relied mainly upon what could be seen from the surface, rather than regular underwater sampling, and Table 3 reflects this bias. It may be part of the reason why Stream Water-crowfoot (*Ranunculus penicillatus ssp pseudofluitans*) was recorded almost twice as often as the remaining 12 together, since its stems and filiform leaves float up to just under the surface and its flowers are conspicuously above it.

For similar reasons, a number of the other species recorded are probably much more frequent than the data show. Nuttall's Waterweed (*Elodea nuttallii*), for instance, was noticed in vast quantities in material caught on willow branches after raised flood water levels and in material dredged and dumped on banks, both at several sites where it had never previously been recorded. These observations raise the probability that further unrecorded quantities of Horned Pondweed (*Zannichellia palustris*), Rigid Hornwort (*Ceratophyllum demersum*), Water-milfoil

(*Myriophyllum spicatum*) and submerged pondweeds (*Potamogeton perfoliatus*, *P. pectinatus* and *P. crispus*) may also lurk unknown beneath the surface. Furthermore, some submerged species are missing altogether: for instance, since the study Small Pondweed (*Potamogeton berchtoldii*) has been found to occur in some tributaries of the Salisbury Avon.

Other submerged plants were unrecorded or under-recorded because of lack of the necessary expertise to detect and identify them. This may be the case, for instance, with Willow Moss (*Fontinalis antipyretica*), which was the only conspicuous underwater aquatic in some parts of the Rivers Kennet and Till. Three liverworts (*Pellia sp*, *Conocephalum sp* and *Marchantia sp*) were observed in quantity on channel stonework in urban stretches. There was only one mention of a stonewort (*Chara sp*). Filamentous algae formed extensive tufts from stones or were seen as epiphytes streaming from the underwater parts of emergent aquatics.

Table 3: Data for submerged aquatic plants

SPECIES	HABITAT TYPE(S)	OVERALL FREQUENCY SCORE	NUMBER OF SUBSITES	NUMBER OF SITES
<i>Ranunculus penicillatus ssp. pseudofluitans</i>	(F)S(M)	531	93	55
<i>Elodea nuttallii</i>	S	78	19	16
<i>Elodea canadensis</i>	S	54	13	13
<i>Fontinalis antipyretica</i>	S	45	7	6
<i>Apium nodiflorum</i> , underwater variant	E(S)	30	6	5
<i>Ranunculus fluitans</i>	S	26	8	4
<i>Zannichellia palustris</i>	S	16	6	5
<i>Myriophyllum spicatum</i>	S	14	7	6
<i>Ceratophyllum demersum</i>	S	9	4	3
<i>Potamogeton perfoliatus</i>	S	3	1	1
<i>Potamogeton pectinatus</i>	S	3	1	1
<i>Potamogeton crispus</i>	S	3	1	1
<i>Lemna trisulca</i>	(F)S	1	1	1
<i>Crassula helmsii</i>	F(S)	1	1	1

The above recording may help explain why submerged aquatics accounted for only 6% of the total species recorded and only 7% of the vegetation (Table 1).

Results: IV. Floating aquatics

Table 4 on the next page shows plants which were floating aquatics or which also commonly occurred as the floating aquatic habitat-type. This table gives the sequence of species according to their occurrence (as far as could be ascertained) as floating plants. The order therefore does not always square with Table 2, since the sequence of species there is strictly according to their overall occurrence (i.e. including terrestrial and/or emergent and/or submerged forms). It should also be noted that, for three species, occurrence as the terrestrial or emergent habitat-types was so common that placement as a floating plant was estimated. Blanketweed also presented problems, in that it could be transient, so that it was not always scored and estimation was again necessary. Stream Water-crowfoot and emergents which had been released by weed-cutting and snagged on obstructions as floating plant masses were not scored, nor included in this table.

Ten of the species included in Table 4 are also in the top 40 plants overall, as shown in Table 2. At the bottom end of Table 4, every one of the 7 species below Arrowhead (*Sagittaria sagittifolia*), a floating aquatic here occurring as the strap-leaved habitat-type, was so infrequently recorded that it was a matter of chance that they were recorded at all.

As shown in Table 1, floating aquatics accounted for only 9% of the species recorded, though representing 18% of the vegetation. Table 4 shows that the most commonly recorded species were Common Water-starwort (*Callitriche stagnalis*), Common Duckweed (*Lemna minor*), Least Duckweed (*Lemna minuta*), sweet-grasses (*Glyceria notata* and *G. fluitans*), Yellow Water-lily (*Nuphar lutea*), Creeping Bent (*Agrostis stolonifera*), Amphibious Bistort (*Persicaria amphibia*) and Pond Water-crowfoot (*Ranunculus peltatus*). During the study, Least Duckweed was mainly found on slow urban stretches of river, and backwaters near homes, perhaps the result of emptying aquaria. It has since become much more widespread and common. Yellow Water-lily was recorded only for deeper waters, but the others all have adaptations for surviving on wet mud, and could therefore persist in the upper reaches. The floating sweet-grasses (*Glyceria notata*, *G. fluitans* and *G. x pedicellata*) account for approaching a quarter of the scores in Table 4, their floating leaves

sometimes creating conspicuous light green parallel patterns on water surfaces when not spoiled by cattle, - horses or sheep, for whom they are the favourite grasses.

