

## UPDATE REPORT ON SQUIRREL RESEARCH AND MONITORING

From information presented at Country and UK Squirrel Groups and other meetings.  
Please send new items to [mark.ferryman@forestry.gsi.gov.uk](mailto:mark.ferryman@forestry.gsi.gov.uk) (Forest Research)

### NEWS ITEMS

The first National conference on Red squirrel conservation, entitled 'National and International Perspectives on Red squirrel conservation' is to be held at Exeter Business School on 19<sup>th</sup> April 2013. For enquiries and bookings email: [britishredsquirrel@gmail.com](mailto:britishredsquirrel@gmail.com)

A Northern Ireland squirrel seminar (possibly as part of an Ulster Wildlife Trust (UWT) planned event) or a full day conference might be set for later in the year. The next Northern Ireland Squirrel Forum (NISF) meeting is 21<sup>st</sup> February 2013.

New guidance on the ecological impact of development on red squirrels has been published in *UK BAP Mammals; Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation* published by the Mammal Society 2012 (other species covered include harvest mice, hares, hedgehogs, wildcats, pine martens, and polecats). Also recently published are two booklets, one called *Squirrels* written by John Gurnell, Peter Lurz and Luc Wauters and published by The Mammal Society 2012, and the other called *The Eurasian Red Squirrel* *Sciurus vulgaris*, NBB English Edition (2012) by Stefan Bosch and Peter Lurz. See publications at the end of this report for full references.

The Cornwall Red Squirrel project has appointed Natasha Collings [Natasha.collings@rsst.org.uk](mailto:Natasha.collings@rsst.org.uk) as its first full-time co-ordinator. The aim of the project is to re-introduce Britain's native red squirrel into Cornwall. The last red squirrel was seen in Cornwall in 1984. Cornwall is ideally suited to this project because of its relative isolation from the mainland, and the presence of wooded valleys and mixed woodland which offer suitable red squirrel habitat. The project will start with reintroductions on The Lizard and in West Penwith. These sites have been identified in a habitat survey as being suitable for re-introduction. As the two areas are surrounded by sea on three sides they are also more easily defended against re-population by grey squirrels.  
<http://www.cornwallredsquirrels.co.uk/>

Bristol Water plc has produced a red squirrel project proposal for Denny Island in Chew Valley Lake, Somerset (SSSI/SPA), an island that currently supports grey squirrels. The island covers 6Ha and habitat enhancement work including the removal of greys is proposed for 2012-13, prior to the introduction of captive-bred red squirrels. Greys will be controlled on the mainland shoreline of Chew Valley Lake in the vicinity of Denny Island. (See translocations advice below in terms of leaving woodland without squirrels).

Translocations advice: Protocol is required for restricting the spread of disease (adenovirus and SQPV). UKRSG to produce guidance to include health checks for the translocation of red squirrels. Possible regulation needed, e.g. licence to release reds as well as capture. In England the licence required for red squirrel capture from the wild does not cover release, so there is no power to enforce health checks. Legalities would depend on whether the red squirrel is added to schedule 9. Some poxviruses remain infectious in fomites (droppings, hair, skin) for up to, or more than a year if they are kept cool and dry (conditions that you would expect within a drey). If a grey population that is being eradicated is seropositive for the virus, the advice to cut the risk of exposure is to leave the woodland without squirrels for a year before repopulating and destroy the existing grey dreys before releasing the reds.

Following the introduction of the Wildlife and Natural Environment (Scotland) Act 2011 (WANE Act), Scottish Natural Heritage can licence restricted forest activities that could affect red squirrels. Such licences can only be issued if an activity will contribute to significant social, economic or environmental benefit. This covers a range of forestry activities, including felling as part of an approved forest plan. Forestry Commission Scotland is working to produce guidance on how to licence forest operations that may disturb red squirrels and a project is currently underway with Forest Research to assess the behaviour of red squirrels in relation to forest operations. [mark.ferryman@forestry.gsi.gov.uk](mailto:mark.ferryman@forestry.gsi.gov.uk)

The Ring of Gullion Red Squirrel Group was formed in the summer of 2012 and operates in the south Down /Armagh border region of Northern Ireland where there are a mix of red and grey squirrels in a patchwork landscape of forestry and bog land. The group operates over an area of about 15300 hectares with at least five healthy groups of red squirrel in different areas. There are populations of grey squirrels on the North East from Newry City, South in County Louth and West from the rest of South Armagh however sightings of greys within the Ring dyke have, thankfully, remained absent up until now. The group has close ties with local landowners,

businesses in the area, Newry and Mourne District Council and has a good working relationship with NI Forest Service. [www.ringofgullion.org/Red-Squirrel-Group.aspx](http://www.ringofgullion.org/Red-Squirrel-Group.aspx)

The [Glens Red Squirrel Group](#) assisted staff from Belfast Zoo in May-June 2012 in collecting red squirrels from the wild for display with the zoo. Three red squirrels (two females and one male) were collected from the Glens of Antrim under NIEA licence. The squirrels currently have the run of two enclosures which are linked by two overhead runs. While the primary purpose is an educational role, it is hoped that they will breed and their offspring can be returned to the wild in Northern Ireland. The zoo would like to expand this breeding program if these initial steps prove successful.

The Northern Ireland Environment Agency commissioned Queens University to undertake an investigation into the prevalence of SQPV and transmission route between animals. Using a real-time PCR technique allowed an accurate, specific quantification of prevalence. The work has finished and a final report is due shortly.

Key points from the results include:

1. The role of ectoparasites in the spread of squirrel pox is confirmed – fleas in particular seem to carry virus load.
2. Blood, faeces, saliva and surprising urine can contain shed virus particles; the numbers shed rises with advanced stages of the disease. Frontier groups of grey squirrels pose a higher risk to reds as they tend to carry higher viral loads. The full report is to be published in 2013. [Jon.Lees@doeni.gsi.gov.uk](mailto:Jon.Lees@doeni.gsi.gov.uk)

An [end of project report](#) has been produced for the Red Squirrels of the Highlands Project (2009-2012). The charity (Highland Red Squirrel Group) has undertaken to maintain the high profile of red squirrels, submit records to the SSRS database and help answer general queries. A contingency plan for grey squirrel sightings is being developed in conjunction with stakeholders.

