

UPDATE REPORT ON SQUIRREL RESEARCH AND MONITORING

Collated from information presented at Country and UK Squirrel Groups and other meetings by Brenda Mayle (UKRSG Chairperson), Centre for Human and Ecological Sciences, Forest Research 07/06/11 Email: brenda.mayle@forestry.gsi.gov.uk

MONITORING: see the [National Biodiversity Network](#) gateway (NBN) for UK distribution maps.

1. For information on ecology and management of woodland species e.g. squirrels <http://www.harpps.org.uk/harppsapp/harpps2/web/secure/autecology>
2. 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>
3. Analysis of Scotland Strongholds consultation <http://www.forestry.gov.uk/strongholdsconsultation>
4. Northern England Red squirrel review - published and available <http://naturalengland.etraderstores.com/NaturalEnglandShop/NECR019>
5. 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
6. 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'
7. Assessment of Squirrel Distribution in Ireland Coford Funded. Completed September 2007. (NUI Galway/Trinity College, Dublin/CRISIS project). The [Irish Squirrel Survey](#) report.
8. 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

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

1. SQUIRRELPOX VIRUS.

For latest map of SQPV in GB check the [News and Events page](#) or contact d.j.everest@vla.defra.gsi.gov.uk
For more information about what to do if you find a sick, injured or dead red squirrel [Follow this link](#).

- a) 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.
- b) Virus held by Moredun Research Institute.
- c) PhD Supervised by Julian Chantrey & Mike Begon, Liverpool University. Starting mid-2009. Investigating Sefton and other surviving Lancashire populations of reds following 2008 SQPV epidemic.
- d) 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. £250K for first 2 years funding through Wildlife Ark Trust. Funding for final 6 months needed. Progress reports available at <http://wildlifearktrust.org/news/index.htm>
- e) 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.

- f) 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. 1 Red with Squirrel pox on eastern fringe of Kielder Forest March 2008 (Sidwood).
- g) January - Dec 2008 Outbreak of SQPV at Sefton, Lancs. 13 confirmed cases of Red's with Squirrel pox, 1 being treated waiting result and 1 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.
- h) 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.
- i) 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.
- j) Moredun, Zoological Society, VLA - monitoring of pox presence in red carcasses. Monitoring of blood for antibodies. **Antibodies in 40% of greys sampled in South Scotland.**
- k) Sept 2007 Seropositive grey squirrel in Innerliethen, near Peebles.
8 & 12 May 2007, 2 Reds with Squirrel pox virus found near Lockerbie.
Contacts re SQPV; North Cumbria, Simon O'Hare at Cumbria WT
Richard Wales RSSS for further information. richardwales@redsquirrels.org.uk
- l) 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.
- m) 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.
- n) 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.
- o) Mike Scantlebury – Queens, Belfast – Parasite effects on life history characteristics of the grey squirrel and implications for the conservation of the red squirrel.
2. 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.
3. **The Red Squirrel Survival Trust (RSST)**. Patron HRH Prince Charles, Chairman Miles Barnes, CEO: Janet Wickens (2011) <http://www.rsst.org.uk/>
4. **SAVE OUR SQUIRRELS PROJECT** Charity Number 221819 www.saveoursquirrels.org.uk
Largest Single-species Conservation Project in the UK. £1.2m over 3 yrs
Red Alert North England successful £1 million project bid to the Heritage Lottery Fund (HLF). 50% of the funding is from HLF, the rest from partners including the Wildlife Trusts, National Parks, the Forestry Commission and other conservation organisations. Northumberland Wildlife Trust is hosting, managing and directing the project. Team of 7 staff is based at HQ in Newcastle and offices in Cumbria and Merseyside. The project undertakes practical conservation work for reds, survey and monitoring of populations and increasing public awareness and access to red squirrels and their conservation across the north of England. Project manager is Carri Nicholson carri.nicholson@northwt.org.co Tel. 0191 2846884
5. **Red Squirrel Protection Partnership (RSPP)** <http://www.rspp.org.uk/>

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

6. 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.

 - a) Broome et al 2007. Annual and spatial variation in coning shown by the Forest Condition Monitoring programme data for Norway spruce, Sitka spruce and Scots pine in Britain. Forestry Advance Access published on January 9, 2007. doi:10.1093/forestry/cpl046
 - b) Broome and Poulson 2006. Validation of scores re cone density published in Forestry Vol. 79, 2, 160 – 166. <http://www.ingentaconnect.com/content/oup/foresj>
7. **Red/ Greys in Anglesey (Menter Môn.)**
 - a) February 2008. A red squirrel found with suspected SQPV in Pentraeth Forest. SQPV not confirmed. It was taken to Welsh Mountain Zoo for treatment, but died.
 - b) 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](#)
 - c) 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.
 - d) A collaborative research project to assess the impact of grey squirrel control carried out on Anglesey 2002-06. craig@redsquirrels.info
8. **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.
9. **Red Squirrels in Ireland**
 - a) 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.
 - b) Red squirrel genetics (Trinity College, Dublin)