Next most commonly recorded is "Blanket Weed". This is not a single plant species, but a mass of whitish, yellowish green or green filaments made up of one or more of a great number of different species of filamentous green algae in various stages of growth and decay. The species are mostly from the genera *Cladophora*, *Enteromorpha*, *Vaucheria*, *Spirogyra*, *Mougeotia* and *Zygnema* (Spencer-Jones and Wade 1986, Canter-Lund and Lund 1996), but it was not possible to identify particular species or even genera with confidence during this survey. Sometimes Blanket Weed occurs as whitish or yellowish green mats buoyed to the surface by bubbles and feeling somewhat gritty, or as darker green slimy skeins. The occurrence of Blanket Weed is unpredictable, as it appears and disappears, depending partly on nitrate and phosphate levels from run-off of fertilisers from agricultural land. The floating intestine-like masses of *Enteromorpha* probably also require salt run-offs from roads.

The other floating aquatics which were recorded in significant numbers included unspecified *Glyceria* species, Water Fern (*Azolla filiculoides*), and three species capable of producing floating, strap-shaped leaves - Common Club-rush or Bulrush (*Schoenoplectus lacustris*), Unbranched Bur-reed (*Sparganium emersum*) and Arrowhead (*Sagittaria sagittifolia*).

Creeping Bent is worth further description, because of two main features of interest. Firstly, though basically a terrestrial plant, its floating stolons invade the water from the fringing vegetation and it can form untidy floating leaf masses. It can reinvade land from the water. In its own ways, it can be just as aquatic as the floating sweet-grasses. Secondly, it was found in all of the three non-marine varieties identified by Sell and Murrell (1996). *Var. calcicola* colonised only marginally as turf from the edges or in winterbournes. *Var. stolonifera* was much more common, as stoloniferous straggles through reeds, nettles and other fringing vegetation, as floating tangles in ditches, streams and slow rivers, as long leafy masses extending from river banks into channels in September, and as inconspicuous brownish straggles anchored in stonework or snagged by emergent plants. *Var. palustris* was seen as stoloniferous straggles, often with brownish algal epiphytes, at the edges of water.

Table 4: Data for floating aquatic plants and other aquatic plants occurring as the floating habitat-type (floating forms with estimated placements in italics)

SPECIES ETC	HABITAT TYPE(S)	OVERALL FREQUENCY SCORE	NUMBER OF SUBSITES	NUMBER OF SITES
Callitriche stagnalis	FSM	488	91	58
Lemna minor	FM	286	85	58
Glyceria notata	F(T)	158	38	24
Nuphar lutea	FS	137	22	16
<i>Agrostis stolonifera, floating forms</i>				
(<i>Agrostis stolonifera</i> , all)	F(S)T	349	87	79
Lemna minuta	FM	130	26	33
Ranunculus peltatus	FSM	107	22	17
<i>Persicaria amphibia floating forms</i>				
(<i>Persicaria amphibia</i> , all)	FT	112	35	21
Glyceria fluitans	F(T)	92	27	21
<i>Filamentous algae, as floating Blanket-weed</i>				
Glyceria x pedicillata	F(T)	57	15	10
Azolla filiculoides	F	38	10	6
<i>Schoenoplectus lacustris, form with floating strap leaves</i>				
(<i>Schoenoplectus lacustris</i> , all)	(F)ES	151	26	20
Sparganium emersum	F(S)	21	8	5
Glyceria, unspecified	F(T)	20	5	5
Sagittaria sagittifolia, form with floating strap leaves	FES	15	4	4
Nymphaea alba	F	6	1	1
Potamogeton natans	FS	6	1	1
Ranunculus aquatilis	FSM	5	2	2
Callitriche obtusangula	FSM	3	2	2
Potamogeton nodosus	FS	3	1	1
Spirodela polyrhiza	F	1	1	1
Oenanthe fluviatilis, as floating fragments	(F)E(S)	1	1	1

Results: V. Emergent aquatics.

