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Rosettes

*Biennial plants often produce a dense rosette of leaves in their first year. They are particularly attractive this time of year, like this Marsh Thistle (*Cirsium palustre*) rosette here, and quite conspicuous when you take a walk around the woods this month.*



Welcome to the May issue of Ecotype, the Biodiversity and Conservation Newsletter for the Ecology Division of Forest Research.

In this issue, as usual, the main part of the newsletter presents you with an interesting range of research projects undertaken in our Division and Forest Research.

It starts off with **Nigel Straw**, **David Williams** and **Martin Jukes** from Tree Health Division who discuss the expectation that continuous cover forest stands support a higher plant and animal diversity and describe their new study of the insect food-web associated with Sitka spruce stands.

Ralph Harmer from Ecology Division and **Kate Beauchamp** report on a survey of recently clearfelled western hemlock PAWS undergoing restoration on twenty public woodland sites in the South-East of England where they evaluated restoration progress and tree regeneration.

As habitat network modelling processes are employed to investigate the benefits of urban greenspaces for people and biodiversity, **Jordan Chetcuti** explains the role of greenspace gateways in modelling greenspace accessibility.

And finally, two surprising aspects of pine marten scats:

Rob Coope from Tay Forest District looks at what food fragments in marten scats can tell us about their food and whether its composition differs between den and forest.

And **Joan Cottrell** and **Stuart A'Hara** from Ecology Division, **Brian Walker** from the North York Moors Forest District and **Catherine O'Reilly** from the Waterford Institute tell a cautionary tale they have learned from scat identification and how to distinguish fox, pine marten and stoat just by their scats.

These current examples of our research are complemented by a selection of short news items.

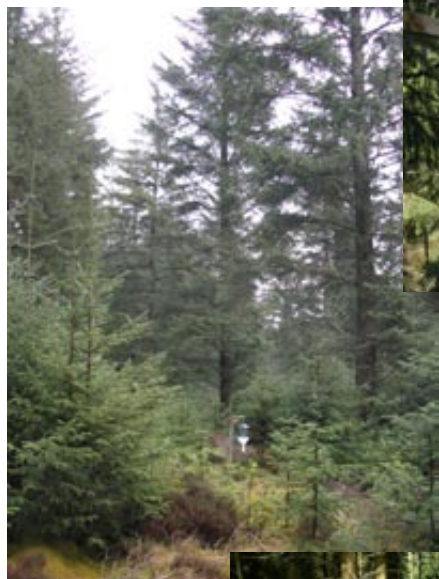
I hope you will find the variety of topics interesting and enjoy reading this issue of Ecotype.

Andrea Kiewitt
Editor

Insect diversity and continuous cover forestry

Nigel Straw, David Williams & Martin Jukes
(TREE HEALTH DIVISION)

One of the benefits of continuous cover forestry is the expectation that the mixed-age structure of stands produced by this type of management will support a higher diversity of other plants and animals, and will increase the ecological value of commercial plantations. There are also potential benefits for insect pest management.



Mixed-age stand of Sitka spruce



Interception trap

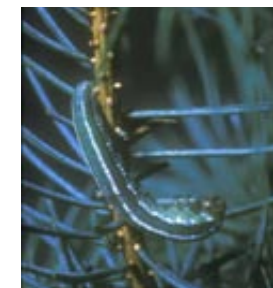


Yellow pan trap

A general increase in biodiversity should see an increase in the abundance and variety of invertebrate predators and parasitoids, and a corresponding reduction in populations of herbivorous species, including potential pests.

The idea that more complex habitats should support more natural enemies and therefore lower and more stable herbivore populations is known as the “diversity equals stability” hypothesis. This is well rooted in ecological theory and pest management. However, it has rarely been tested, especially in forestry.

Tree Health Division’s new research programme [Pests and Diseases under Changing Management](#) aims to test this basic idea by comparing insect diversity and abundance in typical even-aged forest stands with stands representative of continuous cover forestry. The study focuses on Sitka spruce and in particular the food-web of insects associated with the foliage - such as aphids, caterpillars, beetles and sawflies.



