# Biotype

*The Biodiversity & Conservation Newsletter of Woodland Ecology Branch*

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## RESEARCH UPDATE

### The Search for Small Cow-wheat

Alice Broome

While you are out in the woods this summer, please be on the lookout for small cow-wheat (*Melampyrum sylvaticum*). This Nationally Scarce (UK BAP Priority) species is thought to be under-recorded as it can be mistaken for common cow-wheat (*M. pratense*). The key differences are shown in the identification table.

Small cow-wheat is thought to have a restricted distribution in the UK, being confined mainly to upland and central Scotland, but with a few sites in Northern Ireland and the Pennines of England; there are only old records for this species in North Wales.

The plant grows on ledges, grassy hollows and banks in fairly open, deciduous woodland where the humidity remains high. Typically this means slightly enriched ground in wooded ravines and gorges or near lochs where sweet vernal grass, sheep's fescue, wood anemones or pignut grow. It is also a plant of mountains, occurring at up to 600 metres where broadleaved trees are present. The plant is 5-18 cm tall and is in flower between late June and early August.

We are aiming to raise awareness for small cow-wheat among field botanists and land managers/owners, in the hope that more populations will be found. If you do come across what you think might be small cow-wheat, then please get in touch.


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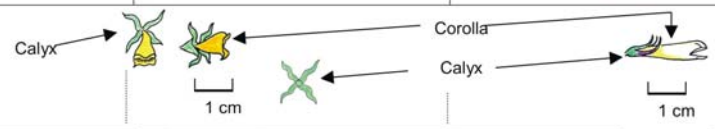
***Melampyrum* identification details** *(Prepared by Paul Gallagher, Scottish Wildlife Trust, February 2003)*

Initially it may appear difficult to isolate small cow-wheat (*Melampyrum sylvaticum*) from the common and very variable common cow-wheat (*Melampyrum pratense*), as the two species sometimes grow together despite differences in habitat preference. With a little experience, it soon becomes very easy to see the difference between them. Although the literature suggests a number of characteristics, those below have been found to be the easiest to work with to date:

| | Small cow-wheat *(Melampyrum sylvaticum)* | Common cow-wheat *(Melampyrum pratense)* |
|---|---|---|
| **The Flower** (corolla) | Almost always an egg yolk shade of yellow, small, short and broad, with an open mouth and drooping (deflexed) lower lip. **Flowers June to August** | Always much longer than it is broad and although the colour varies from almost white, with or without purple/pink spots, to a fairly deep yellow, its length is always considerably greater than its width. **Flowers May to September** |
| |   | |
| **The Calyx** (green structure like that on a tomato surrounding the flower at its base - referred to as bracts with these species in some literature) | Always a fairly bright green, open (spread out and barely touching the flower), star-like and sometimes looking almost fleshy. The lobes are often almost as long as the flower. | Comparatively close to the flower at the base, curving away and upward in a very distinctive manner (a little like an eyelash). |
| **The leaves and stems** | Almost always bright green, with never more than a hint of red, deep pink or purple except late in the year after the flowers have fallen. | Usually a duller green, often with some deep red/pink or purple and sometimes entirely reddish purple. |
| **Size of plant** | Although *Melampyrum sylvaticum* is known as ***small*** cow-wheat, this refers to the flower. The stature of the plant is often about the same as that of *Melampyrum pratense*. | |
| **When gone to seed** | Late in the season some colour begins to show on stem and leaves of small cow-wheat and could lead to some confusion. However the calyx (bracts) remains distinctive with four spreading, wavy, green lobes (rather than the upturned eyelash-like lobes of *M. pratense*). The lobes remain separated from the fruit whereas in *M. pratense* they are appressed to it near the base. | |

# Stock Grazing in Woodland-Part 1

Helen Armstrong & David Bullock

**Summary**
British woodlands have evolved with large herbivores and recent thinking suggests that large, grazing animals may have been able to create woodland with a very open structure. Many, but by no means all, plant and animal species require this type of woodland. When deciding on a suitable stocking regime it is therefore important to set clear management objectives. Low stock grazing is generally good for biodiversity but heavy, or no, grazing is needed for particular species. Trees can regenerate in the presence of grazing animals especially if there are abundant regeneration niches and if there is some 'natural' protection from thorn bushes or dead wood. Our ability to predict the effect of a given stock grazing regime on a particular woodland is very limited. Additional monitoring, research and computer modelling are needed to improve our ability to provide management advice.

**The problem**
Stock animals are capable of having a range of effects on woodlands that are generally seen as deleterious.