As shown in Table 1, emergent aquatics accounted for 18% of the species recorded, but 48% of the vegetation. The most important emergent species are shown in Table 2. The two lists below show, in order of frequency, the less common emergents occurring at between 5 and 40 subsites and those only at 4 or fewer subsites

Emergent species found at between 5 and 40 river channel subsites were:

Water Figwort (*Scrophularia auriculata*) - 38 sub-sites, widespread, but never in quantity (often only one plant per subsite)

Purple Loosestrife (*Lythrum salicaria*) - 15 subsites

Gypsywort (*Lycopus europaeus*) - 14 subsites

Pink Water-speedwell (*Veronica catenata*) - 11 sub-sites

Arrowhead in emergent form (*Sagittaria sagittifolia*) - 6 subsites

Water-plantain (*Alisma plantago-aquatica*) - 5 sub-sites

Emergents found at 4 or fewer river channel subsites were:

Lesser Water-parsnip (*Berula erecta*) Marsh Marigold (*Caltha palustris*) Common Spike-rush (*Eleocharis palustris*) Water Horsetail (*Equisetum fluviatile*) Marsh Horsetail (*Equisetum palustre*) Tufted Forget-me-not (*Myosotis lam*) Water-pepper (*Persicaria hydropiper*) Greater Spearwort (*Ranunculus lingua*) Great Yellow-cress (*Rorippa amphibia*) Marsh Yellow-cress (*Rorippa palustris*) Hybrid Water-cress (*Rorippa x sterilis*) Water Dock (*Rumex hydrolapathum*)

Results: VI. Plants of wet soil

Several of these species merge into the preceding group, while others can survive in marshy or drier sites. Overall, plants of wet soil accounted for 16% of the channel species recorded and 4% of the quantitative estimates. Some species, like Great Willow-herb (*Epilobium hirsutum*) are listed in Table 2. Further plants of wet soil are noted in the two lists below. Some might seem surprisingly infrequent here, but were recorded more commonly as riverside species (Oliver 1997).

Wet-soil/marsh species found at between 5 and 40 river channel sites were:

Marsh Foxtail (*Alopecurus geniculatus*) - 15 subsites

Comfrey (*Symphytum officinale*) - 15 subsites

Butterbur (*Petasites hybridus*) - 13 subsites

Hard Rush (*Juncus inflexus*) - 7 subsites

Hoary Willow-herb (*Epilobium parviflorum*) - 6 sub-sites

Marsh Woundwort (*Stachys sylvatica*) - 5 subsites

Wet-soil/marsh species found at fewer than 5 river channel sites were:

Wild Angelica (*Angelica sylvestris*) Nodding

Bur-marigold (*Bidens cernua*) Trifid Bur-

marigold (*Bidens tripartita*) Wavy Bitter-

cress (*Cardamine flexuosa*) Cuckooflower

(*Cardamine pratensis*) Greater Tussock-

sedge (*Carex paniculata*) Whorl-grass

(*Catabrosa aquatica*) Marsh Thistle (*Cirsium palustre*)

Fen Bedstraw (*Galium uliginosum*)

Marsh Cudweed (*Gnaphalium uliginosum*)

Indian Balsam (*Impatiens glandulifera*)

Sharp-flowered Rush (*Juncus acutiflorus*)

Jointed Rush (*Juncus articulatus*) Toad Rush

(*Juncus bufonius*)

Soft Rush (*Juncus effusus*)

Yellow Loosestrife (*Lysimachia vulgaris*)

Monkeyflower (*Mimulus guttatus*) Blood-

drop-emlets (*Mimulus luteus*) Water

Chickweed (*Myosoton aquaticum*)

Results: VII. Terrestrial invaders

Overall, these fully terrestrial plants accounted for 51% of the species recorded and 23% of the total quantitative scores. Owing to the large number of common weedy species, only those invading at 5 to 40 subsites are listed below. In addition to species already listed in Table 2, there were:

Wood Dock (*Rumex sanguineus*) - 26 subsites Curled

Dock (*Rumex crispus*) - 16 subsites Annual Meadow-

grass (*Poa annua*) - 16 subsites Creeping Thistle

(*Cirsium arvense*) - 15 subsites Yorkshire Fog (*Holcus*

lanatus) - 14 subsites Barren Brome (*Anisantha sterilis*) -

14 subsites Bramble (*Rubus fruticosus* agg - quite

commonly *R. ulmifolius*) - 13 subsites

Spear Thistle (*Cirsium vulgare*) - 12 subsites Prickly

Sow-thistle (*Sonchus asper*) - 12 subsites Redshank

(*Persicaria maculosa*) - 12 subsites Ground Ivy

(*Glechoma hederata*) - 12 subsites Cow Parsley

(*Anthriscus sylvestris*) - 10 subsites Spear-leaved Orache

(*Atriplex prostrata*) - 9 subsites Hogweed (*Heracleum*

sphondylium) - 8 subsites Meadow Foxtail (*Alopecurus*

pratensis) - 7 subsites White Deadnettle (*Lamium*

album) - 7 subsites Common Orache (*Atriplex patula*) - 6

subsites Dandelion (*Taraxacum officinale* agg) - 6

subsites Hybrid Common Dock (*Rumex x pratensis*) - 5

sub-sites

Knotgrass (*Polygonum aviculare*) - 5 subsites

Redcurrant (*Ribes rubrum*) - 5 subsites

Ivy (*Hedera helix*) - 5 subsites

Smooth Sow-thistle (*Sonchus oleraceus*) - 5 subsites

Timothy (*Phleum pratense*) - 5 subsites

Most of these species were most common in drying-out upper reaches, but could also invade channel edges of larger rivers.