The Red squirrels in South Scotland (RSSS) project is now integrated with the Saving Scotland's Red Squirrels (SSRS) project to form a national red squirrel conservation scheme. Forestry Commission Scotland is a contributor to the project.

Dr Andy White is leading on a NERC application to develop competition modelling approaches with squirrel pox as a case study of a disease mediated ecological invasion. The research also involves Dr Mike Boots at Exeter, Prof Colin McInnes from the Moredun and Dr Peter Lurz. They hope to examine factors that affect the rate of spread; both in terms of landscape character and in terms of population structure and to look at the effect of management strategies on the spread of the disease. They hope to work with data from SSRS and to help inform policy development.

Lisa Signorlie - Imperial College London - provided a copy of a poster of her research on the genetics of grey squirrel populations which was circulated at the Scottish Squirrel Group meeting on 19<sup>th</sup> September 2012. Amelia Brereton - University of Aberdeen gave a PowerPoint presentation on the scope of her PhD (2011) research. This had two main aspects to; examine factors that influence the effectiveness of grey squirrel control and to examine the parasites found in grey squirrel populations and the implications for disease transmission. The PhD was supervised by Sandra Telfer.

Silvia Flaherty – University of Edinburgh – recently completed her PhD on 'red squirrel habitat mapping using remote sensing'. A paper from her thesis was published in 2012 'The impact of forest stand structure on red squirrel habitat use. See the abstract at: <http://forestry.oxfordjournals.org/content/85/3/437.abstract> and the full reference at the end of this report.

J. Gurnell, P. Lurz, C. Breummer & A. Meredith are carrying out a 22-month study (Mar 2011-Dec 2012) entitled "Monitoring of squirrel populations at Foulshaw and Meathop Mosses" with funding from Cumbria Wildlife Trust. This will include using camera traps.

Forestry Commission Scotland (FCS) has produced [Guidance for managing forests as red squirrels strongholds](#) The red squirrel strongholds programme is part of the Scottish Government's strategy to secure the future of red squirrels in Scotland. 18 stronghold areas have been identified in public and private areas. The island of Arran, in itself an island stronghold, has not yet been specifically identified, but is the only Scottish island with a resident red squirrel population and vigilance against grey squirrels on the island will be the primary means to safeguard red squirrels. As a precautionary measure, the principles of stronghold management will be incorporated into the management of some of the national forest estate on the island so that red squirrels on Arran will have a refuge should grey squirrels ever establish themselves. As the process moves on, FCS will work with partners to make sure the strongholds programme aligns with other red squirrel conservation actions so that there is a coherent set of measures throughout Scotland. Framework management plans for the

strongholds are being produced— A report has been produced for Forestry Commission Scotland on recommendations for the management of the Arran red squirrel stronghold.

Emma Sheehy - The Mammal Ecology Group, of National University of Ireland (NUI) Galway is examining the relationships between three woodland mammal species in Ireland; the native **red squirrel** and **pine marten**, and the introduced **grey squirrel**. This project aims to increase understanding of the ecology of all three animals, and help in the conservation of the two native species. "Recent anecdotal reports have linked a revival of red squirrel populations and a reduction in the range of grey squirrels, in certain midland counties of Ireland, with the resurgence of the pine marten. It has been suggested that the pine marten is preying on the introduced grey squirrel to a greater extent than the more nimble red squirrel. This projects aims to investigate the relationship between the three species, and identify (if any) the impact that the pine marten is having on squirrel dynamics in Ireland. The work will feed into existing squirrel research in the Mammal Ecology group and inform conservation and management policies in Ireland and other parts of Europe. The initial stage of the project involves a survey of the three species in the counties in question. [The Irish Squirrel and Pine Marten Project](#) is funded by the Irish Research Council for Science, Engineering and Technology, under the Embark Initiative, and is being carried out by Emma Sheehy B.Sc. (Hons) of the Mammal Ecology Group, NUI, Galway under the supervision of Dr. Colin Lawton. [emmasheehy@gmail.com](mailto:emmasheehy@gmail.com)

Margaret Flaherty - The Shannon Project which is investigating the spread of grey squirrels to the west of Ireland is funded by COFORD of the Department of Agriculture, Food and the Marine and is being carried out by Margaret Flaherty MSc of the Mammal Ecology Group, NUI, Galway under the supervision of Dr. Colin Lawton. [The Shannon Project - About margaret.flaherty@nuigalway.ie](#)

**MONITORING:** see the terrestrial mammals section of the [National Biodiversity Network Gateway](#) (NBN) to create UK distribution maps of squirrels from datasets- [About the NBN](#)

For information on ecology and management of woodland species e.g. squirrels see <http://www.harpps.org.uk/harppsapp/harpps2/web/secure/autecology>

Wales Red Squirrel Conservation Plan available to download from the CCW website <http://www.ccw.gov.uk/landscape--wildlife/habitats--species/terrestrial/species/mammals/red-squirrels.aspx>

Forestry Commission- Conserving Scotland's Red squirrels [Red squirrel conservation priorities and key actions](#)

Analysis of Scotland Strongholds consultation <http://www.forestry.gov.uk/strongholdsconsultation>

Forestry Commission Scotland (FCS) and Scottish Natural Heritage (SNH) have worked to produce a joint agency statement on red squirrel conservation <http://www.snh.gov.uk/docs/B829774.pdf> or see the website <http://www.forestry.gov.uk/redsquirrelconservation>

Northern England Red Squirrel Review (2009) [Review of red squirrel conservation activity in northern England - NECR019](#)

Emily Goldstein - [Munster Squirrel Project](#): The project (started September 2010) to determine the current distribution of red and grey squirrels in Munster, Ireland. This project aims to model and map the future range expansion of the grey squirrel and predict the effects on the native red squirrel. The Munster Squirrel Project is funded by the Irish Research Council for Science, Engineering and Technology, under the Embark Initiative, and is being carried out by Emily Goldstein M.Sc of the Mammal Ecology Group, NUI, Galway and the Biodiversity and Ecotoxicology Group, UCC under the supervision of Dr. Colin Lawton and Dr. Mark Emmerson.

