

Ecotype

Winter 2012

Ecotype is the biodiversity and conservation newsletter produced by Forest Research's Centre for Human and Ecological Sciences.

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Fallow and red deer in a parkland setting.

Amongst European nations, Britain has a rather unique assemblage of deer. Apart from our two native species, red and roe, we now have 4 other introduced species, Fallow, Sika, Muntjac and Chinese Water deer, which are continuing to increase and expand their range.

Ongoing research projects within CHES will focus on the effectiveness of new grant schemes to improve deer management, and the potential impact of deer browsing on song birds.

Robin Gill

Editorial

Welcome to the Winter 2012 issue of *Ecotype*, the biodiversity and conservation newsletter produced by Forest Research's Centre for Human and Ecological Sciences (CHES).

What's in this issue:

Head of CHES **Chris Quine** welcomes the year in with an update on the changes happening with the Centre.

Russell Anderson kicks this issue off with some positive findings from an experiment which started 16 years ago investigating ways of restoring blanket bogs.

Louise Sing summarises findings from a recent collaborative project looking at opportunities for woodland expansion in Scotland.

Brenda Mayle joins forces with Joan Webber (FR) and Ben Jones (FC England) and their 'high flying' surveys of tree health. Follow up ground surveys reveal interesting new findings on the associations between squirrel damage and *Phytophthora ramorum*.

Jordan Chetcuti is busy investigating use of conservation planning software developed in Australia to further current FR research and help with land use planning.

Ralph Harmer and Andrea Kiewitt carry on the search to find a way to control the pesky bramble in order to help restocking by natural regeneration.

CHES's **Michal Petr** has been working alongside colleagues across Forest

Research. He gives us an insight into what is being done to plan for climate change and introduces us to two European research projects.

Black grouse habitat and forest management is the PhD topic highlighted in this issue. **Jenny Owen** completed her PhD entitled 'Provision of habitat for black grouse *Tetrao tetrix* in commercial forest restocks in relation to their management' in March 2011.

We round the issue off with our **news and conferences** page which contains information on two conferences taking place this year involving members of CHES, MSc student opportunities with FR, and updates to the Woodland Grazing Toolbox and UK Red Squirrel Group website. Plus news of an award winning student and a couple of recent FC publications.

All together these articles highlight a small selection of the current projects we are working on at Forest Research. I hope you find this Winter 2012 issue of *Ecotype* informative and enjoyable to read.

Claire Noël
Editor

Changes within CHES

2012 promises to be a year of considerable change within the Centre for Human and Ecological Sciences!! No doubt such sentiments are common in many introductions by public bodies to this year.

Readers of *FR News* will be aware that funding for the Agency is due to decline by approximately 25% within the current four year spending review period. Work led by CHES has not emerged unscathed by the decision processes of 2011. As a consequence, and with a number of staff taking opportunities for Voluntary Exit, there will be some significant changes to scope and staffing.

In particular, we wish all the best as they leave FR (and FC) after distinguished careers of varying lengths to Brenda Mayle and Helen Armstrong from the Vertebrate Management programme; to Andrea Kiewitt (a former editor of *Ecotype*) from the Habitat Management programme; and to Tytti Vanhalla from the Genetic Conservation programme. In addition, some redeployment means that from the Habitat Management programme, Steven Hendry is resuming his career in tree health as a pathologist, and Colin Edwards has joined FE Scotland on a 2 year secondment to see some of his research into practice. Peter Crow is moving from a focus on Heritage to wider aspects of environmental science. In due course, there are plans to review the Centre structure within FR.

Nevertheless, the management cliché that when there are threats, there can also be opportunities is apparent – and there are undoubtedly some exciting research possibilities with a refocusing of 4 remaining programmes. In each case, we are keen to complement our own expertise and funding with that of others – and have renewed ambitions for partnerships, collaboration and the pursuit of external funding.

