

Ecotype

The Biodiversity and Conservation
Newsletter of Ecology Division

Forest Research 

PROGRAMME GROUP RESEARCH

UPDATE: Conservation & management of species & genetic resources

Grey squirrel damage prediction – interim progress

Mark Ferryman & Brenda Mayle

Background

Grey squirrels frequently cause damage to trees by stripping bark from the main stem and branches. This allows fungal invasion, weakens the stem and if bark is removed from right around the stem, will cause death of the tree above the point of injury.

Vulnerability of trees to damage is dependent on species, age and growth rate, with sycamore, beech, oak, sweet chestnut, pine, larch and Norway spruce being most favoured by squirrels. Usually young trees between 10 and 40 years old are most damaged.

Current management guidance (Mayle *et al*, 2004) is to prevent or limit damage to vulnerable trees by reducing grey squirrel numbers in surrounding woodland prior to and during the damage period (end of April to end of July).

More trees are damaged when squirrel numbers are high and particularly when there are large numbers of juveniles becoming active in the population.



Snapped stem on 33 year old beech caused by grey squirrel damage

Breeding success is dependent on the abundance of the previous autumn tree seed crop as this influences winter mortality and determines if and when breeding starts and how many females produce spring litters.

Damage prediction study

This study is exploring the relationship between grey squirrel populations, winter food availability, spring breeding success and damage in the following summer.

Eleven sites with broadleaf or conifer species of vulnerable age, adjacent to good grey squirrel holding habitat (mature broadleaf woodland e.g. oak and beech), were selected in 2003 in southern and south-west England, and south Wales, with a further 3 sites in northern England selected in 2005. At each site squirrels are trapped in holding habitat in early January each year and natural food availability (seeds on the ground) is assessed. Damage in the vulnerable crops is assessed in September each year.

Similar numbers of squirrels were captured in total over the 11 sites in 2003 and 2004 with none captured in 2005. Natural food collected in January 2005 was twice that collected in 2003 and 30 times that collected in 2004. Damage assessments showed 9% of trees were damaged during 2003 and 7% during 2004 in total over the 11 sites. As winter trappability in January 2005 was poor but natural food availability was high, we expect damage levels to have been high this year. This is supported by the numerous

enquires we have received this summer relating to squirrel damage.

Further analysis of the results will examine the relationships between grey squirrel populations, food availability and damage on a site/species basis. The results can then be used to provide guidance on the interpretation of winter trapping information to identify high, medium or low damage-risk years, and to inform decisions on the intensity and extent of control required to minimise damage. This study will continue for at least one more year in all sites.

The recently revised Forestry Commission Practice Note 4: Controlling Grey Squirrel Damage to Woodlands (Mayle, Pepper & Ferryman, 2004) can be downloaded from the Forest Research website:
www.forestresearch.gov.uk/website/forestresearch.nsf/ByUnique/INFD-69FEY8

Or ordered from:
Forestry Commission Publications
PO Box 25
Wetherby
West Yorkshire
LS23 7EW
Tel: 0870 121 4180
Fax: 0870 121 4181
E-mail: forestry@twoten.press.net

For more information contact:
Brenda Mayle (Programme manager)
Alice Holt
Tel: 01420 526236
E-mail: brenda.mayle@forestry.gsi.gov.uk

Or:
Mark Ferryman (general enquiries)
Alice Holt
Tel: 01420 526164
E-mail: mark.ferryman@forestry.gsi.gov.uk

Or visit:
www.forestresearch.gov.uk/greysquirrels

Molecular genetics of native tree species

Joan Cottrell & Stuart A'Hara

The molecular laboratory at our Northern Research Station (NRS) has recently been involved in two collaborative projects which aim to increase our understanding of geneflow in our native tree species.

The first is the EU project 'Oakflow' in which nine European laboratories are studying an oakwood in their localities. This entails genetic fingerprinting of all the trees in an intensively studied plot (ISP) using at least five microsatellite loci (repeated sequences of DNA useful for defining the relationships both between individuals and populations).

In addition, several hundred acorns collected from mother trees in the ISP have also been fingerprinted. The data will be used to determine the paternity of the acorns using the software computer program 'Famoz'. This will enable pollen dispersal curves to be constructed which will be useful in simulations of the effects of fragmentation of the landscape on geneflow.

The second project is jointly funded by Forest Research/DEFRA and involves a collaboration with East Malling International and NRS. This project involves a detailed study of a wild cherry wood in Kent. Once again all the adult trees in an ISP have been fingerprinted with microsatellites. Seeds collected from these trees have also been analysed. The data are being used to examine the genetic structure of the wood and the degree of clonality (asexual reproduction) which is present. Once again, the data will be analysed using 'Famoz' to determine paternity of seeds for the construction of pollen dispersal curves.