Assessment of Squirrel Distribution in Ireland Coford Funded. Completed September 2007. (NUI Galway/Trinity College, Dublin/CRISIS project). The [Irish Squirrel Survey](#) report.

All Ireland Red Squirrel Species Action Plan published in 2008 [http://www.doeni.gov.uk/niea/all-ireland\\_red\\_squirrel\\_sap\\_web\\_version\\_may\\_08~changed~final\\_2\\_.pdf](http://www.doeni.gov.uk/niea/all-ireland_red_squirrel_sap_web_version_may_08~changed~final_2_.pdf)

[Mammals in a Sustainable Environment \(MISE\)](#) is a project funded by the European Regional Development Fund under the Ireland Wales Programme 2007-2013 (INTERREG IVA), and will set out to foster involvement of Report-Research and Monitoring feb 2013

communities in Ireland and Wales in mammal conservation. The nature of the Welsh/Irish INTERREG IVA collaboration will allow the sharing of skills and expertise across the cross border regions. Monitoring and conserving biodiversity is increasingly being recognised as critical for sustainable development. Small and medium sized mammals are key components of most ecosystems but can be difficult to monitor due to small numbers, elusive and or nocturnal behaviour. Within the INTERREG IVA area, fieldwork in Ireland will largely be carried out in Waterford but will also involve Kilkenny, South Tipperary, Wexford, Dublin and Wicklow. In Wales, fieldwork will be throughout the INTERREG IVA region. Survey work in Ireland will involve monitoring different mammals including otters, pine martens, bats and squirrels. Monitoring in Wales will include some mammals absent in Ireland such as polecats, weasels, harvest mice and dormice. Survey methods include scat/spraint collections, Hair-tube surveys and small mammal feeding stations.

Gurnell et al. (2007) Developing a monitoring strategy for red squirrels (*S. vulgaris*) across the UK. JNCC & PTES funded. This report concerns survey and monitoring methods for squirrels in the UK and was commissioned by the Joint Nature Conservation Committee and the People's Trust for Endangered Species. [Full report](#). See revision (2009) of FC Practice Note 11 '[Practical Techniques for Surveying and Monitoring Squirrels](#)'

P. Lurz, J. Gurnell, with others, have collated 1990-2010 squirrel distribution records for the north of England and Scotland.

Yorkshire Dales National Park. Survey of Reds & Greys in 2006.

Reds confirmed in all 8 woodlands surveyed, using hair tubes, in 6-8 sites from sightings at feeders. Confirmed grey from 3-8 sites from feeders and hair tubes.

Contact Ian Court for further information. [Ian.Court@yorkshiredales.org.uk](mailto:Ian.Court@yorkshiredales.org.uk)

**RESEARCH - RED SQUIRRELS:** see also [SquirrelWeb current and recent projects](#)

#### **SQPV / ADENOVIRUS**

For latest map of SQPV in GB check the [News and Events page](#) on the UKRSG web pages or contact [David.Everest@ahvla.gsi.gov.uk](mailto:David.Everest@ahvla.gsi.gov.uk)

For more information about what to do if you find a sick, injured or dead red squirrel go to the [RSSS FAQ](#) webpage.

#### **Outbreaks SQPV:**

Outbreak of SQPV at Paxton House, Berwickshire December 2011. Two diseased red squirrels, one confirmed SQPV. No reds seen in the area between Jan-March 2012.

A seropositive grey squirrel confirmed at Culzean Country Park, Ayrshire 13/12/2011.

A sero-positive grey squirrel was caught in Newton Stewart - reported at SSG Sept 2011.

The SQPV outbreak at the Buccleuch Queensbury Estate, north of Dumfries has resurfaced with the confirmation of four SQPV red squirrels found between April and Sept 2011.

There was an increase in numbers and distribution of seropositive grey squirrels between March and Sept 2011 in South Scotland. In March 2011 high numbers of seropositive grey squirrels were caught at a number of estates adjacent to the River Tweed in south east Scotland. Red Squirrels in Northern England (RSNE) implemented emergency control across the English side of the border in response to this.

Confirmation of an outbreak of Squirrel Pox in Tollymore Forest, County Down, Northern Ireland 3-4 April 2011. **First SQPV in Northern Ireland.** See <http://www.bbc.co.uk/news/uk-northern-ireland-12935115>

Five red squirrels have been found dead near Haltwhistle, Northumberland. Provisional tests on two of the animals found the cause of death was adenovirus. The others are being post-mortemed. Cumberland News 18/3/2011 (Page: 7).

A SQPV red squirrel was found at Maxwellton Estate just south of Kirkland in March 2011, following the control of seropositive greys in Dalnacallan Forest, Moniaive. This is a new squirrelpox outbreak area in south Scotland. Intensive trapping was implemented around Thornhill and Moniaive.

January - Dec 2008 Outbreak of SQPV at Sefton, Lancs. 13 confirmed cases of Red's with Squirrel pox, one being treated waiting result and one recently found. Local extinction on site especially near NT feeding station. Feeding stopped as no squirrels left. NB Feeding is useful for seeing and catching sick squirrels. 60% decrease in red squirrel numbers at Formby, since 2007 due to an outbreak of squirrel pox virus.

Confirmed SQPV in reds around Swarland near Alnwick, NE England April & August 2008 and in Drumlanrig, South Scotland, after positive greys found in same area. Dead reds at Annan, Dalton and Langholm, April 2008. One Red with Squirrel pox on eastern fringe of Kielder Forest March 2008 (Sidwood).

Seropositive grey squirrel in Innerliethen, near Peebles Sept 2007.

Two Reds with Squirrel pox virus found near Lockerbie 8 & 12 May 2007.

Two seropositive grey squirrels have been found in a woodland in Mauchline, East Ayrshire (approximate grid NS520273). RSSS has been controlling greys and sampling bloods with no previous cases being detected. As their presence represents a huge leap to the north it is suspected that these animals may have been released by someone.