A new programme, 'Land Use and Ecosystem Services' (contact [Duncan Ray](#)) is bringing past accomplishments in landscape ecology, spatial analysis and geographic information science to bear on a very topical theme. We are also consolidating a number of biodiversity and nature conservation threads into the Gene, Species and Habitat Conservation programme (contact [Joan Cottrell](#)). Much of our economic expertise is being focussed within a new programme 'Realising the economic value and ecosystem services from woodlands' (contact [Gregory Valatin](#)), whilst that of our social scientists is addressing 'Societal benefits and governance of trees, woods and forests' (contact [Anna Lawrence](#)). In each case, we increasingly adopt an interdisciplinary approach (see *Ecotype 50* and *Growing Places 8*).

Forthcoming issues of *Ecotype* will continue to report on progress in this excellent applied research and we welcome all feedback and interest in collaboration.

Chris Quine

Restoring blanket bog

Russell Anderson

An earlier generation of foresters met the challenge of developing machinery and methods for afforesting bogs. Times have changed and we now appreciate that blanket bogs are very special, globally scarce habitats and that the enormous amount of carbon held in the peat is best kept there, where it will not contribute to global warming (see <http://www.forestry.gov.uk/fr/INFD-7J5E7F>). There are fears that forests planted on bogs cause the slow release of this carbon, counteracting the carbon-sink benefit of the trees.

Forest Research set up an experiment in 1996 with funding support from the LIFE Peatlands Project to test methods of restoring afforested blanket bogs. Its aim was to determine how restoration success is affected by felling/removal treatments and damming of plough furrows.



Image 1. Experiment plot soon after felling and removal of the trees. In this treatment the plough furrows were left open.

The results show that raising of the water table, which is commonly understood to be the key to reinstating peat formation, is best achieved by a combination of felling the trees and damming the plough furrows. However, bog vegetation made a recovery after the trees were felled, regardless of whether the furrows were dammed or not.

Conifers have regenerated on the experiment plots - mostly lodgepole pine with a few Sitka spruce - and these need to be cleared to prevent the restored blanket bog from reverting to woodland. This is partly an edge effect and it might not be an issue if much larger areas were being restored.



Image 2. In the mid-ground, the same experiment plot as in Image 1, twelve years later.

The restoration treatments also affected the peat itself. Its water content increased, its density decreased and the ground surface rose upwards by a few centimetres. This is probably the first evidence that bog restoration can at least partially reverse some of the changes in peat properties brought about by afforestation.

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Woodland expansion geographic information system (GIS) analysis

Louise Sing

CHES staff (in collaboration with The James Hutton Institute) recently completed a contract for the Scottish Government’s Woodland Expansion Advisory Group to determine the impact of various constraints on the availability of land for new woodland in Scotland. The work was carried out using a Geographic Information System (GIS), updating work previously published in 2006 ([report available here](#)), and determining the effect of recent changes in policy on the availability of land for woodland expansion. Using national digital datasets of land use, the land area of Scotland was divided into 0.25 hectare grid cells and each cell assigned to one of three categories (Phase 1, 2 and 3):

Phase 1: land predominantly unavailable for woodland expansion. This is land which is currently wooded, land with biological or physical constraints to planting (e.g. urban areas), and land which is subject to current forestry policies restricting woodland expansion (peat deeper than 0.5 metres and prime agricultural land). The only opportunities for woodland expansion on such land are likely to be small in scale – for example small woods on farms, riparian woodlands, urban woodlands.

Phase 2: land affected by national designations and policies. National and international conservation designations (e.g. Sites of Special Scientific Interest, Specially Protected Areas, National Scenic Areas), catchments at risk of acidification and heritage sites impose varying degrees of constraint on woodland expansion.

Phase 3: land not included in Phase 1 or 2, and which therefore is most

likely to have the potential for woodland expansion. Aside from the formal constraints to woodland expansion identified in Phase 1 and 2, there remain many other constraints to planting on this land. The report discusses the types of land in Phase 3 and these potential constraints.

| | |
|--|----------------------------------|
| Phase 1: Land that is predominantly not available for woodland expansion | 3.59 million ha, 46% of Scotland |
| Phase 2: Land affected by national designations and policies which impose varying degrees of constraint on woodland expansion | 1.60 million ha, 20% of Scotland |
| Phase 3: Land not included in the first two categories and which is therefore most likely to have potential for significant woodland expansion | 2.69 million ha, 34% of Scotland |

Table 1. Results of GIS analysis

It is the Phase 2 and 3 land which form the basis for the debate over where woodland expansion could occur in Scotland, given aims to increase cover from around 17% to 25% by 2050. The full report, with accompanying maps, is available [here](#) (3.8Mb) or via the Woodland Expansion Advisory Group website (www.forestry.gov.uk/weag).

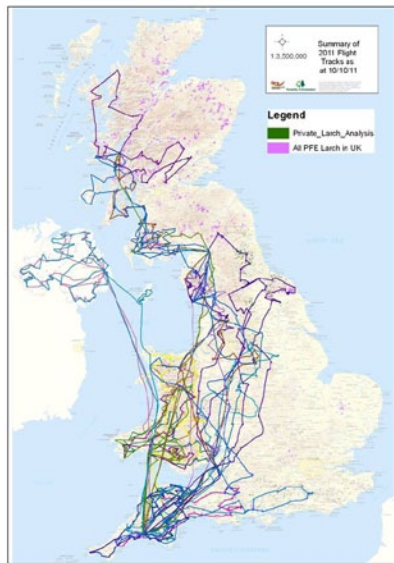
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Aerial surveys for *P. ramorum* in Wales show extent of damage by squirrels to larch

Brenda Mayle, Ben Jones, Joan Webber

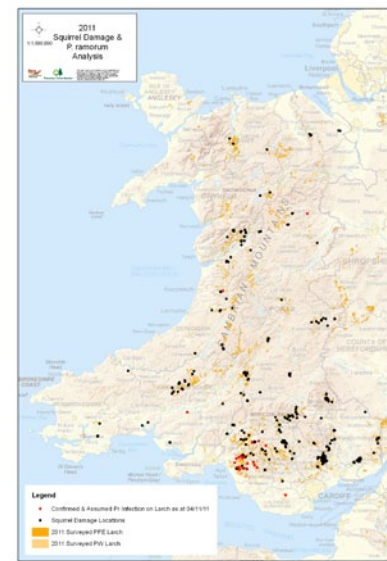
Over the last two years helicopter aerial surveys by Forest Research, funded by Fera Phytophthora Programme, have been used to detect symptoms of dieback or crown colour change in larch trees as the initial step in detecting *Phytophthora ramorum* disease in commercially grown larch in GB. The surveys have concentrated mainly in the western region of Britain, where the climatic conditions favour *P. ramorum* (Map 1).



Map 1. Flight tracks for aerial surveys of larch for dieback due to *P. ramorum* during 2011.

The cause of the symptoms then has to be established with ground surveys and, if *P. ramorum* is suspected, confirmed in the lab. Ground surveys have identified that some of the dieback detected in larch in Wales is due to squirrel bark-stripping damage. Of the 1513 sites (4,764 ha) surveyed squirrel damage was confirmed as the cause of the dieback in 21% (317 sites). No sites had *P. ramorum* confirmed associated with squirrel damage, although for a few sites (11/317) *Phytophthora* infection was suspected but not confirmed so these will be closely monitored next year. (Map 2)

There have been some suggestions in the media that bark stripping of larch by grey squirrels is providing access for *Phytophthora* spores and assisting the spread of the disease. Results of the surveys to date do not provide evidence



Map 2. Map of Wales showing areas of larch surveyed & confirmed *P. ramorum* (red dots) and squirrel damage (black dots).

to support this. In fact, the reverse is probably true as larch responds to wounding by producing copious resin which is likely to make it more difficult for spore germination and infection to occur. *P. ramorum* is capable of infecting trees with intact bark, particularly thin-barked species such as beech and grand fir. Despite the fact that beech is heavily damaged by grey squirrels (see www.forestry.gov.uk/fr/greysquirrels) significant levels of *P. ramorum* infection do not occur. Infection on beech is always associated with close proximity of infected rhododendron or larch.

These results demonstrate the usefulness of aerial surveys as a tool to identify areas of dieback across woodland areas. In Wales the follow up ground surveys have identified extensive squirrel damage on larch, and in other areas dieback is due to bark stripping damage by deer. It confirms the need for managers to visit their woods to check on tree health, and to consider grey squirrel control.

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New work investigating 'MARXAN with zones' in land use planning

Jordan Chetcuti

Good spatial planning is a case of balancing different land use objectives in the most efficient way. Forest Research has developed a number of decision support tools, but a way to combine the outputs, as well as other information, for use in planning is now needed.

We investigated MARXAN developed by University of Queensland, Australia, for use in creating an optimized forest plan.

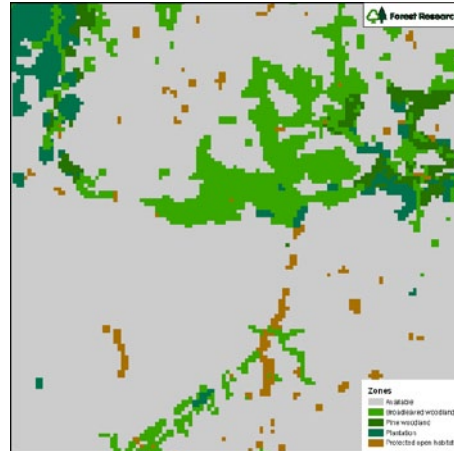


Fig 1. Planning units showing current zone allocation.

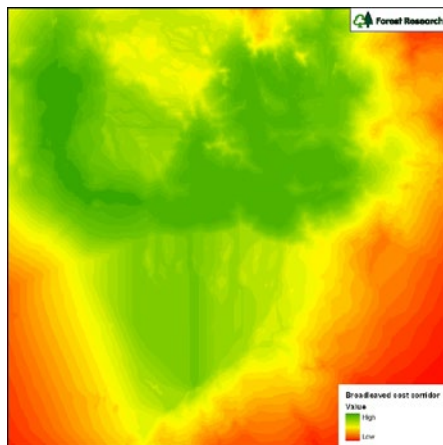


Fig 2. Broadleaved cost corridor data as an example of a factor influencing decision making.

MARXAN with zones (MARXAN Z) is likely to be more useful to us than the original MARXAN as it allows multiple objectives each with multiple costs.

This could be of particular interest in planning to improve a range of ecosystem service objectives, some of which may be in conflict within a single planning unit.

MARXAN Z resolves the objectives and conflicts by trying different configurations that meet the objectives;

it then goes through a number of iterations of different solutions, listing which iteration had the lowest cost.

We have begun to investigate using MARXAN Z for use in land use planning within Cairngorms National Park. Figure 1 shows the starting point, and which zone each planning unit currently falls into. Figure 2 shows the sort of data that could be used to target a land use objective of habitat network enhancement; in this case the least cost corridor between broadleaved habitat patches as a priority for improved connectivity.

Figure 3 shows an example of how a solution from MARXAN Z may look, when this and other factors are taken into account.

We plan to take this work forward as part of the Land Use and Ecosystem Services (LUES) programme, for example in our Lochaber case study.

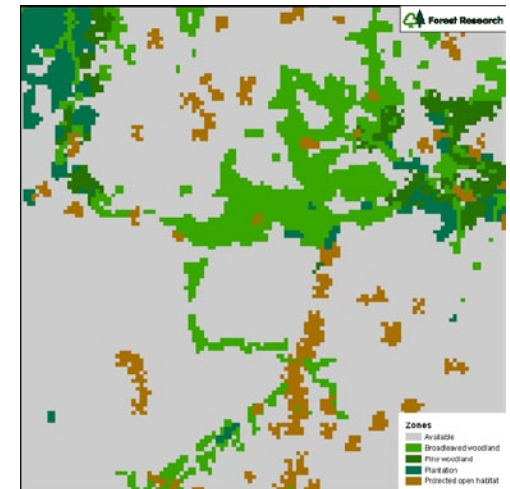


Fig 3. A theoretical example of an output from MARXAN Z.

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Suppressing bramble using overstorey cover – does it work?

Ralph Harmer and Andrea Kiewitt

The concept of continuous cover forestry is an attractive ideal for some woodland owners as it maintains long-term woodland cover with its associated biodiversity, amenity and economic values whilst providing conditions which theoretically allow restocking by natural regeneration. One expectation of continuous cover forestry is that retention of overstorey cover will suppress growth of the ground flora sufficiently to allow tree seedlings to establish, but there is little evidence to support this assumption. During our studies of tree regeneration in planted ancient woodland sites (PAWS) we also observed growth of the ground flora, especially bramble, which has a notorious reputation as a competitive weed that causes problems during restocking.