- At high densities they can cause damage to field and ground layer plant species and prevent flowering and seeding.
- At even higher densities, for example around feeding points, or where a woodland is used as a holding area rather than to supply forage, the ground can become completely denuded of vegetation.
- Browsing by stock on young trees can completely prevent regeneration and bark stripping of older trees can damage, or kill, them.

For these reasons, the exclusion of stock is often one of the first measures taken by a manager wanting to improve the nature conservation value of a woodland. However, this is not always the best action to take for two reasons:

1. Some species thrive in heavily grazed woodland. An extreme example is the netted carpet moth (Eustroma reticulata), a rare species found, in Britain, only in parts of Cumbria and Wales. The caterpillars of this moth rely on the annual touch-me-not balsam (Impatiens noli-tangere) plant for food. The balsam cannot compete successfully with perennial vegetation and requires ground that has been heavily poached by cattle over winter. Hence conservation of this UK Biodiversity Action Plan Priority Species requires a form of management that would normally be seen as damaging.

2. No grazing at all can be just as damaging to biodiversity as can heavy grazing. With no grazing, tall grasses and shrubs dominate, out-competing smaller herb and bryophyte species and generally leading to a decline in plant diversity. Although some bird and animal species may benefit from this dense shrub layer, many others will not. Invertebrates, in particular, often require a mosaic of open glades and closed woodland in close proximity to each other. This varied and relatively open woodland structure is not provided by either no grazing or heavy grazing but require light to moderate, or temporally variable, grazing levels.

Why is it that many species seem to require this sort of open, and varied, woodland structure? Were these species really confined to small, and temporary, gaps in the woodland or perhaps to exposed areas with high rates of wind throw or to areas of shallow soil where trees could not take root? Or was the intimate mix of habitats that they need actually quite common?

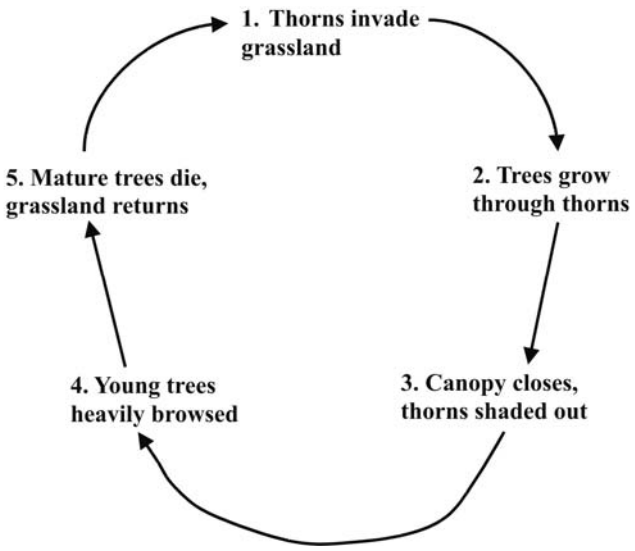
**The history of grazing in British woodlands**
After the last ice age there were six species of grazing mammal present in mainland Britain which had the potential to affect woodland dynamics. These were:

- Aurochs or wild cattle (Bos primigenius).
- Red deer (Cervus elaphus).
- Roe deer (Capreolus capreolus).
- Elk or moose (Alces alces).
- Wild boar (Sus scrofa).
- Beaver (Castor fiber).

Of these, only the red and roe deer remain in Britain today. But what sort of effect did these species have

on the woodlands of the time? This is a very topical question because the Dutch ecologist Frans Vera recently published a book in which he challenged the traditional view that our 'natural' woodlands were largely closed canopy forest in which the only gaps were caused by fallen trees (Vera 2000). His view is that grazing and browsing animals drove woodland dynamics creating mosaics of closed forest and savannah woodland alongside scrubby and open areas, much like the large herbivores of East Africa drive woodland succession today. Vera's vision certainly fits with the habitat preferences of many woodland invertebrates, lichens and birds. But how would it have been achieved? Figure 1 shows the cyclical succession, driven by large herbivores, that woodlands might have gone through before humans started to have a major impact.

**Figure 1.** Schematic diagram of cyclical woodland succession driven by large herbivores (after Vera 2001).




Grasslands were invaded by scrub species such as hawthorn (Crataegus monogyna) and blackthorn (Prunus spinosa) whose thorns protected them, to some extent, from browsing. Protected within the patches of thorn scrub, young trees, especially of light-demanding species such as hazel (Corylus avellana) and oak (Quercus spp.), could regenerate. Jays (Garrulus glandarius) are likely to have had an important role in planting acorns and they preferentially cache acorns in open areas. Over time, the other tree species overtopped the thorns and shaded them out, forming a stand of mature trees with no thorn understorey. The grazing animals could then graze under the canopy preventing further tree regeneration. Eventually the mature stand died allowing enough light to reach the ground for a grass sward to develop once again. Grazing pressure would have been high enough to prevent tree regeneration until the thorn species once again gained a foothold.