Report of Greys in New Milton, Hampshire showing SQPV symptoms (puffy eyes, lesions). C McInnes & D Everest at the VLA have been advised.

### Research SQPV/Adenovirus:

Adenovirus: This is possibly more of a threat as there are no external signs of the disease. It can only be picked up in post mortem. It seems to hit captured populations more seriously and this might have an impact on any proposed translocations, especially in England where captured populations are a vital source. This spreads not just from animal to animal but also through inanimate objects such as traps/feeders/boots. This disease can wipe out a population very quickly (posted Nov. 2011).

There is little evidence that red squirrels in general are able to survive SQPV infection, hence there is a low likelihood of finding resistance/resilience to SQPV infection in red subspecies. No studies to date have specifically looked at subspecies and their susceptibility to squirrelpox virus.

Progress with testing of dipstick developed by [Moredun Research Institute](#) for testing of blood samples for SQPV antibodies is ongoing. Virus held by Moredun Research Institute.

Real time PCR developed at Liverpool University to identify the virus in animals and the environment. This is much more sensitive than previous tested PCR.

Moredun, Zoological Society, VLA - monitoring of pox presence in red carcasses and monitoring of blood for antibodies. Antibodies found in 40% of greys sampled in South Scotland.

(No date) Ireland pox antibodies confirmed but no disease seen. A limited analysis of grey squirrel blood samples in 2009 suggested that the percentage of seropositive greys is steadily increasing since 1999.

Sally Sue Bell, PhD Heriot-Watt University 2010 in invasive species and disease dynamics, using SQPV as a case study. Results suggest that culling greys may be effective at protecting red populations from replacement, but none of the conservation strategies currently employed can prevent periodic outbreaks of infection within red squirrel refuges. Mathematical Models Assessing the Importance of Disease on Ecological Invasions [http://www.ros.hw.ac.uk/bitstream/10399/2316/1/BellSS\\_0310\\_macs.pdf](http://www.ros.hw.ac.uk/bitstream/10399/2316/1/BellSS_0310_macs.pdf)

January 2009. [Vaccine development work at Moredun](#). Viruses grown in culture to promote attenuation. Identifying parts of virus recognised by squirrel immune system to enable development of subunit vaccine. First 2 years funded through Wildlife Ark Trust.

July 2008 onwards. Intensive trapping of greys along Lyne and Irthing valleys and North Tyne valley to protect Kielder reds. Traps loaned from Red Squirrels South Scotland.

Wendy Mitchem-Lines MSc, Sparsholt 2007. (FR & Moredun) Comparison of current and historical data on the proportion of seropositive greys in two populations. Results provide evidence in support of virus surviving in absence of Reds.

Caterina Fiegna, 3 yr PhD study, Moredun supervised by Colin McInnes, started June 2007. 'Development of an understanding of the transmission of squirrelpox virus to inform red squirrel conservation in Scotland'. Transmission grey-grey and grey-red, funded by SEERAD.

Corrie Bruemmer – PhD study - London and Newcastle Universities. Investigating epidemiology of poxvirus in red & grey squirrels on local, regional and national scale, by:

1. Investigating the spatial dynamics of poxvirus spread in red and grey squirrel populations from past documented disease outbreaks in the UK.
2. Quantifying the incidence and distribution of poxvirus in grey squirrels in Cumbria.
3. Quantifying the incidence of poxvirus in grey squirrel populations at local (woodland) population and investigate the role of between species transmission at the level of interacting individuals through analysis of space use.

Gurnell et al. Short study to quantify and understand the role of grey squirrels in spreading squirrel poxvirus (SQPV) to red squirrels:

1. by using molecular techniques to determine where SPQV resides in the body;
2. by carrying out field work to determine the feasibility of carrying out longitudinal studies on SPQV in grey squirrels.

CURRENT PROJECTS (SQPV) provided by Colin McInnes at the SSG meeting 19<sup>th</sup> September 2012:

- Lisa Collins/ Neil Warnock – Queens University Belfast – are looking at the epidemiology of squirrelpox in Northern Ireland.
- Mike Scatlebury/ Nikki Marks – Queens University Belfast – Parasite effects on life history characteristics of the grey squirrel and implications for the conservation of the red squirrel in Northern Ireland.
- Luc Wauters/ Italian LIFE+ project – Eradication and control of grey squirrel: actions for preserving biodiversity in forest ecosystems. This is looking at various aspects including pathogen burdens in grey squirrels in Italy and through links to other labs, genetic diversity in squirrel populations.
- Helen McRobie – Anglia Ruskin University – Quantifying virus in grey squirrels.
- PhD Supervised by Julian Chantrey & Mike Begon, Liverpool University is investigating the epidemiology of squirrelpox in the Sefton red squirrel population and other surviving Lancashire populations of reds following 2008 SQPV epidemic. Starting mid-2009.

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#### **OTHER RED SQUIRREL PROJECTS:**

Conifers and red squirrel refuges (Forest Research): Analysis of data collected through Forest Health Survey on coning for Norway & Sitka Spruce and Scots Pine. Larch included from 2005. [alice.broome@forestry.gsi.gov.uk](mailto:alice.broome@forestry.gsi.gov.uk)

Selective access traps and feeders in N England A 'lift the lid' hopper, containing chopped hazelnuts, inside a mesh cube, which is selective for reds (only allows an animal <380 g through mesh). To be published in 'Transactions of the Natural History Society of Northumbria 2008'.

A live trap has been modified to select for greys by letting reds out. Mesh at one end has been replaced with a version of the mesh used in the hopper. Greys >380g trapped. [veronicacarnell2@hotmail.com](mailto:veronicacarnell2@hotmail.com)

Use of Rope Bridges by red squirrels - Gavin Skipper & Jim Downie

Stephen Lockwood 2008 MSc project, Leeds University. 'Can canopy rope bridges provide habitat connectivity for arboreal mammals?' A pilot study of rope bridge use by red squirrels, *Sciurus vulgaris*, on the Cowal Peninsula, West Scotland'. Rope bridges can aid arboreal mammals such as red squirrels crossing areas of unsuitable habitat. The baiting of bridges can increase the number of crossings, although this does not appear to increase the habituation of the squirrels to the bridges, and the baiting may just increase the number of events by decreasing the need of squirrels to forage for food in other areas. There is little or no habituation period required before red squirrels will start using the rope bridges, making them an effective tool for long and short term conservation of a species. Contact. [james.downie@lochlomond-trossachs.org](mailto:james.downie@lochlomond-trossachs.org)

Sutherland Red Squirrel Project. Dr Joeline Hughes and Prof. D Macdonald, Wildcru and Oxford University. Funded by The European Nature Trust. Network analysis of habitat suitability for red squirrels and defendability against greys.