Images a, b & c: Development of bramble cover in one sample quadrat within an area of the stand that had been thinned to remove 20% of basal area: a = 2002; b = 2003; c = 2004.

We applied four different thinning treatments to replicated plots in a 35-year-old stand of Corsican pine removing 10%, 20%, 40% and 80% of the basal area. In the following three years we observed the development of the bramble thicket recording cover, height, and numbers of inflorescences and berries. Whilst values for these were generally ranked according to thinning intensity there were no significant differences between treatments. However, shoot length was significantly reduced in the 10% compared with the 40% and 80% treatments. Although the bramble thicket was less well developed in the 10-20% treatments the establishment of tree seedlings was not improved and their mean height was typically less than that of the surrounding bramble.

These results suggest that retention of overstorey cover may be an ineffective method of controlling bramble and will not necessarily improve seedling establishment.

A full report of these results is available in [Forestry](#).

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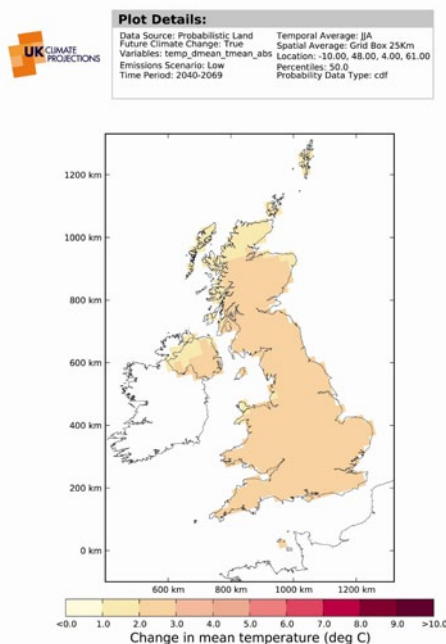
British forestry and climate change: how can changes in climate affect forests?

Michal Petr

The current and future climate in Britain

Climate is a major factor influencing forestry, affecting tree choice and growth across Britain. Based on past observations we know that climate has been changing and is hard to predict. One of the fundamental questions in

forestry then is "How will future climate change influence British forests?" The Read report, 'Combating Climate Change - a role for UK forests', provided the first comprehensive synthesis, but identified the need for further work. The UK Climate Projections (UKCP09) provides the latest climate change projections and offers unique information about the major influential climate variables such as temperature and rainfall. For example, the map here shows the most likely change in mean daily temperature from the UKCP09 projections, indicating an average increase of about 2 degrees Celsius by the 2050s. Such a change could have major implications for how forestry is undertaken in Britain. However, forest planning and management must take into consideration issues of uncertainty when assessing possible responses. Our



Most likely change in summer mean temperature from an average climate in 1961-1990. © UK Climate Projections 2009.

knowledge is improving through better understanding of the complexities of the climate system, but uncertainties remain due to natural climate variability, future greenhouse gas emissions and also climate models themselves.

FR climate change adaptation research

Forest Research are investigating how to incorporate the latest climate change projections into their decision support tools such as Ecological Site Classification (ESC) and working on forestry climate change adaptation strategies. These tools will enable forest planners to assess potential impacts due to climate change whilst taking into account uncertainties. In addition, they will support risk assessment of hazards such as drought and wind that are already having an impact on British forests. More information about climate change adaptation research being conducted by Forest Research in collaboration with other European partners is available for two research projects, [ForeStClim](#) and [MOTIVE](#).

Reference:

Murphy, J.M. et al., 2009. UK Climate Projections Science Report: Climate change projections. Met Office Hadley Centre, Exeter, UK.

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Understanding the value of second rotation forestry to black grouse

Jenny Owen

Black grouse populations often increase around newly-planted forests, but numbers decline as trees close canopy and ground vegetation important to black grouse is shaded out. As large areas of Britain's plantation forests are now reaching harvesting stage, second rotation forest blocks, or 'restocks', are becoming increasingly available. This study aimed to determine the suitability of restocks for black grouse and their broods, and to assess how forest management may improve these new habitats.



Black grouse, *Tetrao tetrix*.