There is much debate currently about whether these processes really did occur and, if so, over what spatial and temporal scales. We will probably never know for sure but Vera's ideas raise the possibility that, at least in lowland Britain, open woodlands may have been more common than was supposed. This may help to explain why many of today's woodland species need just this sort of woodland to survive. Vera's theory has also helped us to accept that large herbivores are integral to woodland processes, rather than just management tools to achieve a product.

But what about more recently? How have the species that need open woodlands survived to the present day? Along with Vera's theories has come a better understanding of the way in which our forebears managed woodlands. Increasingly there is evidence that many semi-natural woodlands owe their most valuable characteristics to intensive past management. This included grazing by cattle, and /or sheep, probably often at quite high densities. It might also have included putting pigs into the woodland in autumn to feed on acorns and other mast. As well as providing valuable forage and shelter for the animals, the woods were also harvested for timber. This was often done by coppicing young stems or pollarding older trees. When trees were coppiced, they had to be protected from browsing for at least five years using walls or fences. Coppicing results in quite dense stands of young stems with open areas where the stems have recently been cut. On pollarded trees, the new growth is above the height of grazing stock. Pollarding extends the lives of trees and this practice would

have produced a forest with a low density of open-grown trees, including some veterans, little scrub cover and little, if any, natural tree regeneration. The relative importance of different outputs from the woodland such as firewood, timber, charcoal and livestock would have depended on the needs of the locals and the type of woodland. But, in general, what resulted from much

historical grazing in woodlands was probably quite similar to the open, varied habitats that may have been common in pre-historic times and, in which many of our wood-pasture species evolved.

Latterly, these labour-intensive methods have ceased and woodlands have increasingly been used merely as 'holding yards' for stock. This has led to some of the negative effects discussed above. More recently, however, there has been an increase in interest in managing woodlands for biodiversity. There is a realisation that a lack of grazing can lead to a loss of biodiversity as well as the loss of tree regeneration niches. Interest in using stock as a management tool in woodland is now growing.

**Using stock to manage for biodiversity**

It will usually be impossible to provide a grazing regime that is ideal for all species so the first, and most important, management action is to decide on the objectives for the wood. They might be very general, for example to increase overall biodiversity, or they might relate instead to a particular species or group. Either way, the objectives must be clear and the manager must have some understanding of what sort of woodland conditions are required. Most conservation managers use stock in woodlands either to:

- Open up the woodland.
- Keep the ground flora short and reduce tree regeneration.
- Encourage trees to regenerate by creating regeneration niches.

This will usually require light to moderate grazing levels however there are occasions where a very heavily grazed (see the example above of the netted carpet moth), or an ungrazed woodland is required. Some woodland bat species need a dense understorey that retains humidity, and others require a high biomass of insects. To achieve these, very low, or no, stock grazing may be required.

Once the need for stock grazing has been determined, the next question is usually to choose between sheep and cattle. Aside from practical considerations, the ecological characteristics of the two species need to be considered. Sheep and cattle graze in different ways and both can have their uses. Cattle are thought to generally benefit biodiversity levels more than sheep for several reasons:

- They are less selective grazers than sheep and remove more coarse vegetation, such as purple moor grass (Molinia caerulea) than do sheep.
- Their trampling can also help to break up stands of bracken. This reduction in the cover of dominant plants means that smaller plant species are not out-competed and this can lead to a higher diversity in the sward.
- Cattle, like sheep, browse tree and shrub seedlings and saplings and so reduce densities of regenerating trees and shrubs; however, their hoof prints increase the number of potential tree regeneration niches. Whether cattle reduce or increase the density of regenerating trees at a particular site depends on the stocking rate and season as well as on other environmental conditions. Cattle also make tracks through woodland. It is thought that these are of benefit to woodland grouse chicks, reducing their chances of getting wet from overhanging vegetation. This may be significant for the capercaillie (Tetrao urogallus) for which high spring rainfall has been implicated in low reproductive success.
- They produce copious amounts of dung; a valuable habitat for coprophagous invertebrates and fungi. Their large body size and high intake requirements mean they will not thrive in woodlands with little ground layer vegetation, especially where grasses are scarce. They may also have an effect on local deer populations either encouraging them by increasing the cover of the more nutritious plant species or discouraging them by creating a browse line on the trees which is above the height to which small deer can reach.