Various strategies are used by these terrestrial invaders. The ever-present Common Stinging-nettle will not tolerate continuous immersion of the roots for more than a month without yellowing and ceasing growth, but thrives on intermittent inundation. Ditches, streams and winterbournes and the edges of channels of larger rivers are invaded from the fringes by profuse seeding, stolons, rhizomes and cattle-poached chopped fragments in clods of earth. Vertical growth is very rapid in late spring and summer, rhizome growth in summer and autumn, and horizontal stolon growth, once established, continues in all seasons, including winter. Bittersweet and Broad-leaved Dock were regularly seen as healthy emergents, often seeding whilst in water. Cleavers never rooted from the water, but as one of the most abundant annual riverbank plants (especially in farming areas) it crossed ditches and winterbourne channels in summer, or festooned reeds and other emergent plants to cover broader channels of slow-moving water. Seedlings could be abundant on summer or autumn channel mud and on the banks in winter and spring. Rough Meadow-grass seeds profusely and the seeds seem to germinate within days, whether in shaded or open sites. Growth rate is fast, continuing in winter, and as an underwater turf in winterbournes and at river edges. Unlike other grass species, the flowering and fruiting panicles of Rough Meadow-grass thrived under slow or fast-running water (flexing with the current) to seed successfully when water levels fell, easily out-competing the flote-grasses in all situations except open marshy areas with slow-moving water.

Results: VII. Indications of overenrichment

There were long periods of very low rainfall in the period of the study, the years 1992-6. Low river flows meant that any chemical run-offs from agriculture or other sources such as the roads were relatively concentrated. These chemicals can function as nutrients for wild plants. Study of the data from Grime et al (1988), Hanf (1983), Preston and Croft (1997) and Sikula and Stolfa (1978) shows that the 40 species in Table 2 can be thought of as on a continuum of preference for different degrees of enrichment of the environment by nutrients. On this continuum they range from "preferring highly enriched (or eutrophic) conditions", through

"preferring somewhat enriched (or somewhat eutrophic) conditions," then through "preferring moderately enriched (or mesotrophic) conditions", to "tolerant of a wide range of conditions which include nutrient deficient (or oligotrophic)". While the same species can vary in its position on the continuum, a rough classification into the four categories is possible, and this is shown in Table 5 on the next page. This shows that 29 of the 40 species are characteristic of enriched (13 species) or highly enriched (16) environments. Eight more species usually prefer moderate enrichment, and 3 have very variable tolerance. Note that some species in the first three categories can occasionally grow in conditions more usually associated with plants in the last category. These are placed in brackets in Table 5. All 12 of the terrestrial invaders (see Results II) were farmland weed or grass species characteristic of environments with high nitrate and phosphate levels.

"Pea soup surrounded by nettles" was a characteristic description by recorders of some summer or autumn sections of rivers, where there were concentrations of filamentous algae or microscopic algal blooms in agricultural areas. Four miles of the salt and nutrient dependent alga *Enteromorpha* persisted for several weeks in the Upper Kennet during a very dry spring, following winter road-saltings. (Compare Gregory 1998).

Discussion

Over half of the 62 plant species in the Tables 2, 3 and 4 are typical of river channel flora of the lowland rivers, especially chalk streams. Mantle and Mantle (1992) and Grose (1957) treat many of these plants as characteristic of chalk winterbourne and perennial streams - Stream and Pond Water-crowfoots, Fool's Water-cress, water-starworts, Water Forget-me-not, water speedwells, bur-reeds and Willow Moss. All feature in the top halves of the three tables

The main differences between the current study and the species lists for watery and riverside habitats produced by Grose (1957) in his Flora of Wiltshire are as follows:

- The top ranking of Reed Canary-grass, and high rankings of 11 grass and agricultural weed species headed by the Common Stinging-nettle (*Urtica dioica*) in Table 2.
- The high ranking of sweet-grasses (*Glyceria spp*), aquatic and semi-aquatic forms of Creeping Bent (*Agrostis stolonifera* vars *stolonifera* and *palustris*) and an alien duckweed (*Lemna minuta*) in Table 4.
- The high ranking of a new alien waterweed (*Elodea nuttallii*) in Table 3.