PhD examining Irish red squirrel genetics confirmed the existence of a native Irish red squirrel lineage.
 - c) CRISIS Project (Forest Service, Rep. of Ireland)

Multi-faceted study examining red squirrel conservation through grey squirrel control
 - d) 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.
 - e) 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.
10. Selective access traps and feeders in N England veronicacarnell2@hotmail.com
 - a) 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'.
 - b) 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.
11. 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

12. Sutherland Red Squirrel Project. Dr Joelene 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.
13. Feeding Activity patterns and interspecific interactions of red and grey squirrels. Henry Dobson MSc? Project University of Glasgow. 2006?
14. Habitat preferences of Red and Grey squirrels in Tentsmuir Forest, Fife. Dr Justine Ina Davies, University of Dundee Bsc. Hons Thesis. March 2008
15. The distribution of Red Squirrels in relation to habitat quality in an area of northern Scotland. G.T.O. Davies. University of Newcastle 2006.

RESEARCH - GREY SQUIRRELS

1. 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
2. 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.

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 are providing samples. See project outline on [SquirrelWeb](#).
3. MSc Imperial College & Forest Research, Rachel Marshall. Handling of larch seed by grey squirrels. Can they distinguish filled from empty?
4. MSc Imperial College & Forest Research, Jamie Samson (2008). [Factors affecting foraging behaviour in the grey squirrel \(*Sciurus carolinensis*\), under manipulated field experiments.](#)
5. [Developing methods of predicting grey squirrel damage](#) (Forest Research). Assessment of natural food availability, grey squirrel presence and trapability (Index-trapping) in 'holding habitats' in first week of January. Correlation with damage in adjacent 'vulnerable stands' monitored in September. 14 sites England and Wales.
6. [Impact of damage by squirrels on growth of oak](#). (Forest Research). Paper published in 'Forestry' on 'tree size as indicator of risk of damage'.
7. Impact of damage by squirrels on growth of beech. (Forest Research). Started 2005 in 1 site
8. Influence of thinning on risk of damage (Forest Research). Additional information from 2 of the Index trapping sites where vulnerable stands have been thinned. Started 2005.

Reproductive Inhibition

9. [Reproductive inhibition](#) (Forest Research) (2006-09) Collaborative studies with Food and Environment Research Agency, (Fera) and the National Wildlife Research Center, (NWRC), USDA, U.S.A. funded

by Defra, FC & SNH. Fertility control vaccines developed in 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.

10. 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.

11. **Biodiversity impacts: Birds**

There is little evidence to support suggestions that greys are a significant predator of woodland birds.

- a) Colin Bonnington PhD study [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).
- b) 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).
- b) 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. 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.
- c) Stable Isotope analysis of grey squirrel diet to investigate seasonal variation in plant and animal components. (Newcastle University FC funded). Results inconclusive.
- d) RSPB video monitoring of spotted flycatcher nests 2005-08 showed no predation events by grey squirrels.
- e) The Game & Wildlife Conservancy Trust 'Controlling grey squirrels, to help woodland birds'. A study funded by The European Squirrel Initiative, The Dulverton Trust and Lord Barnbys' Foundation. Pilot study spring 2007: 3 paired woods & the number of fledged birds (productivity) assessed. 2008: 5 regional pairs of woods, grey squirrels removed from one of each pair, presence & breeding success of birds measured April/May & May/June. Squirrels 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 to be selected for 2010.

12. Clocaenog (Forest Commission & Forest Research)

Monitoring greys and trapping when presence confirmed. Within the 'Landscape Ecology Project' models are being developed to investigate temporal and spacial balances between habitat requirements of red squirrels, other priorities, and predicted forest structure changes based upon the Forest Design plans.

13. Public Opinion Survey (ESI) <http://www.europeansquirrelinitiative.org/survey.html>

Repeat of UK telephone survey – February 2006. Covering range of socio-economic classes. Shows increasing awareness and support for reds and control of greys to benefit reds.

14. **Greys in Ireland**

- a) Grey squirrel control (Trinity College, Dublin). PhD project investigating grey squirrel impacts and control. 2006-08?
- b) Dr F Naulty and Prof T Hayden (2008) Phoenix Park Grey Squirrel Project Removal of grey squirrels from two city parks in Dublin.

15. Greys in Europe

- a) 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 (English language available).
- b) 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/>
- c) Signorile, A.L. and Evans, J. (2006). Damage caused by the American grey squirrel (*Sciurus carolinensis*) to agricultural crops, poplar plantations and semi-natural woodland in Piedmont, