

Ecotype

Summer 2013

Ecotype is the biodiversity and conservation newsletter produced by Forest Research's Centre for Ecosystems, Society and Biosecurity.

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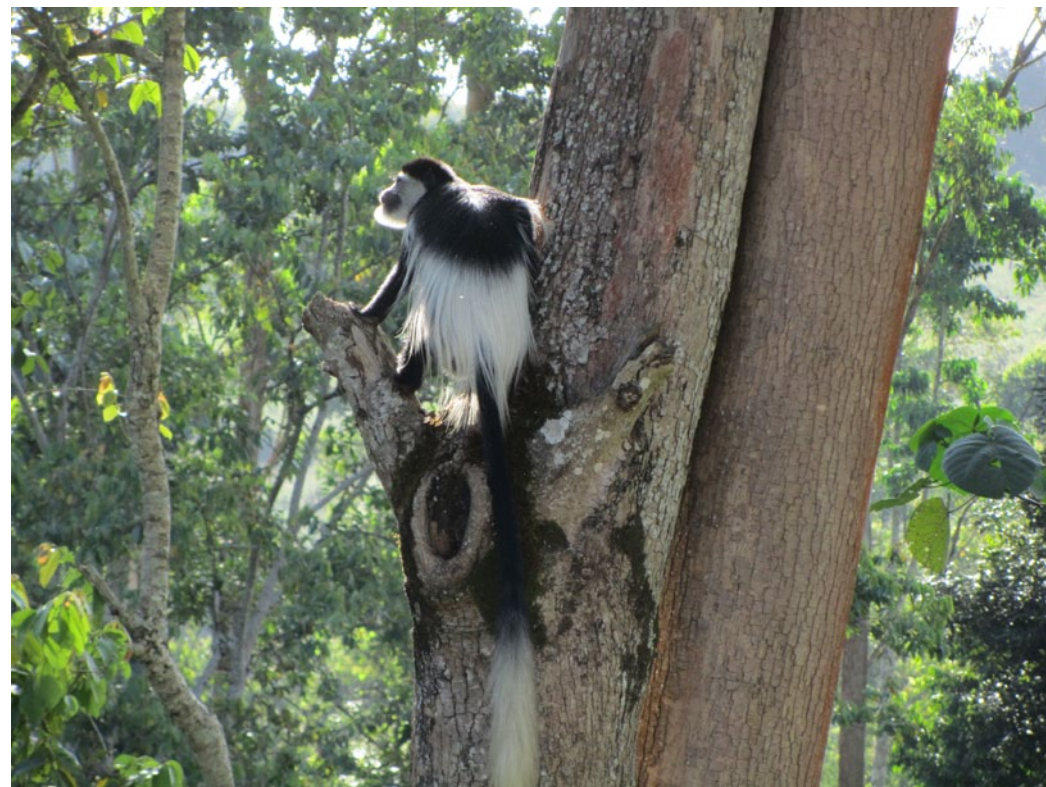
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A black-and-white colobus monkey, common in Ugandan forests

Since leaving Forest Research to take up a post at the University of Bergen in Norway, former CHES member Amy Eycott has been looking at the effects of fragmentation on the flora and fauna of forests in Uganda.

Amy describes the project and key findings in the article on [page 4](#)

Editorial

Welcome to the Summer 2013 issue of *Ecotype*, the biodiversity and conservation newsletter produced by Forest Research's Centre for Ecosystems, Society and Biosecurity (CESB).

What's in this issue:

Head of CESB [Chris Quine](#) updates us on the FR centre restructure and the opportunities these changes provide.

As mentioned on the front cover, [Amy Eycott](#) introduces a project, focussing on the effects and fragmentation on species richness in Ugandan forests.

[Darren Moseley](#) explores how the use of scenarios can help forest planners consider future changes and ensure that our woodlands continue to deliver the ecosystem services to meet society's requirements.

[Kevin Watts](#) outlines a new project between FR and the University of Stirling, which aims to use historical woodland creation sites to unpick the principles behind the development of ecological networks.

[Robin Gill and Mark Ferryman](#) feed back on a recently attended red squirrel conference.

[Mike Smith](#) introduces some case studies of ecosystem services, and how these are underpinned by international collaboration.

[Louise Sing](#) informs us of a new climate matching tool which is under development.

Our featured PhD student for this issue [Christopher Nichols](#), who is currently studying at the Royal Veterinary College London, updates us on progress with the project 'Grey squirrels (*Sciurus carolinesis*) in British woodlands: understanding bark stripping and reproductive biology.

We round the issue off with our [news and conferences](#) page where we welcome two students, details of recent publications, and news of award winning articles.

All together these articles highlight a small selection of the current projects we are working on at Forest Research. I hope you find this Summer 2013 issue of *Ecotype* informative and enjoyable to read.

Lucy Turner
Editor

New Centre....New Opportunities

Chris Quine

The organisation of Forest Research changed at the start of April 2013 and Ecotype is now prepared under the auspices of the Centre for Ecosystems, Society and Biosecurity (CESB). The new Centre title reflects the wider membership and breadth of themes covered by staff – who will continue to work closely with scientists in the Centre for Sustainable Forestry and Climate Change, led by Helen Mckay, and colleagues in the Centre for Research Services, led by Hugh Williams. The reorganisation is a response to both the changing focus of the work required of FR and the reduction in overall staffing due to funding cuts.

CESB will apply a wide range of expertise to important issues concerning the health, functioning and value of Britain's trees woods and forests. In particular it leads FR's research into biosecurity threats, ecosystem robustness and resilience, land use and ecosystem services, and the way in which society values trees. This includes research familiar to regular Ecotype readers on gene, species and habitat conservation, led by Joan Cottrell, and on land use and ecosystem services, led by Duncan Ray; as well as on the physical environment, forest soils and water, led by Tom Nisbet; on social and economic perspective of tree, woods and forests, led by Anna Lawrence; and on pathogen and pests threats to tree health, led by Joan Webber. Interdisciplinary research is encouraged and the mix of disciplines will be a powerful resource from which to address some of the many complex environmental problems facing those concerned with Britain's trees woods and forests. The Centre will provide a stimulating environment through scientists with professional training in plant pathology, entomology, soils and hydrology, plant and animal ecology, social and political science, economics, statistics and spatial analysis.



Cleaning boots after a forest walk as part of biosecurity measures

An example of the application of the Centre's expertise is the recently started contract for DEFRA on 'Social and economic analyses of disease management of Dothistroma Needle Blight'. Dothistroma Needle Blight is a fungal pathogen which causes defoliation and tree death in a wide range of pine, and some other conifer, species. Originally seen as a threat to commercial forests of exotic pine species, there is now evidence of the disease affecting the health of the Scots pine both in planted forests and in Caledonian pinewoods. This research project will combine expertise in tree health with that in forest ecology, social science and economics to understand the barriers to adoption of measures which can mitigate the impacts of the disease. We will be working with scientists from Fera, Brunel University, North Wales and New Zealand as well as stakeholders across GB.

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The Matrix: Influence of disturbance and fragmentation on species richness in Ugandan forests

Amy Eycott

Millennia of human activity in the fertile region around Lake Victoria have fragmented and degraded the once-extensive moist broadleaf forest. Despite legal protection through a network of forest reserves, pressure on these forests continues, both from illegal timber and charcoal production and by clearing forests for agriculture.

The Matrix project is a collaboration between Bergen University and Makerere University in Uganda. The team have assessed the impact of forest fragmentation on diverse species groups: Lepidoptera, birds, monkeys, bats, trees and ferns. The project also includes a legal component looking at the reasons for forest clearance and the impact of legal frameworks for ownership.

Ugandan forest biodiversity is severely affected by several things:

- Habitat disturbance, both past and ongoing
- Habitat fragmentation
- Land-use intensity in the surrounding landscape



A strangler fig tree with a hollow where its 'victim' tree used to stand

Disturbed and fragmented forests become dominated by forest generalists and edge species, with reductions in forest specialists continuing long after the fragmentation or logging disturbance has stopped. It is likely that the continuing decline in forest specialist species is due to land-use intensification around the fragments. Diverse 'home gardens' where many crops are grown have been replaced by plantations of tea or sugar cane, neither of which contain many resources for wildlife.



The sugar cane plantations cut right up to the edge of the forest reserve

Reserve forests fare better than privately-owned forests, and private forests with secure ownership are more likely to remain uncleared than those where the ownership is not formalised. While effective protection of reserve forests remains a priority and a challenge, smaller fragments can play a role in species conservation if the owner feels secure in retaining the value of the forests.

For further information on [The Matrix project](#) please contact:

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Amy worked on landscape ecology within Forest Research before joining the University of Bergen to undertake The Matrix project.

How could 'future' change in UK forests and wooded landscapes affect the delivery of ecosystem services?

Darren Moseley

Land use change has been one of the major influences on UK forests and wooded landscapes over the last 50 years, with the future likely to be affected through changes in climate, emerging pests and diseases and social and economic pressures. This poses forest planners with a difficult task: how to make decisions that affect the future delivery of ecosystem services when faced by these unpredictable issues? One approach is to consider how a range of futures may unfold; a process that is often referred to as scenario planning.

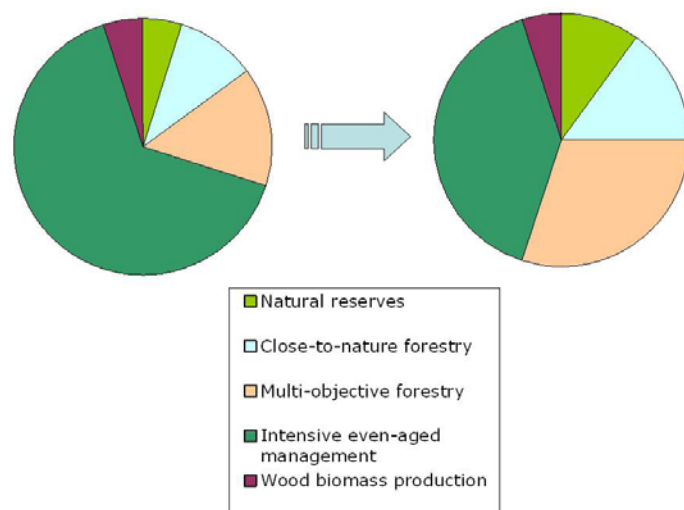


Figure 1. Theoretical depiction of how the balance of forest management types may change under the UK NEA scenario 'Green and pleasant land'

Scenarios are considered as possible (plausible) futures, rather than as forecasts or predictions of what will happen. Examination of scenarios allows consideration of how different environmental, societal and economic factors could potentially affect our forests and what management options are appropriate to address these changes.

The Land Use and Ecosystem Services group at Forest Research are using the scenarios produced by the UK National Ecosystem Assessment (UK NEA) to investigate how land use and the balance of forest management approaches required to deliver ecosystem services may change over the next 40 to 50 years. For example, in one scenario called 'Green and pleasant land' there is an emphasis on restoring and protecting woodlands to enhance biodiversity, but also an increase in the recreational use of woodlands. To ensure our woodlands can deliver the ecosystem services to meet society's future requirements under this scenario, forest planners would need to consider changing the way woodlands are managed. This may require a reduction in the proportion of highly productive woodland and an increase in the proportions of woodland managed for multiple objectives and 'close to nature' forestry (see figure 1).

This research is being developed with UK forest managers to help practice and policy make more informed decisions on the delivery of ecosystem services.

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Using historical woodland creation to unpick the ecological networks concept

Kevin Watts

The concept of ecological networks, and their focus on landscape-scale conservation, is seen by many as an effective response for biodiversity conservation in fragmented landscapes. As a result conservation activities, such as habitat restoration and creation, are being targeted towards the establishment of ecological networks. These are typically conceptualised as a suite of core areas connected by buffer zones, corridors and smaller stepping stone patches (see figure 1) that allow species or their propagules to move between them. Although this is a very appealing concept, based on a number of sound scientific principles, it is supported by limited empirical data. This has resulted in much debate on the relative merit of, and balance between, alternative conservation actions. In a time of budget cuts and limited resources, it is important to ensure that such conservation actions are implemented in the most effective areas to ensure real biodiversity benefits and underpinned by the best available evidence.

Many landscape-scale conservation projects aimed at implementing the ecological network concept are underway throughout the UK (e.g. Nature Improvement Areas (NIAs)) and it may be many years/decades until biodiversity benefits are realised. However, a [collaborative project](#) between Forest Research and Stirling University (with initial funding from Forestry Commission, Natural England and Scottish Natural Heritage) plans to identify equivalent settings/landscape assemblages and draw out the necessary evidence from historical woodland creation sites, which will have inadvertently created the components of ecological networks (or mini NIAs) in many locations across the UK. We will use digital spatial datasets of woodland cover in the UK to systematically identify a range of

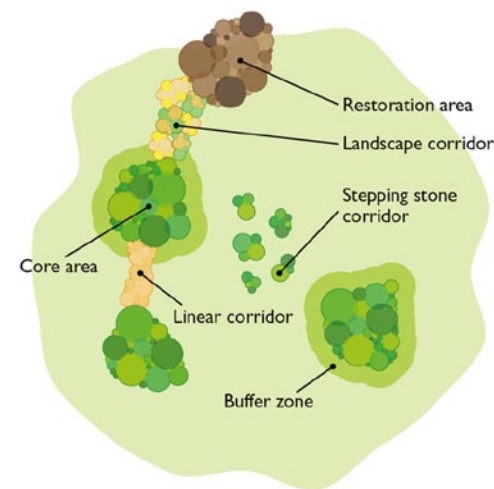


Figure 1. Components of ecological networks from Lawton et al. 2010

woodland patches of different character (e.g. age, size, degree of connectivity and spatial arrangement) to represent the different components of ecological networks. These sites will be surveyed for a range of woodland-dependent species with different life-history traits (e.g. habitat specificity and dispersal abilities) as future funding allows.

Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J. and Wynne, G.R. (2010). Making Space for Nature: a review of England's wildlife sites and ecological network. Defra, London, UK.

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National and International perspectives on red squirrel conservation – Exeter University 19th April 2013

Robin Gill and Mark Ferryman

A summary of a one day conference with presentations on various projects devoted to red squirrel conservation.

Colin McInnes of the Moredun Institute gave an update on Squirrel pox virus (SQPV) and the development of a vaccine to protect red squirrels. This requires vaccination with a live virus of a closely related strain to which red squirrels are naturally resistant. Initial trials have shown that captive red squirrels, treated with the new vaccine have survived after being challenged with SQPV. It is hoped that the vaccine could be used as part of a recovery program for red squirrels.

David Everest from Animal Health and Veterinary Laboratories Agency talked about Adenovirus, a disease which can be fatal to red squirrels without any external symptoms. There is evidence that the adenovirus is spreading in the UK. It can affect squirrels in captivity and other situations where grey squirrels are absent, so grey squirrels are not the only vectors. Mice are suspected carriers. Squirrels that are to be translocated should be PCR tested as the Negative Contrast Stain TEM technique does not always show the infection.



Red Squirrel

Craig Shuttleworth (Red Squirrel Survival Trust), Colin Lawton, (National University of Ireland) and Natasha Collings (Cornwall Red Squirrel Project) each gave presentations on the re-introduction of red squirrels. Projects in Anglesey, Cumbria and Ireland have achieved some success. Red squirrels are now present all over Anglesey after a sustained control effort on grey squirrels. This has also fortuitously resulted in a decline in the frequency of greys registering positive for carrying SQPV. There have however been setbacks, with some instances of mortality in red squirrels due to outbreaks of the adenovirus. All studies emphasised the need for a continual control effort to prevent grey squirrels spreading back into previous control areas. In Cornwall a re-introduction project is underway, with the initial objective of re-establishing red squirrels in the Lizard and West Penwith Peninsulas; areas where the exclusion of grey squirrels may be achieved with least cost.

Colin Lawton gave a presentation on a declining grey squirrel population in central Ireland which is thought to be due to predation by an increasing pine marten population. Red squirrels are more arboreal in behaviour than greys and appeared unaffected in the same area. The geographic range of pine martens do not overlap with grey squirrels in most of the UK, so it may not be surprising that such an effect has apparently gone unnoticed or undocumented before.