Habitat useful to black grouse in restocks appears to be relatively short-lived. Field data showed that following clearfell, brash (discarded first-rotation tree tops and branches) initially restricted recovery of ground vegetation, which was later shaded by newly-planted conifers closing canopy after only eight years. In the interim period, heather, a key species for black grouse, recovered to a height and density



Typical restock mosaic on the upper forest edge incorporating areas left unplanted.

suitable for feeding, nesting and cover, but dominated for only one to two years prior to canopy closure.

Results suggest that extending the fallow period between clearfell and replanting can increase the period of time when vegetation is available to black grouse. However, recorded increases in mammalian predators, possibly as a result of habitat changes, may mitigate benefits. Invertebrates preferred by black grouse chicks were available in restocks from planting to canopy closure, but Lepidoptera larvae (caterpillars) - a key food item - were more abundant on comparable open ground. On average, 40% of ground in 72 Forestry Commission Scotland restocks was left unplanted for conservation and aesthetic reasons, which is likely to provide a valuable, longer-term habitat resource for black grouse.



Increasing the fallow period prior to replanting allows heather to recover and dominate prior to tree canopy closure.

I conducted this project as a PhD studentship jointly supervised by Russell Anderson (Forest Research) and staff at Royal Society for the Protection of Birds, Scottish Natural Heritage and Stirling University. Black grouse are one of six key woodland species for action under the [Scottish Forestry Strategy](#). Further information about their status and ecology can be found at www.blackgrouse.info.

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News and conferences

2012 Conferences

The SAC/SEPA Biennial Conference 2012, 'Valuing Ecosystems: Policy, Economic and Management Interactions' conference will take place on the 3rd and 4th April 2012. CHES's Chris Quine will be chairing day two of the conference, with our Social Research colleagues Anna Lawrence and David Edwards speaking.

The European Congress of Conservation Biology 2012 (ECCB2012) will be held between 28th August and 1st September 2012 at the Scottish Exhibition and Conference Centre, Glasgow. CHES's Kevin Watts will be jointly running a symposium entitled [Landscape scale conservation](#).

Award winning student

PhD student Matti Salmela ([Ecotype 52](#)) recently won two awards from [The Scottish Forestry Trust](#) for his papers on Scots pine genetics; The Dr. Cyril Hart Memorial Award and the Scottish Woodlands Student Excellence Award.

Publications

[Natural regeneration in western hemlock plantations on ancient woodland sites](#). Ralph Harmer, Kate Beauchamp and Geoff Morgan. Forestry Commission Research Note 011, December 2011.

[Biodiversity in fragmented landscapes: reviewing evidence on the effects of landscape features on species movement](#). Amy Eycott and Kevin Watts. Forestry Commission Research Note 010, November 2011.

Updates to the Woodland Grazing Toolbox

Major revisions to the Toolbox ([Ecotype 50](#)) due soon include:

- Developments of the method of assessing the impacts of large herbivores in woodlands including two additional historic structure types, clearer names for structure types, better descriptions of indicators, more photos and an improved field sheet.
- Simpler and clearer Section 6 (devising a suitable grazing regime) with additional information on accounting for the effects of deer. Clearer and easier to use spreadsheet for calculating appropriate stocking rates.
- Addition of information on using pigs to manage woodlands for biodiversity.

Opportunities to gain skills & experience in Field Ecology

Forest Research are advertising a number of exciting field projects for MSc students this year. These provide experience in a range of areas, enabling the student to develop experimental planning, analysis and reporting skills alongside key field skills. Subjects include assessment of specific components of woodland biodiversity (fungal and invertebrate communities), of feral boar impacts on woodland biodiversity, and evaluation of efficacy of PAWS restoration. Social science projects include consideration of reintroduced or problem species and how to involve communities in wildlife management. Details for all projects are available on our website via this [link](#).

UK Red Squirrel Group

Previously hosted by Scottish National Heritage, the [UK Red Squirrel Group](#) webpages are now on the FR website and contains information and links to the Country groups/forums, and many local and regional red squirrel groups.

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 the Centre for Human and Ecological Sciences 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.

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

www.forestry.gov.uk/forestresearch

www.forestresearch.gov.uk/fr/growingplaces