Spruce sawfly (*Gilpinia hercyniae*) feeding on needles



Tower to enable sampling in the canopy

A total of 24 research plots have been established in Wales: at Teranig, Cwm Berwyn, Clocaenog and Cefn Llwyd (near Bala). Insects in each plot will be sampled over three years using different types of trap (yellow pan, interception and pitfall traps, and litterfall collectors). These have been placed both at ground-level and in the canopy, and are emptied fortnightly from April through to October. The insects and other invertebrates are then identified at Alice Holt.

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Restoration of Western Hemlock PAWS

Ralph Harmer and Kate Beauchamp

Western hemlock is a shade tolerant tree species that regenerates freely from seed and is capable of establishing beneath a tree canopy. It also grows quickly and casts dense shade.

During the middle of the 20th century promoting the use of non-native conifers was in its heyday. At that time, such attributes of a tree species would be regarded as beneficial to the establishment of plantations on poor, uneconomic, derelict, broadleaved woodland sites.

Nowadays, many of such sites would be viewed as valuable ancient semi-natural woodland. And under current policies, which promote the restoration of native woodlands on Plantations on Ancient Woodland Sites (PAWS), the characteristics of western hemlock make plantations of this species prime candidates for restoration.

Existing [advice on restoration](#)  (PDF-1975K) recommends that it should preferably take place gradually with the plantation species being removed in several operations. However, clearfelling may be appropriate if significant regeneration of the plantation species is likely to occur. Therefore, stands of western hemlock are often clearfelled leaving sites with little vegetation.

Despite ongoing practical activity to restore woodlands, so far there has been little study of its effectiveness. Therefore, in order to assess restoration progress and evaluate any tree regeneration, a survey of western hemlock PAWS has recently been carried out. Twenty public woodland sites in the South-East England Forest District were systematically surveyed for the amount and species of trees regenerating in relation to several site characteristics.

This included the presence of parent tree species on site and their canopy cover, and the type and amount of ground flora present.

Birch, ash, oak and western hemlock seedlings were most common, and preliminary analyses indicate that seedling presence was related to presence of parent trees, amount of canopy cover and type of vegetation present. However, the relationships differed between species and there was significant variation between sites. The success of restoration was variable, with high numbers of western hemlock seedlings regenerating on some sites.



Clearfelled stand of western hemlock almost devoid of vegetation

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Greenspace gateways

Jordan Chetcuti



Habitat networks are now recognised as a key tool for addressing habitat fragmentation and associated biodiversity loss. The same processes used to model habitat networks are employed to investigate how urban greenspaces can benefit people as well as biodiversity.

The Forest Research suite of models, [Biological and Environmental Evaluation Tools for Landscape Ecology \(BEETLE\)](#), were used for examining networks to demonstrate potential accessibility of urban greenspace for people. Three user profiles, termed 'nervous', 'average' and 'confident', were developed to represent how a range of people may access and utilise greenspace. They were based on the preference for certain types of greenspace, mobility, and motivation. Landcover was scored in terms of the perceived usability for each of the user profiles and greenspace areas classified as accessible or inaccessible (Figure 1). It was assumed that nervous users would be restricted in terms of distance travelled (up to 300 m) and route

taken, whereas confident users would travel further (up to 1000m) and take a variety of routes to access greenspace.



Urban greenspace area (a), classified as accessible in green or inaccessible in red (b)

Care was taken not to model accessible greenspace areas as accessible from all around their boundary (Figure 2a) as this could potentially have been an unrealistic representation. In reality, access is often restricted by boundary features, e.g. the green area is only accessible through two gateways marked by pink dots (Figure 2b).



Unrestricted access (a) and restricted access (b) to greenspace: gateways as pink dots, reduced access as red circles

The initial analysis applied a boundary to the greenspace and removed an area to represent the gateway. The process, however, can remove narrow greenspaces and features such as footpaths. Using a very high resolution to counteract this problem would result in an extremely long GIS processing time. Instead, the gateway points were used as starting points for the networks, restricted access greenspace designated as impermeable, and that adjacent to the points later mosaiced to the networks. The generated greenspace networks can reflect current accessibility (Figure 2b) but also suggest where improved access could extend existing networks.

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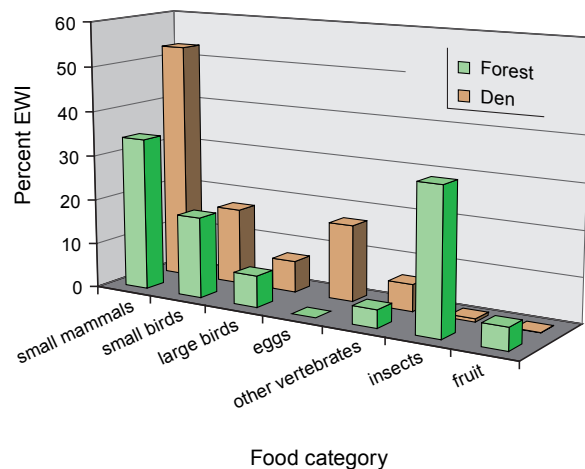
How does a marten feed her young?

Rob Coope



Young pine martens, which are called kits, are born in a natal den, usually in late March or April, and are tended exclusively by their mother. She feeds her litter for several months, initially by lactation and then increasingly by bringing food to the den. After the summer peak the feeding gradually declines until the kits become independent and disperse in the autumn.

In order to investigate the composition of the marten's food, a cluster of scats was collected in August from an abandoned den at Torr Dhuin in Inchnacardoch Forest, near Fort Augustus. One mature female and at least two kits had used it for 6 weeks before.



The food species were identified from fragments in these scats. Their assemblage and proportions differed from those of scats collected throughout the forest at the same time.

Most of the scats at the den would have derived from food eaten there although those from the female were likely to contain material eaten away from the den.

Estimated weight intake of food (EWI) from a natal den compared to that from the surrounding forest (Inchnacardoch, Scotland)

Twenty-six food species were found in scats from the forest, but only 12 in those from the den. This indicates that food transportability may have been responsible for this difference. It suggests that females carry food to the den in their mouth. Small mammals and eggs are particularly easy to carry this way, not so small insects and fruit. If pine martens swallowed the food and regurgitated it for their kits like other carnivorous mammals, such as foxes, do, den and forest scats would have the same composition.

This dependence on transportable food to raise the young could influence the population dynamics or feeding behaviour of pine martens. If one type of food becomes unusually scarce, such as small mammals in a population breakdown, then other types may need to be exploited more, or the survival of young martens to maturity in that season could be reduced.



Young pine marten kit

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Scat identification - a cautionary tale!

Joan Cottrell, Stuart A'Hara, ECOLOGY DIVISION
Brian Walker, NORTH YORK MOORS FOREST DISTRICT
Catherine O'Reilly, WATERFORD INSTITUTE

Background

In 2004, there was a [confident sighting of a pine marten](#) in woods on the western fringe of the North York Moors National Park. This was exciting news because pine martens are believed to have become extinct in England about a decade ago. To encourage visits from pine martens, several den boxes were erected the following spring. During his annual inspection of the sites, the FC Ranger Mick Douch discovered scats on the lids of two dens this winter. The scats were photographed and samples taken. Field experts agreed that they were typical of pine martens.



Scats on top of den in the North York Moors - sign of pine martens?

The genetics team at Forest Research's Northern Research Station performed a real-time PCR molecular test on the scats designed to distinguish fox from pine marten. This suggested that the scats originated from a pine marten. For confirmation, the DNA extracts were sent to the Waterford Institute in Ireland for DNA sequencing.

But to everyone's surprise the DNA sequences obtained from the North York Moors matched those of stoat!

Further Reading

O'Reilly, C., Statham, M., Mullins, J., Turner, P.D., O'Mahony, D. (in press) Efficient species identification of pine marten (*Martes martes*) and red fox (*Vulpes vulpes*) scats using a 5' nuclease real-time PCR assay. *Conservation Genetics*.

This is indeed a cautionary tale in two ways:

Firstly, it shows that improved methods for identifying scats are needed. Field identification based on the position, smell, size and general appearance of the scat can be incorrect. Ecologists were surprised that stoats would access den boxes high up in trees.

Secondly, DNA-based scat identification using real-time PCR is a new science and some technical issues remain to be resolved. In theory, the probe for the pine marten should not have reacted with the stoat DNA as the relevant section differs by a single base in pine marten and stoat, but it did. This makes the fox/pine marten test really a fox/(pine marten or stoat) test.



Adult pine marten

A real-time PCR test to specifically differentiate these two species could be devised. DNA sequencing is not always suitable because, unlike real-time PCR, it requires DNA of reasonable quality. However, on this occasion the stoat diagnosis is reliable since stoat and pine marten differ by around 30 bases of the over 250 bases sequenced.