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Green infrastructure and ecosystem services

Mike Smith

Forest Research is developing collaborative links in Sweden and Russia to contribute to greater understanding of green infrastructure across the boreal forest, its dynamics and ability to deliver ecosystem services. Using appropriate rapid assessment methodologies and stakeholder engagement we will study how local people perceive the societal goods and services that the different forest types provide. The study will then investigate if these ecosystem services can be mapped onto the forest types.

This is being undertaken through a number of case studies within a boreal forest network that will link researchers and practitioners. The network will help meet the challenges of delivering biodiversity conservation, provisioning, regulating and cultural ecosystem services and to establish sustainable forest management practises.



Recent field visit to Lochaber

The Scottish case study is based around Lochaber Forest District and researchers within the Forest Landscape Society group from the Swedish University of Agricultural Sciences in collaboration with FR's Land Use and Ecosystem Service programme and the Forest district undertook focus group meetings and stakeholder interviews in late April. This is the start of a collaboration that will also include case studies in central Sweden and northern European Russia.

The land use of Lochaber District is primarily forestry and an agriculture which is largely pastoral with sheep and cattle grazing (for beef). Sheep grazing tends to be on the higher and nutritionally poorer hill land and cattle grazing on lower and relatively more fertile ground. There are several large freshwater lochs (lakes) and the area, being on the western sea-board of Scotland is fringed by sea and sea lochs.

Across Lochaber District, the forest zone changes from western oceanic oak woods to the Atlantic edge of the sub-boreal pinewood zone. The native woodland cover has declined over the last two to three centuries, leaving remnant areas of ancient native woodland; the Caledonian pinewood fragments are protected under EU NATURA 2000 designations. In the last 100 years forestry has expanded using exotic conifer species, and for a time the replacement of native woodlands through under-planting. The forest stock is very important for the economy of the region and Fort William has one of the biggest sawmills in Scotland which depends on a continuous production of Sitka spruce. The balancing of priorities of conservation and production poses interesting challenges in the delivery of ecosystem services.

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New climate matching tool under development

Louise Sing

A team of spatial scientists and software developers in Forest Research have been pooling their skills in python programming, databases and geographic information system (GIS) to develop a tool which compares the projected future climate for Europe with the current climate of locations across the globe. The tool will identify locations around the world where the current climate is most similar to the future climate of a selected European site for a range of possible climates (from Global Climate Models) over a range of timescales (2030, 2050 and 2080). The climate matching tool can suggest areas of the world where seed or genetic material may be suitable for adapting forestry to reduce the impacts of climate change.

The results are calculated using the climatic difference method developed by Broadmeadow et al. (2005) for temperature, diurnal temperature range and precipitation using [WorldClim](#) and [CCAFS](#) data. Other factors significant

for tree growth, including moisture deficit (using potential evapo-transpiration data as detailed in Phil Taylors article in [Ecotype 56](#)), continentality and day length, will also be added. The outputs are in csv and kml format, which can be plotted in a GIS (figure 1), or in Google Earth/Maps (figure 2).

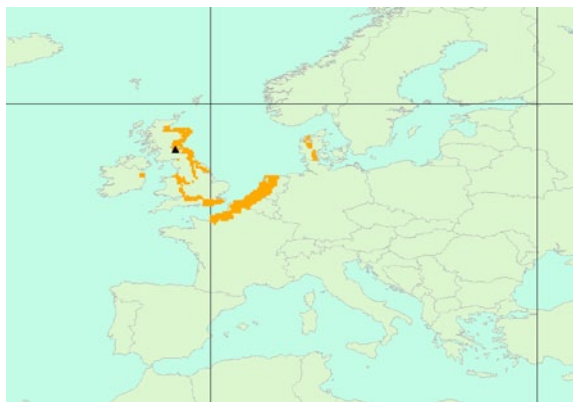


Figure 1. An example of output from the model mapped in the GIS



Figure 2. Results mapped in Goole Earth

Using python and open source database software improves the tool's accessibility and availability compared with other commercial climate matching tools, and it is also customisable for developers. The work is being funded by Trees4Future, an Integrative European Research Infrastructure FP7 project, and will be

developed as a web application in conjunction with other European partners later in the year.