For more information, contact:
Joan Cottrell
Northern Research Station
Tel: 0131 445 6921
E-mail: joan.cottrell@forestry.gsi.gov.uk

Or:
Stuart A'Hara
Northern Research Station
Tel: 0131 445 6919
E-mail: stuart.a'hara@forestry.gsi.gov.uk
Website:
www.forestresearch.gov.uk/website/forestresearch.nsf/ByUnique/INFD-65PBMH

Research in support of the UK Biodiversity Action Plan Priority species - 1: new work in 2005

Alice Broome

Four new projects have been initiated this year on woodland Priority species in collaboration with UK Biodiversity Action Plan (UKBAP) Lead Partners and Steering Groups. These are:

- A survey of small-leaved lime woods in Wales for the rare bark beetle *Ernoporus tiliae*
- The impact of timber extraction on the survival and spread of the pinewood herb, twinflower (*Linnaea borealis*)
- Establishing new populations of small cow-wheat (*Melampyrum sylvaticum*) in Perthshire
- Trials to investigate management beneficial for juniper (*Juniperus communis subsp. communis*) regeneration.

Further details on the juniper and small cow-wheat projects are given below.

Juniper Natural Regeneration Management Trials

Juniper is:

- Shade intolerant
- Thought to need a short sward or bare ground in order to germinate
- Susceptible to browsing/grazing when young.

Work on the propagation and establishment of juniper has already been published in:

- Growing juniper: propagation and establishment practices (Forestry Commission Information Note 50)*
- Upland juniper management (Plantlife leaflet)**

However, research is still needed on natural regeneration of juniper. Forest Research has been working with Plantlife Scotland to establish a number of sites where management thought to encourage the natural regeneration of juniper could be investigated. These include:

- Release from heavy grazing pressure to protect young seedlings

- Light summer grazing by cattle to reduce competing vegetation
- Careful manual or chemical management of competing vegetation in areas where there is little browsing/grazing.

For the trial sites, we looked for juniper populations where managers planned to implement one or more of these practices for a minimum of 5 years.

A number of potential sites have been identified offering the opportunity to study the effects of:

- Summer cattle grazing (2 sites in Perthshire, 1 site in Inverness-shire)
- Scarifying acid grassland (2 sites in Speyside, 1 site in Midlothian).

Monitoring plans have been agreed with landowners/managers and funding partners for five of these sites. These plans describe:

- How the condition of the ground vegetation/seed bed will be assessed
- How juniper regeneration will be surveyed and measured.



Common juniper and juniper berries

To support these observations, germination of locally collected juniper seed, sown at the site, will be monitored. Data from the first year of the trial has been collected, and monitoring is planned to continue for a further 5 years. Further sites are being considered for inclusion in the trial next year.

Small cow-wheat Species Recovery Project

Small cow-wheat is an annual plant of broadleaved, humid ravine woodlands,

where it is a partial parasite on a wide range of plants. Once widespread in Britain and Ireland (over 200 sites) it is now restricted to only 22 sites, 19 of which are in Scotland.

The decline has been attributed to habitat loss. Existing populations of small cow-wheat are mostly small and widely scattered and a recent study has shown there is low genetic diversity within the Scottish populations. The species also has poor dispersal ability, and this means that recovery is

unlikely. The species is therefore vulnerable to further habitat loss and unfavourable climate change.



Small Cow-wheat
© Paul Gallagher, Scottish Wildlife Trust
2005

Forest Research, on behalf of the UKBAP National Steering Group for Small Cow-wheat, has been awarded funding by the Scottish Executive under their Biodiversity Action Grant Scheme to carry out a Species Recovery Project. The project aims to create 5 new genetically diverse populations in the Perthshire and Central Highlands area, which was once a stronghold for the species.

Knowledge gained from a current PhD on small cow-wheat is providing the necessary understanding of the ecological requirements, biology and propagation potential of the species, and work on the genetic structure of the Scottish populations is helping to guide the design of the project. Using local knowledge and site survey we have identified the sites where the new populations could be established.

The next step is to collect seeds from the donor populations and sow them at the new sites. Besides monitoring germination and survival success of plants, we aim to follow how the genetic composition of the population changes through successive generations. We hope the outcome will be a widening of genetic structure within each population, which infers increased adaptability and resilience to loss.

For more information about the above projects, contact:

Alice Broome

Tel: 0131 445 6974

E-mail: alice.broome@forestry.gsi.gov.uk

*** Forestry Commission Information Note 50 can be downloaded from the Forest Research website:**

www.forestresearch.gov.uk/fr/INFD-69QKPJ

Or ordered from:

Forestry Commission Publications (see address at end of squirrel article on page 2).