Habitat preferences of Red and Grey squirrels in Tentsmuir Forest, Fife. Dr Justine Ina Davies, University of Dundee Bsc. Hons Thesis. March 2008

The distribution of Red Squirrels in relation to habitat quality in an area of northern Scotland. G.T.O. Davies. University of Newcastle 2006.

Feeding Activity patterns and interspecific interactions of red and grey squirrels. Henry Dobson MSc? Project University of Glasgow. 2006?

**The Red Squirrel Survival Trust (RSST).** The Red Squirrel Survival Trust is a national charity established to ensure the conservation and protection of the red squirrel in the UK. RSST support the Red Squirrels South Scotland project ([RSSS](#)), a public-private partnership with strong volunteer involvement. RSST is a partner in the Saving Scotland's Red Squirrels project and is involved in a partnership project called Red Squirrels Northern England ([RSNE](#)). The project partners are RSST, the Forestry Commission, Natural England and The Wildlife Trusts and the project is set to run for 5 years. As well as the project partners, it incorporates local volunteer groups associated with Northern Red Squirrels and other local red squirrel conservation groups. Project Manager (RSNE) Nick Mason (from April 2011) <http://www.rsst.org.uk/>

**SAVE OUR SQUIRRELS PROJECT (SOS)** Charity Number 221819 [www.saveoursquirrels.org.uk](http://www.saveoursquirrels.org.uk) (new webpages)

Save our Squirrels is the largest single-species conservation project taking place in the UK at present, and has a budget of £1.2M over the next three years to undertake red squirrel conservation, information, and access projects in the North of England and beyond. Over 50% of this budget has come from the Heritage Lottery Fund, with the balance being funded by the public and private sector businesses that make up Red Alert North England and donations from the general public. Save our Squirrels was created by Red Alert North England in 2006 to deliver the North of England Red Squirrel Strategy, but is managed and directed by Northumberland Wildlife Trust.

SOS Project aims and objectives are to: 1. Raise the profile and plight of the red squirrel through education, engagement and access work, 2. Undertake habitat management and squirrel conservation activities with the landowners and managers in the 16 reserves and surrounding areas, 3. Secure the long-term sustainability of red squirrel conservation, access and public engagement

Project manager is Carri Nicholson [carri.nicholson@northwt.org.co](mailto:carri.nicholson@northwt.org.co) or [info@saveoursquirrels.org.uk](mailto:info@saveoursquirrels.org.uk)

**Red Squirrel Protection Partnership (RSPP)** (Note the link (<http://www.rspp.org.uk/>) for the RSPP not working February 2013).

Project to control grey squirrels in NE England, to protect red squirrel reserves. Project Manager Lord Rupert Redesdale.

#### **RED / GREYS IN ANGLESEY (Menter Môn.)**

A red squirrel found with suspected SQPV in Pentraeth Forest February 2008. SQPV not confirmed. It was taken to Welsh Mountain Zoo for treatment, but died.

Modelling by CSL re. potential for eradicating grey squirrels from the island. Preliminary and final reports will be produced by spring 2007. See Friends of the [Anglesey Red Squirrels](#)

Squirrelpox outbreak in Newborough Forest on Anglesey in December 2006. Treatment of diseased animals has been successful and over 40 red squirrels present in the forest May 2007.

A collaborative research project to assess the impact of grey squirrel control carried out on Anglesey 2002-06. [craig@redsquirrels.info](mailto:craig@redsquirrels.info)

#### **RED SQUIRRELS IN ARRAN**

Katharine Miller BSc project Stirling. An investigation into the distribution of red squirrel on the Isle of Arran and use of gardens by squirrels. Includes limited cone analysis for SS, larch and LP.

#### **RED SQUIRRELS IN IRELAND**

Emma Sheehy - Project examining the relationships between three woodland mammal species in Ireland; the native **red squirrel** and **pine marten**, and the introduced **grey squirrel**. [The Irish Squirrel and Pine Marten Project](#)

[emmasheehy@gmail.com](mailto:emmasheehy@gmail.com) (more details posted under 'Pine marten predation of squirrels').

Red squirrel translocation project (National University of Ireland, Galway)  
Following a successful translocation of reds to uninhabited woodland, in which the translocated squirrels became established and started breeding, a second site has been selected. The National Parks and Wildlife Service are sourcing a donor population.

Red squirrel genetics (Trinity College, Dublin) PhD examining Irish red squirrel genetics confirmed the existence of a native Irish red squirrel lineage.

CRISIS Project. [Department of Agriculture, Food & the Marine, Rep. of Ireland](#)  
Multi-faceted study examining red squirrel conservation through grey squirrel control.  
[Methodology and Reports.](#)

Kate O'Loan, Coleraine. MSc GIS analysis to identify priority sites for red squirrels in NI based largely on the methodology of Poulson et al (2005) in Scotland as described in a report commissioned by SNH.

Anne McComb (Tollymore Red Squirrel Group) Impact of the supplementary feeding of red squirrels (*Sciurus vulgaris*) and the culling of grey squirrels (*S. carolinensis*) on the populations of red and grey squirrels in Tollymore Forest Park (J336317), County Down, Northern Ireland.

Lara Wilson-McKee - An Investigation into the Public Perception on Control of Invasive Alien Species: Case study on the Grey Squirrel - Queen's University Belfast.

Claire Dunphy - Landscape favourability for Red and Grey Squirrels in Northern Ireland and Development of a draft Local Species Action Plan for the Red Squirrel in the Glens of Antrim - Queen's University Belfast / Quercus / NIEA.