Broadmeadow, M. S. J., Ray, D., & Samuel, C. J. A. (2005). Climate change and the future for broadleaved tree species in Britain. *Forestry*, 78(2), 145-161. doi:10.1093/forestry/cpi014

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Grey squirrels and bark stripping: Bones of contention

Christopher Nichols

Why do grey squirrels strip the bark off trees? We know the behaviour is no random act of malice as it is possible to predict the extent to which a particular stand of trees will be damaged. However, the motivation behind this pesky penchant for the persecution of trees is still unknown.

Once squirrels have stripped a tree's bark they seem to eat the exposed phloem tissue and lick the exuding sap. Could this behaviour be the result of a nutrient-seeking urge? Is the defiance due to a deficiency? The working hypothesis of my PhD is that grey squirrels damage trees to ameliorate a seasonal calcium deficiency.

The first step towards testing this hypothesis is determining whether a seasonal calcium deficiency exists, and if it coincides with the peak bark stripping season (April to July). Such a deficiency is plausible for both juvenile squirrels and adult females, due to the rigours of growth and reproduction respectively. It is also possible that all individuals in a particular area will be partially calcium deficient following a fruitful autumnal seed crop, due to the low phosphorus to calcium ratio, and high levels of unsaturated fatty acids in the seeds.



Grey Squirrel damage to beech

Grey squirrels will be sampled throughout the year to analyse natural variation in bone density, using a pQCT bone scanning machine. The extent to which various markers of bone formation and resorption are present in the blood over time, will also be determined via blood sampling and analysis. Contingent on these results, I can then go on to test other assumptions of the calcium hypothesis, e.g. that squirrels can utilise the form of calcium present in tree phloem.



Grey Squirrels: Is their defiance due to deficiency?

The aim of this project is to gather information for the future development of humane non-lethal alternatives to grey squirrel control.

For now though, I've got a bone to pick with squirrels!

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News and conferences

Students join CESB

CESB have recently welcomed 3 new students.

Jonas Leveque, from Wageningen University, who is carrying out an Erasmus programme funded placement with Forest Research. Jonas is jointly supervised by Mariella Marzano and Alice Broome, and will be carrying out a project on understanding human perceptions related to wildlife disturbance, with a focus on amphibians in Scotland.

Anna Hover is completing a five month placement from AgroParisTech engineering school, Nancy. Anna will be working with Alice Broome on a variety of protected species projects.

Katy Reed has finished her short term appointment working for Nadia Barsoum, and has been successful in obtaining a PhD studentship, supervised by Daegan Inward, investigating the role of *Agrilus biguttatus* in acute oak decline.

Publications

Chris Quine, together with Kevin Watts and Sallie Bailey have had a paper published in Journal of Applied Ecology discussing the interplay between sustainable forest management and ecosystem services. Visit <http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12068/abstract> where the full article can be downloaded

Liz O'Brien and Jake Morris have had a paper titled 'Well-being for all? The social distribution of benefits gained from woodlands and forests in Britain' published in Local Environment.

Award Winning Articles

Congratulations to our Research Fellow Dr Steve Petty on being a co-author of a recent paper 'Europe-Wide Dampening of Population Cycles in Keystone Herbivores' in the prestigious journal, Science.

Tom Connolly, a statistician within CESB was part of a writing team (Bill Mason and co-authors Helen McKay, Andrew Weatherall, and Alan Harrison) awarded the 2012 Silviculture Prize for 'The effects of whole tree harvesting in upland Britain on the growth of Sitka spruce over ten years'

A Fond Farewell

Farewell to former CHES member Ralph Harmer who will be maintaining his links with FR as a research fellow.

About 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 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.

Contacts

To comment, provide material for future issues, or if you wish to receive *Ecotype* by e-mail, please contact the editor:

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Web links

www.forestry.gov.uk/fr/ecology

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www.forestry.gov.uk/fr/growingplaces