E-mail: forestry@twoten.press.net

****Plantlife leaflets can be downloaded from: www.plantlife.co.uk**

**Or ordered from:
Plantlife Scotland
Balallan House
Allan Park
Stirling
FK8 2QG
Tel: 01786 478509**

Research in support of UK Biodiversity Action Plan Priority species – 2: Argent and Sable moth Alice Broome

Background

The Argent & Sable moth is a UK Biodiversity Action Plan Priority Species. It is classified as Nationally Scarce. Two sub-species occur in Great Britain:

- *Rheumaptera hastata hastata* (Linnaeus, 1758)
- *Rheumaptera hastata nigrescens* (Prout, 1914).



Argent & Sable moth

hastata sub-species.

Since 2000, Forest Research has been collaborating with Butterfly Conservation in the study of the sparsely distributed *Rheumaptera hastata*

This moth breeds in lowland woodland where:

- It feeds on silver birch, although it is probable that downy birch is also used as a foodplant
- The larva spins two or three leaves together and feeds from within the chamber, eating the inner surface when small and later eating right through the leaf
- It overwinters as pupae, which have been found in moss at the base of trees
- Adults fly by day in warm sunny weather between May and early July.

Knowledge gained from these studies has been

used to produce management guidance for this moth in lowland woodlands. Some aspects of the moth's ecology remain unclear and these provisional recommendations may require modification in the light of further studies.

Threats

The main threats to the Argent & Sable are due to the decline of traditional coppicing, leading to:

- Increased shade levels through neglect or conversion to high forest systems
- Even-aged nature of many existing woodland sites and increasing shade levels in woodland rides
- Isolation of suitable woods, combined with the moth's limited colonising ability
- Lack of knowledge of methods for maintaining suitable breeding habitats in the long term.

Provisional management recommendations

Actively managed coppice woodland

The Argent & Sable thrives in actively coppiced woodland where birch is present. Rotational coppicing provides a continuity of open or lightly shaded habitats and is the most effective method of habitat management in order to ensure the long term survival of the species.

- Actively coppiced areas less than five years old are preferred
- Standard density should be

between 0-20%

- The minimum compartment size should be at least 0.5 ha, preferably larger.