Patrick O'Shea - 'An Exploration of the Food Preferences of Red Squirrels (*Sciurus vulgaris*) and Grey Squirrels (*S. carolinensis*) Feeding at Selective Supplementary Feeders'. – Queen's University Belfast.

**RESEARCH - GREY SQUIRRELS:** see also [SquirrelWeb current and recent projects](#)

Report on public attitudes to grey control in Aberdeen. SNH Commissioned Report no.384: 'Assessment of public attitudes to grey squirrel control in Aberdeen 2010. <http://www.snh.org.uk/pubs/detail.asp?id=1659>  
Contact Isla Martin for enquiries regarding the report: [Isla.martin@snh.gov.uk](mailto:Isla.martin@snh.gov.uk)

Public Opinion Survey (ESI) <http://www.europeansquirrelinitiative.org/survey.html>  
Repeat of UK telephone survey – February 2006. Range of socio-economic classes.  
Shows increasing awareness and support for reds and control of greys to benefit reds.

Anna Lisa Signorile Ph.D. Project to evaluate the inbreeding coefficient of European grey squirrel populations by examining the heterozygosity at specific loci through microsatellite analysis of DNA. Title: 'Genetic and Ecological Determinants of the Expansion of Grey squirrel Populations across Europe'.  
Project funded by NERC at Imperial College London and the Institute of Zoology. Supervisors are Dr Dan Reuman, Dr Chris Carbone, Dr Jinliang Wang, and Dr. Tony Sainsbury. Dr Sandro Bertolino (University of Turin) & Dr. Peter Lurz (Newcastle University) are outside supervisors and collaborators. FC is providing samples. See project outline on [SquirrelWeb](#).

MSc Imperial College & Forest Research, Rachel Marshall. Handling of larch seed by grey squirrels; Can they distinguish filled from empty?

MSc Imperial College & Forest Research, Jamie Samson (2008). [Factors affecting foraging behaviour in the grey squirrel \(\*Sciurus carolinensis\*\), under manipulated field experiments.](#)

Amelia Brereton, PhD from Oct 2011, at Aberdeen University on the effect of grey squirrel control on grey squirrel movement, supervised by Sandra Telfer. The Centre for Ecology & Hydrology (CEH), UCL is also involved.

Edinburgh University Undergrad project - Investigating the arrangement of energetic content in woodlands to determine what conditions may foster co-existence of red and grey squirrels: an example of a bioenergetic model. The Fife Red Squirrel Group is supporting the project.

[Developing methods of predicting grey squirrel damage](#) (Forest Research). A Project that assesses natural food availability, grey squirrel presence and trapability (called 'Index-trapping') in 'grey squirrel holding habitats' in January, then compared with tree damage levels in adjacent 'vulnerable habitats' in September. The data from this nine-year study is in the process of analysis. The working title is 'Using tree seed availability in mid-winter to predict risk of summer bark-stripping damage by grey squirrels'. [mark.ferryman@forestry.gsi.gov.uk](mailto:mark.ferryman@forestry.gsi.gov.uk)

Christopher Nichols – PhD Study (started October 2012). The aims of this project are to discover the reasons why grey squirrels strip the bark from trees and to explore the development of commercial products (such as dietary supplements or deterrence devices) that could be developed to solve this problem. Whilst the underlying causes for this behaviour are probably multi-faceted, our working hypothesis is that grey squirrels are eating phloem to gain calcium. Trees are most vulnerable to bark stripping during the spring and summer, and it is plausible that juveniles and female adults may be prone to calcium deficiency at this time – juveniles because they have just passed through their main period of bone growth, and female adults because of post-partum rigours such as lactation. In addition, after a good mast year grey squirrels will have received an unsaturated fatty acid-enriched autumn feed, and may be prone to calcium deficit in subsequent months. Initially the project aims to test this hypothesis as well as gathering baseline physiological data with a view to aiding and informing ongoing research on the development of grey squirrel contraceptive agents. Supervisors are Nigel Goode (Royal Veterinary College) and Robin Gill (Forest Research). [christoper.nichols@forestry.gsi.gov.uk](mailto:christoper.nichols@forestry.gsi.gov.uk)

[Influence of tree size and dominance on incidence of bark stripping by grey squirrels to oak and impact on tree growth](#) (Forest Research) in Forestry. See publications Mayle *et.al* 2009.

## REPRODUCTIVE INHIBITION

[Reproductive inhibition](#) (Forest Research) (2006-09) Collaborative studies with Food and Environment Research Agency, (Fera) and the National Wildlife Research Center, (NWRC), USDA, USA. funded by Defra, FC & SNH. Fertility control vaccines developed in the USA are being tested in grey squirrels. They are not species specific. Specificity will need to be achieved through bait delivery systems. The work involves: 1. Identification of the best carrier bait and suitable bait markers, 2. Evaluation of bait uptake 3. Field trials. [mark.ferryman@forestry.gsi.gov.uk](mailto:mark.ferryman@forestry.gsi.gov.uk)

See Mayle, B.A., Ferryman, M., Peace, A., Yoder, C., Miller, L. & Cowan, D. 2012 The use of DiazaCon™ to limit fertility by reducing serum cholesterol in female grey squirrel, *Sciurus carolinensis*. Pest management Science (2012) wileyonlinelibrary.com DOI 10.1002/ps3347 [The use of DiazaCon™ to limit fertility by reducing serum cholesterol in female grey squirrels, Sciurus carolinensis - Mayle - 2012 - Pest Management Science - Wiley Online Library](#)

### Immuno-contraception (ESI)

Professor A Peters of Arpexas Ltd / ESI is leading a group examining the potential for fertility control in grey squirrels, using a sperm antigen approach.

## BIODIVERSITY IMPACTS - BIRDS

Colin Bonnington PhD Squirrels in suburbia: The avian impact of urban grey squirrels. To determine the variables which influence the distribution of grey squirrels in an urban environment and investigate the impact that the species has on bird populations in that habitat. (University of Sheffield: Dr Karl Evans and Professor Kevin Gaston; NERC funded). <http://aps.group.shef.ac.uk/apsrtp/aps-rtp-2010/bonnington-colin/research.html>  
There is little evidence to support suggestions that greys are a significant predator of woodland birds.