Sheep are particularly useful grazers in woodlands on slopes too steep for cattle, where forage availability is low or where it is desirable not to disturb the ground too much. Johnny's Wood in Borrowdale, Cumbria, is nationally important for its rich bryophyte flora. Thomason (1995) found that the bryophyte community does best when grazed in winter by 1 sheep $ha^{-1}$ in open wood and 0.5 sheep $ha^{-1}$ in closed wood. This stops the bryophytes being overgrown and allows some tree regeneration. Johnny's Wood is also good for wood warblers (Phylloscopus sibilatrix) which tend to breed in high canopy woods with little understorey.

The breed of stock needs to be suited to the site conditions (see Tolhurst and Oates 2001 for breed characteristics) but, no matter which breed is used, the individual animals must be pre-adapted to the conditions on the site. Animals cannot switch from good quality forage to poor quality, or vice versa, without being given time to adapt physiologically and behaviourally to both the changed quality, and distribution, of forage and the availability of shelter and water.

Seasonality of grazing, number of animals and the length of time they are in the woodland will all influence the resulting structure and composition of woods. Johnny's Wood is one example where trial and error experimentation resulted in useful recommendations. However, in general, there has been very little research on herbivore impacts on woodlands and it has rarely been possible to predict the outcome in terms of biodiversity features in anything other than a general way. Current advice is often to maintain existing grazing if it seems to be working or to graze 'lightly' then increase the grazing pressure if it doesn't appear to be achieving the desired outcome. However, with so many animal, and site, variables to take into account it can take many years to find the right grazing regime for a particular site. We would stress, however, that the objective might not be to achieve a particular product or pattern by introducing stock grazing. The objective may be to restore woodland processes in which the role of large herbivores is integral.

**References**

Thomason, D. (1995). Grazing in western sessile oakwoods in the Lake District. Biological Journal of the Linnean Society, 56 (Suppl.), 49-51.

Tolhurst, S. & Oates, M. (2001) The breed profiles handbook. Published by English Nature on behalf of the Grazing Animals Project. Peterborough.

Vera, F.W.M. (2000) Grazing ecology and forest history. CABI Publishing, Oxford.

Abstract of a talk given at a Mammal Society Conference on 'Mammals in Woodlands', London, November 2002. Part 2 will appear in the next issue of Biotype. Full conference abstracts will be published by the Forestry Commission in 2003/2004.

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## FRCC Workshop – Woodland Birds in the UK, 23-24 APRIL 2003

Chris Quine

The Forest Research Co-ordinating Committee (see below) promotes linkages amongst funders, and between funders and researchers. Occasional workshops are organised to consider topical subjects. This spring, a workshop was organised to consider the research agenda and funding of research on woodland birds.

A number of recent developments have served to emphasise the importance of woodland birds. For example –

- A decline in many woodland bird species has been observed.
- The inter-relationship between this decline and that of farmland birds has been acknowledged.
- Some woodland bird species are included as priorities within the UKBAP and a number of these are under serious threat, and appear on red and amber lists of Birds of Conservation Concern 2002.
- Past changes in woodland structure and extent have affected bird populations.
- Knowledge is required to develop specific measures that encourage habitat enhancement.
- The Wild Bird Index forms the Wildlife Headline Indicator that government will use, along with 14 others, to measure sustainable development progress.

- A contract 'Long-term changes in the populations of woodland birds' has been let to RSPB/BTO funded by a partnership of DEFRA, EN, FC (England, Wales and GB), Woodland Trust, RSPB, BTO. This study focuses on broadleaved woods and further work may be needed to improve geographic and woodland type coverage.

The objectives for the workshop, which has received financial support from DEFRA and the Forestry Commission, were -

- To briefly summarise recent/existing research work on 'woodland birds' in the UK.
- To stimulate funding consortia to progress a woodland bird research agenda.
- To review and prioritise research needs, incorporating the needs of policy makers and within the context of overall biodiversity research priorities.
- To identify key scientific questions.

The meeting heard introductory talks from -

- Jane Goodwin, DEFRA - the international and national political context for woodland birds.
- Rob Fuller, British Trust for Ornithology - priority areas for research as identified by the Woodland Bird Group and other members of the research community.
- Gordon Patterson, Forestry Commission, - areas for research required to support developments in policy.

The talks were followed by Workshop sessions to develop the research agenda.

Main findings are being summarised and will appear in an FRCC Information Note, and will be mentioned in a future issue of BIOTYPE.