- The large variety **of** terrestrial weed species within the river channels in comparison with aquatic and wet soil species (Tables 1 and 2, and see text and species lists).
- The low frequency of occurrence **of** some traditional aquatic groups, such as the pondweeds (*Potamogeton spp*) in Table 4.

Mantle includes a photo captioned "A chalk stream in trouble (River Kennet at East Kennett, Wiltshire) showing a channel filled with arable weeds". This invasion of Wiltshire river channels and banks (Oliver 1997) by terrestrial grasses and agricultural weeds

since the quantitative estimates of Grose (1957) may be due to some or a combination of the following:

- Reduced flows creating water-free channel edges downstream and dry channels upstream (ARK 1992, Fowler 1992, Giles et al 1991, Mantle and Mantle 1992, NRA 1992, BBC 1997).
- Intensive farming and sewage pollution causing enrichment with nitrates and phosphates (Fowler 1992, Mantle and Mantle 1992) or other pollutants, including salt run-offs from roads.
- Increased drainage and ditching causing immediate and rapid run-offs of rainwater, rather

Table 5: Nutrient preferences of the 40 most common river channel species

PREFERRING HIGHLY ENRICHED CONDITIONS	PREFERRING SOMEWHAT ENRICHED CONDITIONS	PREFERRING MODERATELY ENRICHED CONDITIONS	TOLERANT OF WIDE RANGE OF CONDITIONS
Calystegia sepium	Agrostis stolonifera	Carex acutiformis	(Agrostis stolonifera)
Elodea nuttallii	Apium nodiflorum	Carex riparia	(Callitriche stagnalis)
Elytrigia repens	Arrhenatherum elatius	Iris pseudacorus	(Lemna minor)
Galium aparine	Callitriche stagnalis	Mentha aquatica	(Lemna minuta)
Glyceria maxima	Epilobium hirsutum	Myosotis scorpioides	(Phalaris arundinacea)
Glyceria notata	Glyceria fluitans	Phalaris arundinacea	(Oenanthe crocata)
Lemna minor	Nuphar lutea	Ranunculus ficaria	(Poa trivialis)
Lemna minuta	Oenanthe crocata	Ranunculus penicillatus ssp. pseudofluitans	Ranunculus peltatus
Lolium perenne	Persicaria amphibia		Rumex conglomeratus
Phragmites australis	Rorippa nasturtium-aquaticum		Schoenoplectus lacustris
Poa trivialis	Sparganium erectum		
Ranunculus repens	Veronica anagallis-aquatica		
Rumex obtusifolius	Veronica beccabunga		
Solanum dulcamara			
Typha latifolia			
Urtica dioica			

than *buffers of* spongy marsh, or water meadows which hold winter and spring rainfall into the summer (Mantle and Mantle 1992).

- Farming right up to the banks reducing the aquatic and wet soil flora to a thin, constricted ribbon of water, rather than a broad and varied complex of marsh, mud, islets, riffles, pools and deeper water flows.

However, the first two of these factors tend to be temporary in relation to downstream water quality, unless water abstractions are too severe. The permanent loss of marshy buffers and broad zones flanking streams (i.e. the last two factors), in favour of drainage, ditching, fencing, hedging and farming very close to the edges of waterways, however, seem to be of long-term importance in reducing the numbers and variety of wet soil, emergent and aquatic plant species and encouraging terrestrial weeds.

The rapid spread of aquatic aliens is another major finding in this study. Such aliens can show remarkable fluctuation in their numbers. Thus, Canadian Waterweed colonised Wiltshire rivers rapidly to pest proportions, then declined (Grose 1957, Gillam, Green and Hutchison 1993). Least Duckweed more recently carpeted the Kennet and Avon Canal for miles, then disappeared suddenly, with colonies then appearing in some of the rivers. Even more substantial has been the recent invasion of Nuttall's Waterweed into the Thames, Bristol Avon, and Kennet and Avon Canal. The reasons for these fluctuations are not clear. There is little or no evidence relating them to changes in nutrients in the water. The fact that the three species do not reproduce sexually in this country, the *Elodeas* propagating by elongating shoots and turions and *Lemna minuta* by budding, may be relevant, since it reduces the genetic variability that helps a plant population to adapt to changes in the environment. This could make a population seriously at risk from disease. Duckweeds, for instance, are susceptible to fungal and other infections, especially in relation to temperature and crowding of fronds (Rejmankova et al 1986). Interdependent and possibly symbiotic relationships with other aquatic organisms, particularly protozoa and algae, may also affect whether a population thrives or recovers, however patchily, from declines associated with known or suspected aquatic pathogens (Landolt 1986, Oliver 1993, 1996).

Conclusions

Increased land drainage, ditching, reduced marshy fringes and fewer water meadows, nutrient enrichment and diminished flow of rivers may all have contributed to changes in the river and winterbourne channel flora over the past 40-50 years. Many river channel and fringing species are of comparable

frequencies to those reported by Grose in the 1950s. However, some other native groups of wet soil and aquatic plants now appear to have only a toehold, whereas agricultural weeds and grasses have invaded the river channels in quantity and variety. Furthermore, two new alien aquatic species have established themselves in Wiltshire rivers in the 1990s.

The invasion of river channels by terrestrial species can be seen as an extension of their invasion of river banks at the expense of traditionally water-loving plants (Oliver 1997). This too was attributed to a range of agricultural practices discussed in more detail in that earlier paper. Farming right up to the edges may be the single most important factor in reducing aquatic, emergent and wet soil plant species to narrow ribbons, rather than broader and more varied river corridors. The answer seems to lie in cherishing or protecting some remaining riverside wetland habitats - a process already in operation, but needing to be pursued with vigour.

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PLANT RECORDS 1996

Explanatory notes

- The following is a selection from the records made by members of Wiltshire Botanical Society in 1996. Records of common species and updates of 1993 Wiltshire Flora are not included unless there is some special reason. Unconfirmed records have been omitted.
- An asterisk indicates that the species is not native.
- Recorders are identified by initials as follows:

BG — Beatrice Gillam
BL — Barbara Last
DA — David Allen
DG — Dave Green
JG — J. Grigson
JLP — John Presland
JN — Joy Newton
JEO — Jack Oliver
JTa — Jo Taylor
JW — Jean Wall
MH — Malcolm Hardstaff
MP — Maureen Ponting
MS — Malcolm Storey
PA — Peter Andrews
PD — Paul Darby
RG — Rita Grose
RMV — Roger Veall
SG — Sarah Grinsted

Vc 7 records

Carex binervis - PD/SG/JW, Upper Seagry, Seagry Wood; Kington St Michael, Heywood, 1st and 2nd recent vc records

Centaureum pulchellum - JG, Somerford Common, on ride, 1st recent vc record

Chrysanthemum segetum * - JEO, West of Marlborough, Clatford Junction south of A4

Coronopus didymus * - JEO, West of Marlborough, Clatford Junction south of A4

Crocus tommasinianus * - JLP, Winsley, two clumps by roadside, 1st vc and county record

Epipactis helleborine JN, approx 1000 plants in small wood

Erigeron acer - JLP, Hullavington, one plant in disused railway yard

Galeopsis bifida - JEO, West of Marlborough, Clatford Junction south of A4

Hedera helix ssp hibernica - MP, Savernake forest, Bedwyn Common near St Katherines

Hyoscyamus niger - JLP, near Winsley, one plant in barnyard

Impatiens parviflora * - PD/JTa, Wroughton, Salthrop Wood, 2nd vc record

Juniperus communis - DG, Oare Hill/Martinsell Hill, up to 100 elderly bushes, extension of known population

Lithospermum officinale - JLP, Hullavington, one plant in disused railway yard, new 10km record

Lysimachia punctata * - JEO, West of Marlborough, Clatford Junction south of A4

Melissa officinalis * - JLP, Winsley, one plant on roadside

Oenothera cambrica - JEO, West of Marlborough, Clatford Junction south of A4

Oxalis corniculata * - JEO, West of Marlborough, Clatford Junction south of A4; pavements in Mantons, Marlborough, and Lockeridge

Papaver argemone - PA, West Down, between Beckhampton and Cherhill, new 10km record

Phacelia tanacetifolia * - JEO and JN, between Cherhill and Yatesbury, set-aside field edge strip, increasingly planted as a crop

Platanthera chlorantha - JN, Aldbourne, 16 flowering plants and many non-flowering plants in small wood

Potentilla x mixta - JN, Somerford Common, new 10km record

Prunus cerasus * - JEO, Clatford, extensive suckering, many plants

Ranunculus arvensis - JN, near Witcha Farm, NE of Ramsbury, 1 plant in wild part of cottage garden, nationally scarce plant, 1st recent vc record

Rorippa sylvestris - JEO, Lockeridge, pavements, paths and cracks in road surfacing; Clatford, compacted rubble

Rosa multiflora * - JEO, Clatford, artificial bank of earth, probably bird sown

Rosa rubiginosa - JN, Swindon, Coate Water, 1st recent vc record

Rosa sherardii - PD, Luckington, 1 bush in hedge, new 10km record

Rubus ulmifolius - JEO, South of Lockeridge, common; Clatford, abundant

Rubus armeniacus - JEO, South of Lockeridge

Rubus bloxamii - JEO, South of Lockeridge

Schoenoplectus tabernaemontani - PD, North of Swindon, Haydon, in pond; DG, Swindon, Gorse Hill, urban flood lagoon, both are new records for this 10km square

Solidago gigantea * - JEO, West of Marlborough, Clatford Junction south of A4

Sorbaria sorbifolia * - JEO, Lockeridge, garden escape, hedgerow suckers

Thlaspi arvense - JEO, Lockeridge, field side; JEO, Clatford, fieldside; JEO and JN, between Cherhill and Yatesbury, set-aside field edge strip

Tilia cordata - DG, Savernake, 2 huge trees on Marie Louise track, 1st native record for this 10km square; DG, Ashton Keyes, Cotswold Water Park, adjacent to Clattinger Farm, new 10km record

Valerianella locusta - JEO, Lockeridge, garden wall base, roadside; East Kennett, garden wall base, roadside near school, new 10km records

Vicia bithynica - PA, Swindon, Okus, in hedgerow, 1st county record of this nationally scarce species

Vc 8 records

Agrimonia procera - JEO and WBS members at meeting 3.8.96, SE of Salisbury, SE of Earldom's Lodge

Aphanes inexpectata - RMV, West of Damerham, northern part of Kingland Copse; Martin Wood, on sandy track, new record for vc 8 part of 10km square

Asplenium adiantum-nigrum - RMV, Bowerchalke Church

Atropa belladonna - RMV, Porton, Tower Hill Plantation, in mixed woodland

Barbarea intermedia * - RMV, Lopshill, edges of pastures, new 10km records

Carex divulsa ssp leersii - RMV and JEO, East of Redlynch, East Copse, 1st record for County

Carex humilis - RMV, North of Damerham, Toyd Down, on chalk bank, new record for vc 8 part of 10km square

Carex pallescens - RMV, West of Damerham, northern part of Kingland Copse, new record for vc 8 part of 10km square

Carex panicea - RMV, North of Lopshill Farm, damp grassland, new record for vc 8 part of 10km square

Carex pilulifera - RMV, North west of Damerham, Bouldsbury Down, edge of mixed woodland, new record for vc 8 part of 10km square

Centaurium pulchellum - BL, Stockton, Stoney Hill, on a trackway, 1st vc record for about 30 years

Chrysosplenium oppositifolium - RMV, North of Lopshill Farm, wet ground near stream, new 10km record for vc 8

Colchicum autumnale - JEO and WBS meeting, Stourhead

Cornus sericea - JEO and WBS meeting, Stourhead, extensive spread by suckering

Coronopus didymus * - RMV, North of Damerham, roadside verge, new 10km record for vc 8

Cuscuta epithymum - BG, SPTA, West Down, 2 groups of plants in short calcareous grassland on ancient ditch bank

Heracleum mantegazzianum * - JEO, Urchfont Manor, edges of woods, new 10km record

Hieracium maculatum * - JEO, West of Ludgershall, Windmill Hill Down, beechwood, new 10km record

Hieracium trichocaulon - JEO and MS, WBS meeting 3.8.96, SE of Salisbury, SE of Earldom's Lodge, 2nd vc record

Hyacinthoides hispanica * - JEO, Urchfont Manor, within and outside grounds, blue, white and pink forms

Hyacinthoides non-scripta x hispanica (*H. hispanica* is non-native, but hybrid arises naturally) - JEO, Urchfont Manor. *H. hispanica* crossing with *H. non-scripta* from Oakfrith wood, also backcrossing to create intermediates

Hypericum humifusum - RMV, West of Damerham, northern part of Kingland Copse, new record for vc 8 part of 10km square

Hypericum maculatum - RMV, North of Darnerham, verge of bridleway; also on footpath north of Knoll Farm, new 10km records for vc 8

Hypericum pulchrum - RMV, West of Damerham, northern part of Kingland Copse, new record for vc 8 part of 10km square

Isatis tinctoria * - JEO, Urchfont Manor, introduced for dying course 12 years ago and now regenerating vigorously over 0.5 acre, 1st county record

Juniperus communis - RMV, Compton Chamberlayne, Compton Down, on edge of chalk pit

Kickxia elatine - RMV, North of Damerham, arable field

Laburnum anagyroides * - RMV, South of Whitsbury, roadside bank in woodland, not obviously planted

Luzula forsteri - RMV, Bousbury Wood, west of Damerham; Whitsbury, Radnall Wood; northern part of Kingland Copse; new record for vc 8 part of 10km squares 10km (SU01 and SU11)

Luzula sylvatica - RMV, Bousbury Wood, west of Damerham, in mixed woodland and edge of conifer wood, new record for vc 8 part of 10km

Lysimachia vulgaris - RMV, South of Tidpit, pond near Allen River, new 10km record for vc 8

Melampyrum pratense ssp commutatum - RMV, Whitsbury common, roadside verge, new vc record

Montia fontana ssp minor - RMV, Lopshill, damp turf east side of stile on footpath, also frequent north and west of Lopshill Farm, new 10km records for vc 8 (previous record in 1985 was unconfirmed)

Myosotis discolor - RMV, Lopshill, between hedge and muddy hollow (pond)

Oxalis stricta * - RMV, Whitsbury churchyard, 3rd county record

Pedicularis sylvatica - RMV, Lopshill Common and Farm, damp grassland, new 10km records

Poa angustifolia - RMV, Lower Daggons, neutral grassland on roadside bank; north of Damerham, roadside at crossroads of Knoll Farm

Populus nigra - New 10km records from Bratton, Westbury and South Wraxall. Now over 500 trees identified in Wiltshire

Prunus padus * - RMV, North of Damerham, entrance of road to Knoll Farm, planted, new 10km record for vc 8

Pseudotsuga menziesii * - JEO and WBS meeting, Stourhead, seedlings

Ranunculus flammula - RMV, North of Lopshill, damp ground, new 10km record for vc 8

Ranunculus hederaceus - RMV, North of Lopshill, damp turf, east side of stile on footpath, 1st recent vc record

Ranunculus omiophyllus - RMV, Lopshill Farm, muddy hollow (pond), new 10km record for vc8

Rosa stylosa - RMV, Pepperbox Hill, 1st recent vc record

Rosa micrantha - RMV, Pepperbox Hill, new 10km record

Rosa tomentosa - JEO and MS, WBS meeting 3.8.96, SE of Salisbury, SE of Earldom's Lodge, 1st record for vc8

Rubus cardiophyllus - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; East of Redlynch, East Copse; Tichbourne Farm locality, conf. DA

Rubus armeniacus - WBS meeting 3.8.96, Tichbourne Farm locality, conf. DA

Rubus rossensis - WBS meeting 3.8.96, Tichbourne Farm locality, conf. DA

Rubus subinermoides - WBS meeting 3.8.96, Tichbourne Farm locality; East of Redlynch, East Copse, . cont. DA

Rubus subinermoides x ulmifolius - WBS meeting 3.8.96, Tichbourne Farm locality, conf. DA

Rubus moylei - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge, conf. DA

Rubus diversus - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge, conf. DA

Rubus leightonii - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; Tichbourne Farm locality, conf. DA

Rubus tuberculatus - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; Tichbourne Farm locality, conf. DA

Rubus ulmifolius - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; East of Redlynch, East Copse, conf. DA

Rubus bloxamii - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; Tichbourne Farm locality, conf. DA

Rubus rubritinetus - WBS meeting 3.8.96, East of Redlynch, East Copse, conf. DA

Rubus flexuosus - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge, conf. DA

Rubus leucostachys - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge, conf. DA

Rubus mucronatiformis - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge; Tichbourne Farm locality, conf. DA

Rubus leucandriformis - WBS meeting 3.8.96, East of Redlynch, East Copse, conf. DA

Rubus asperidens - WBS meeting 3.8.96; SE of Salisbury, Earldom's Lodge, conf DA

Saponaria officinalis * - JLP, Trowbridge, two patches in car park

Senecio sylvaticus - RMV, West of Damerham, northern part of Kingland Copse, new 10km record for vc 8

Sinapis alba * - RMV, South of Damerham, Hyde Farm, beside track, new 10km record for vc 8
Sison amomum - RG, Woodborough, Hurst Lane, a clump growing in road verge near ditch, new 10km record, conf. JO

Spergula arvensis - RMV, Lopshill, damp turf, east side of stile on footpath

Spergularia rubra - RMV, North west of Damerham, Blagdon Hill Wood, on track,

Symphytum x uplandicum * - RMV, West of Damerham, roadside verge, new record for vc 8 part of 10km square

Thalictrum flavum - RMV, South of Tidpit, near Allen River, new record for vc 8 part of 10km square

Tilia platyphyllos * - RMV, North of Damerham,

Avenue up to Knoll Farm, planted but suckering, new 10km record for vc

Tsuga heterophylla * - JEO and WBS meeting, Stourhead, saplings

Vaccinium myrtillus - RMV, North west of Damerham, Martin Wood, on sandy edge of conifer plantation, new 10km record for vc 8

Veronica austriaca * - JLP, Firsdown, Middle Winterslow, roadside near Thorny Down, 1st vc and county record

Vicia tetrasperma - RMV, West of Damerham, Bouldsbury Wood, in clearance, new 10km record for vc 8

Viscum album - RMV, Homington, beside road on *Malus domestica*; Nunton, in meadow on *Crataegus monogyna*; East Wellow, in and around garden on *Malus domestica*, *Salix x sepulcralis* and *Malus* sp.

Vulpia bromoides - RMV, North west of Damerham, Martin Wood, grassy track, new record for vc 8 part of 10km square