In the future, video cameras will be placed above the den boxes to capture an image of the animal responsible for the deposits.

Also thanks to everyone involved, especially Johnny Birks, John Messenger, Peter Turner, John Knight and Mick Douch.

The hunt for the elusive North York Moors pine marten continues - so watch this space!

For further information on real-time PCR contact:

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Feral Wild Boar

Wild Boar were released in the Forest of Dean in 2000 and have recently begun to spread throughout the entire forest. An appropriate management strategy is currently being sought for them. The most conspicuous signs of the animals are dug up pastures, picnic sites and grass verges, and holes in fences. Their effect on woodland flora and tree regeneration is unclear. However, there are concerns that they represent a danger, both to the public as well as stalkers - especially as this population consists of feral animals accustomed to human presence. Forest Research are reviewing appropriate methods for monitoring both numbers and impacts of feral boar, as well as effective fencing techniques (contact [Robin Gill](#), [Roger Trout](#)).

Restocking seminars and natural regeneration

Two restocking seminars were organised by Forest Enterprise England for their foresters in the Forest of Dean and the North York Moors. [Ralph Harmer](#) and [Andrea Kiewitt](#) went along to discuss issues of natural regeneration, answer questions on site management and restocking success and present their research experiments on the topic.

New website on Peri-urban Deer Project

The Peri-urban Deer Project has a new website: <http://www.forestresearch.gov.uk/fr/INFD-7D4AXC>.

The project examines the interaction of roe deer with people in Scotland's peri-urban environments. It brings together information on the ecological and social driving forces that affect this interaction. The project is funded by the Deer Commission Scotland through the Scottish Government, contact [Norman Dandy](#) in Forest Research.

Multifunctional Green Networks: their role in a joined-up Scotland

Scottish Natural Heritage provided those involved in mapping, modelling and creating multi-functional green networks with an opportunity to discuss new applications and exchange ideas. The event was attended by local authority planners, and stakeholders from the Scottish Government and land-use organisations. [Darren Moseley](#) presented the results from a SNIFFER (Scotland and Northern Ireland Forum For Environmental Research) project examining urban networks for people and biodiversity. This research demonstrates how urban green networks can be developed to benefit a diverse range of people, and also biodiversity and environmental issues.

New Bulletin on estimating deer numbers

The Forestry Commission has published Bulletin 128: Estimating deer abundance in woodlands: the combination plot technique. This technique is a variation of the faecal pellet group count method. The authors Graeme Swanson, Douglas Campbell and [Helen Armstrong](#) also provide one of the most comprehensive overviews of dung counting methods available. Forestry Commission Bulletin 128 is priced £17.50 and can be ordered from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire, LS23 7EW; Tel: 0870 121 4180; quoting stock code FCBU128.

Monitoring Performance and Health of Deer

The Scottish Government, via the Deer Commission for Scotland, have commissioned Forest Research ([Rebecca Brassey](#), [Helen Armstrong](#) and [Robin Gill](#)) and the Macaulay Institute to develop measures of deer performance and health. The project will focus upon open hill red deer and aims to develop a robust monitoring system for the long-term but also appropriate for deer managers. Potential indicators have been discussed already. The next project phase involves recruiting of suitable open hill estates and developing a pilot data collection package.

About Ecotype

Who reads Ecotype

Ecotype addresses forestry practitioners and conservation professionals, in both the public and private sectors. Amongst our readership are people from:

- County and District Councils
- Natural England
- DEFRA
- Wildlife Trusts
- National Trust
- British Trust for Ornithology
- RSPB
- Woodland Trust
- Forestry Commission, Forest Enterprise
- Centre for Ecology & Hydrology
- Natural Environment Research Council
- Universities, Museums
- Private Consultants
- Interested individuals

Who contributes

Most of the articles are written by people within the Ecology Division and sometimes other parts of Forest Research about work related to biodiversity and conservation management of forests and woodlands. Contributions may also be invited from other parts of the Forestry Commission, and others working within forest biodiversity and conservation, subject to relevance to the main themes of Ecotype. Note that the editor reserves the right to edit, delay or reject articles depending on the space available and relevance of the subject.

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Visit the web pages of Ecology Division at:

www.forestresearch.gov.uk/ecology

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For information on seminars, conferences and training days in which Forest Research are involved see the events webpage at:

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