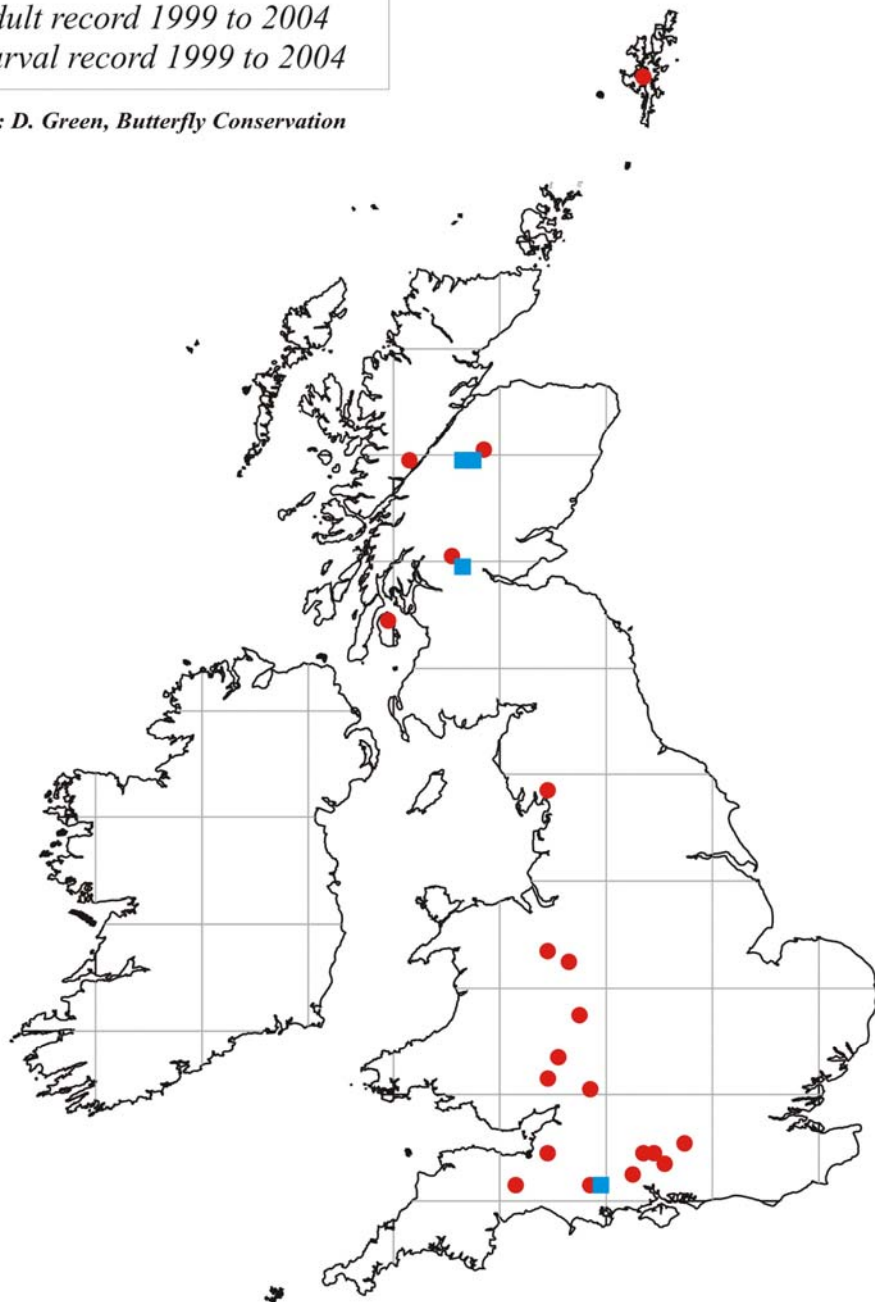
Woodland rides and clearings

Deliberate conservation management of woodland rides and clearings can provide valuable secondary breeding habitat for the Argent & Sable for periods when no suitable coppice areas may be available. However, this alone should not be relied upon to

Distribution of the Argent and Sable moth

- Adult record 1999 to 2004
- Larval record 1999 to 2004

Source: D. Green, Butterfly Conservation



sustain viable populations and rotational coppice remains the preferred management technique.

In modern plantations, colonies tend to be concentrated in:

- Open sunny rides with grass or scrub margins
- Rides running between young plantations where trees are 2-5m tall
- In wider rides running through older plantations.

The survival of Argent & Sable populations in woodland rides and clearings is dependent on the regular management of ride edge vegetation. Ideally this should be cut back relatively infrequently, for example with sections cut every 3-6 years. Note that the moth cannot tolerate annual edge cutting as this removes all potential breeding habitat. Cutting in alternate years (as often used on woodland nature reserves) is also unsuitable. The moth often breeds at low density and it may be beneficial to aim for the creation of a network of habitat patches within woods rather than concentrating on single areas.

Specific requirements

Whether in coppice areas, woodland rides or clearings, the moths need:

- Small birches, between 0.3m and 1.4m high
- Saplings or re-growth from cut stumps as both are suitable
- Ride edges which are unshaded or lightly shaded by the surrounding trees, giving levels of 0-30% shade (more shady rides are avoided completely)
- Moderate herbivore browsing can be tolerated and may prolong the suitability of birch re-growth, particularly on the edges of coppice compartments
- Recent studies suggest a possibility that browsed plants may be preferred although further investigations are needed to confirm this
- On coppiced areas, continuity of management is essential, as it is important to ensure that suitable unshaded small birches are available every year
- It is vital that birch re-growth on ride edges should not be treated with selective herbicides.

For more information, contact:

Alice Broome

Northern Research Station

Tel: 0131 445 6974

E-mail: alice.broome@forestry.gsi.gov.uk

PUBLICATIONS

New Ecology Division publication:

Watts, K., Humphrey, J. W., Griffiths, M. W., Quine, C. P., and Ray, D. 2005. Evaluating biodiversity in fragmented forest landscapes: principles. Information Note 73, Forestry Commission, Edinburgh.

This can be downloaded from the FC website at: www.forestry.gov.uk/publications

Or ordered from:
Forestry Commission Publications (see address at end of squirrel article on page 2).

CONTACT DETAILS

To provide material for future issues, or if you wish to receive Biotype by e-mail, get in touch with:

Andy Brunt
Ecology Division
Forest Research
Alice Holt Lodge
Wrecclesham
Farnham
Surrey GU10 4LH
Tel: 01420 22255
Fax: 01420 520180
E-mail:
andrew.brunt@forestry.gsi.gov.uk

For general enquiries concerning the biodiversity related work of Forest Research, contact:

Chris Quine
Head of Ecology Division
Forest Research
Northern Research Station
Roslin
Midlothian EH25 9SY
Tel: 0131 445 2176
Fax: 0131 445 5124
E-mail: chris.quine@forestry.gsi.gov.uk

For more general information about the work of Forest Research, visit our website at:
www.forestresearch.gov.uk