Newson et al, 2009. This recent study by scientists from the British Trust for Ornithology and Natural England found no evidence that grey squirrels have any significant impact of woodland birds in England. (Review of woodland bird breeding performance, comparing success within and outwith grey squirrel range for bird species).

Nest Camera Predation Pilot Study. (From Woodland Bird group minutes)

4-month project over 4 sites in the New Forest in 2007. Cameras monitored 50 nests of 8 species, no canopy nesters were included (20 with cameras). 4 predation events recorded, but none by grey squirrels. Predators

included tawny owls, jays and song thrush. In 2008, 18 nests had been monitored and no predation by grey squirrels had been seen.

Stable Isotope analysis of grey squirrel diet to investigate seasonal variation in plant and animal components. (Newcastle University FC funded). Results were inconclusive.

RSPB video monitoring of spotted flycatcher nests 2005-08 showed no predation events by grey squirrels.

The [Game & Wildlife Conservation Trust](#) 'Controlling grey squirrels, to help woodland birds'. A study funded by The European Squirrel Initiative, The Dulverton Trust and Lord Barnbys' Foundation. In a pilot study in spring 2007 the number of fledged birds (productivity) was assessed in 3 pairs of woods. In 2008 the presence & breeding success of birds measured April/May & May/June in 5 regional pairs of woods (grey squirrels removed from one of each pair of woods). Squirrels were successfully removed from 4/5 woods. Bird productivity was greater in woods with squirrels removed, but also greater where breeding densities were lower. More corvids (1-2) were also recorded in woods with more squirrels. 5 more wood pairs were to be selected for 2010. [Game & Wildlife Conservation Trust - Press Releases](#)

## GREYS IN IRELAND

Emma Sheehy - Project examining the relationships between three woodland mammal species in Ireland; the native **red squirrel** and **pine marten**, and the introduced **grey squirrel**. [The Irish Squirrel and Pine Marten Project](#)  
[emmasheehy@gmail.com](mailto:emmasheehy@gmail.com) (more details posted under 'Pine marten predation of squirrels').

Margaret Flaherty - The Shannon Project is investigating the spread of grey squirrels to the west of Ireland, is funded by COFORD of the Department of Agriculture, Food and the Marine and is being carried out by Margaret Flaherty MSc of the Mammal Ecology Group, NUI, Galway under the supervision of Dr. Colin Lawton.  
[margaret.flaherty@nuigalway.ie](mailto:margaret.flaherty@nuigalway.ie)  
[The Shannon Project - About](#)

Grey squirrel control 2006-08? (Trinity College, Dublin). PhD project investigating grey squirrel impacts and control.

Dr F Naulty and Prof T Hayden (2008) Phoenix Park Grey Squirrel Project Removal of grey squirrels from two city parks in Dublin.

## GREYS IN EUROPE

LIFE+EC-SQUARE Project website now on-line. A partnership project for the conservation of the European Red squirrel, protecting the species from the competition of the introduced Eastern Grey squirrel. October 2010 LIFE+ funding for control of greys in North Italy (Ticino), supported by a communication plan to highlight problems caused by greys and benefits of eradication. Sandro Bertolino is the project's general manager. [www.life-ecsquare.eu](http://www.life-ecsquare.eu) (English language available). See also [News page](#) (articles mostly in Italian).

Red and grey squirrels in Italy: News from the European Squirrel Initiative suggests the native Eurasian red squirrel is becoming extinct in the country's Piedmont region, having already disappeared from a large area south of Turin. The article describes the spread of the grey squirrel in Piedmont and the associated extinction of the red squirrel. [ESI Newsletter](#) (Issue 25 pages 9-10 October 2012).

Greys are in three areas where red squirrel populations are declining but no evidence of pox virus. Both reds and grey bodies are being tested – greys which are trapped and reds which are road kill. See [ESI Newsletter](#) Issue 23 page 8 October 2011

Bertolino, S. et.al. 2008 Predicting the spread of the American grey squirrel (*Sciurus carolinensis*) in Europe: A call for a co-ordinated European approach. *Biological Conservation* 141 2564-2575

Bertolino, S. & Lurz, P.W.W. (2011) *Callosciurus* squirrels: worldwide introductions, ecological impacts and recommendations to prevent the establishment of new invasive populations. *Mammal Review* Vol.43; issue 1  
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Lurz, P.& Rushton, S. (2006) Prediction of the Grey Squirrel spread from Italy into adjacent countries. See ESI: <http://www.europeansquirrelinitiative.org/italydownload.html>

Martinoli, A., Bertolino, S., Preatoni, D., Balduzzi, A., Marsan, A., Genovesi, P., Tosi, G. & Wauters, L. 2010: Headcount 2010: the multiplication of the grey squirrel populations introduced to Italy. *Hystrix* 21, 127-136.

DG ENVIRONMENT funded production of a news video on Alien Invasive Species. The grey squirrel was the vertebrate chosen. On Euronews January 2009. <http://www.euronews.net/en/article/09/01/2009/european-biodiversity-under-threat-by-invasive-species/>

## MODELLING STUDIES (RED / GREY)

Claire Stevenson PhD University of Cumbria. Supervisor Owen Nevin. 'Modelling ecological networks and dispersal in the grey squirrel *Sciurus carolinensis*' Using Forest Research BEETLE model for population viability of local squirrel populations (including how to exclude grey squirrels) – PhD completed April 2012.