***(FRCC - The Forestry Research Co-ordinating Committee was set up in 1982 to identify and define forestry research needs, to advise on requirements and priorities, to stimulate exchange of information and collaboration between organisations and to encourage the financing of research. http://www.frcc.forestry.gov.uk)***

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# CONFERENCES

## Genetic Conservation and Management of British Native Trees

This joint meeting of the British Ecological Society Forest Ecology Group and Ecological Genetics Group will take place from 4th-5th September, 2003, at the Battleby Conference Centre, near Perth. The programme will include the following:

**Day 1**

- **Molecular Markers and Genetic Management**. R. Ennos, University of Edinburgh.
- **Genetic History of British Native Tree Populations.** C. Ferris, University of Leicester.
- **Creation of Population Inventories for British Native Trees.** S. Wilson, Consultant.
- **Researching Adaptive Variation in British Native Trees**. Forest Research – Tree Improvement Branch.
- **Policies for the Conservation and Utilisation of Forest Genetic Resources**. G. Patterson, Forestry Commission.
- **Conserving Tree Genetic Resources in a Changing World**. B. Johnson, English Nature.
- **Forest Genetic Management in Germany**. J. Kleinschmit.
- **The Nursery and Forester's Perspectives**. R. Shearer, Alba Trees plc & R. Worrell, Consultant.
- **British Irish Hardwood Improvement Programme for Ash**. T. Wilson/ J. Clark, University of Central Lancashire.

**Day 2**

- **Visit to *Betula pendula* provenance trial at FC Craigvinean forest.** Explanation of research work exploring potential adaptive variation in a native tree species of importance for timber production and conservation. Consideration of the genetic conservation and forestry implications of using regionally selected and improved planting stock of native tree species.
- **Visit to superior *Betula pendula* stand near Dunkeld with plus trees.**

- **Visit to *Quercus spp.* stand near Dunkeld with a possibility of past planting.** Discussion of criteria for selection of seed collection areas for native tree species for both timber production and conservation planting objectives. Consideration of issues of genetic composition where seed source trees may be of planted origin. Requirements for effective management of seed collection areas. Seed collection demonstrations if circumstances allow.
- **Visit to superior *Fraxinus excelsior* stands at Loch Tay**.Overview of natural upland ash woodland in gorge. Discussions of European Community research into tree genetic resources and UK participation in the EUFORGEN process. Consideration of issues affecting in-situ genetic conservation of natural tree populations – e.g. fragmentation, genetic isolation and seed collection off-take.

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# PUBLICATIONS

## Reintroduced and Alien Mammals

The proceedings of two one-day conferences have been amalgamated and published by the Peoples Trust for Endangered Species and Mammals Trust UK. The conferences were entitled:

**The Return of the Native – The Reintroduction of Native Species Back into their Natural Habitat (February, 2001)**
Subjects included:

- **Orchid reintroduction.** Grace Prendergast, Sainsbury Orchid Conservation Project, Royal Botanic Gardens, Kew.
- **Reintroducing dormice (*Muscardinus avellanarius*).** Pat Morris, School of Biological Sciences, Royal Holloway, University of London.
- **Should pine martens be reintroduced to England?** Paul Bright, School of Biological Sciences, Royal Holloway, University of London.
- **Herpetological reintroductions.** Tony Gent, Director, The Herpetological Conservation Trust.
- **Dutch government approved reintroductions.** Hans Kampf, Ministry of Agriculture, Nature Management and Fisheries, The Netherlands.
- **Two tales of two kitties: Restoring the wildcat (*Felis sylvestris*) and the lynx (*Lynx lynx*) to Britain.** Andrew Kitchener, Curator of Birds & Mammals, National Museum of Scotland.

**Mamm*aliens* – A One Day Conference on the Problems Caused by Non-Native British Mammals February, 2002)**
Subjects included:

- **Human dimensions of invasive species of alien mammals.** Jeffrey McNeely, Chief Scientist, IUCN – The World Conservation Union.
- **The history of mammalian introductions in the UK.** Derek Yalden, School of Biological Sciences, The Victoria University of Manchester.
- **The edible dormouse (Glis glis) in Britain.** Pat Morris, School of Biological Sciences, Royal Holloway, University of London.
- **Ecological impacts of the alien grey squirrel (Sciurus carolinensis) in Britain.** John Gurnell, Queen Mary, University of London, and Brenda Mayle, Forest Research.
- **American mink and the ethics of extinction.** David MacDonald, Wildlife Conservation Research Unit, University of Oxford.
- **The impact of introduced deer on the natural environment.** Brenda Mayle, Woodland Ecology Branch, Forest Research.
- **Coypus: Successful removal of an introduced rodent from a threatened wetland habitat.** Morris Gosling, School of Biological Sciences, University of Newcastle upon Tyne.
- **Non-native species policy.** Duncan Williams, DEFRA

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