### PhD Abstract

*Understanding the role of the landscape matrix in species dispersal is important when targeting conservation and management strategies. Least cost modelling is frequently used to assess habitat connectivity and to identify land cover types which may facilitate or impede species movement in the landscape matrix. This study used least cost modelling to assess invasive grey squirrel *Sciurus carolinensis* dispersal movements within the UK. Expert derived land cover resistance sets were compared and a 'best resistance set' was selected. Two major habitat networks were identified within the county of Cumbria. The composition of land cover types covering the Cumbrian Mountain range were suggested to act as a barrier to dispersal. This indicated that there may be multiple colonisation routes into Cumbria. These findings were supported by evidence from mitochondrial DNA sequencing of seven grey squirrel populations. This study provided the first evidence of D-loop sequence variation within UK grey squirrel populations and the genetic differences between grey squirrels in north and south Cumbria. Least cost model predictions were further validated through data from five Global Positioning System (GPS) collared grey squirrels. Buffered least cost path analysis and the development of a least cost corridor model enabled the most probable route grey squirrels will disperse to be identified and validated using GPS data. To provide information on movements and land cover use, the individual movements of each squirrel were assessed. This data was then used to rank use of land cover and feature types. A case study was then used to highlight how the validated least cost model can be applied to areas where red squirrels *Sciurus vulgaris* are still threatened by the invasive grey squirrel to provide information to target management and conservation actions. This study potentially influences management strategies for grey squirrel control and conservation of the native red squirrels.*

Claire Stevenson Aug 2007-Feb 2008. University of Cumbria (FR, NRS). Modelling red squirrel population viability under a range of landscape scenarios in fragmented woodland ecosystem on the Solway Plain. Funded by MTUK, Cumbria Wildlife Trust & FR. Copy of report available from: [andrew.ramsey@cumbria.ac.uk](mailto:andrew.ramsey@cumbria.ac.uk)

Cally Quigley of Cumbria University. (Sept 2008 - April 2009 (FR NRS). Funded by MTUK). Looking at what constitutes a 'corridor' for red squirrels to add to the work done by Claire Stevenson and will entail some BEETLE modelling.

Newcastle University 2007-08. 'Analysis of grey squirrel dispersal routes in Scotland to identify areas most and least readily defended against grey squirrels'. SNH funded.

Scotland red squirrel stronghold areas 2007. GIS analysis using updated criteria, squirrel distribution and habitat data in consultation with stakeholders, to select ~ 20 sites to be considered for management as strongholds for red squirrels into the future. Funded by FCS and SNH. Report published by SNH.

Silvia Flaherty PhD 2007-10 Edinburgh University. Red squirrel habitat mapping using remotely sensed data (LiDAR, CAS, I Quickbird) for West Central Scotland - Cowal & Trossachs FD. Torrance/FC funded. Supervisors Dr G Patenaude and Forest Research (J. Suarez).

Christina Garcia MSc (2006) Edinburgh University GIS Project. Red squirrel habitat mapping using Quickbird imager. Supervisors Dr Genevieve Patenaude and Forest Research (Juan Suarez).

Jamie McWilliam BSc. University of Edinburgh. (FR and FCS). Project investigating scenarios to determine how to reduce risk of grey squirrel incursions for 2 proposed red squirrel stronghold areas in Deeside.

## PINE MARTEN PREDATION OF SQUIRRELS

Emma Sheehy - The Mammal Ecology Group, of National University of Ireland (NUI) Galway is examining the relationships between three woodland mammal species in Ireland; the native **red squirrel** and **pine marten**, and the introduced **grey squirrel**. This project aims to increase our understanding of the ecology of all three animals, and help in the conservation of the two native species. "Recent anecdotal reports have linked a revival of red squirrel populations and a reduction in the range of grey squirrels, in certain midland counties of Ireland, with the resurgence of the pine marten. It has been suggested that the pine marten is preying on the introduced grey squirrel to a greater extent than the more nimble red squirrel. This projects aims to investigate the relationship between the three species, and identify (if any) the impact that the pine marten is having on squirrel dynamics in Ireland. The work will feed into existing squirrel research in the Mammal Ecology group and inform conservation and management policies in Ireland and other parts of Europe. The initial stage of the project involves a survey of the three species in the counties in question. [The Irish Squirrel and Pine Marten Project](#) is funded by the Irish Research Council for Science, Engineering and Technology, under the Embark Initiative, and is being carried out by Emma Sheehy B.Sc. (Hons) of the Mammal Ecology Group, NUI, Galway under the supervision of Dr. Colin Lawton. [emmasheehy@gmail.com](mailto:emmasheehy@gmail.com) [this is also posted in 'News Items'](#).

Scottish Parliament Debate Sept 2008. 'I was alarmed recently while watching television—I think it was an edition of that very good programme on the BBC, "Autumnwatch". I witnessed a red squirrel literally screaming with fear as it fled the clutches of a pine marten, which was chasing it with obvious intent to kill it.'

William Patterson (2007) Honours Project Glasgow University. The diet of Pine Martens with reference to squirrel predation in the Loch Lomond and Trossachs National Park, Scotland. 30 scats from Drymen road, Salloch, Aberfoyle, and Cowal analysed. None contained evidence of red or grey squirrels, which were present in the same forest areas.

Laura Davies (2006) A Comparative Dietary Analysis of Pine Martens in Scotland, with reference to Squirrel Predation. MSc Wildlife Biology and Conservation, Napier University. Scats collected May to August 2006 (19 from Achray, 18 from Lomond and 14 from Ardgartan). Only 1 scat (Lomond) had claws and hairs of a grey squirrel.

### LITERATURE (by author)

See publications on UK Red Squirrel webpage  
<http://www.forestry.gov.uk/website/forestresearch.nsf/ByUnique/INFD-8C8BS6>

and Squirrelweb  
<http://squirrelweb.co.uk/publications/>

Squirrel literature database (up to 2001) collated onto a database (available from Mel Tonkin [mtonkin@swt.org.uk](mailto:mtonkin@swt.org.uk)).

Atkin, J W, Radford, A D, Coyne, K P, Stavisky, J & Chantrey J. 2010 Detection of squirrel poxvirus by nested and real-time PCR from red (*Sciurus vulgaris*) and grey (*Sciurus carolinensis*) squirrels BMC Veterinary Research 2010, 6:33 <http://www.biomedcentral.com/1746-6148/6/33>

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All research updates welcome to inform UK Red Squirrel Group and Country Squirrel Fora.  
Please send to [mark.ferryman@forestry.gsi.gov.uk](mailto:mark.ferryman@forestry.gsi.gov.uk)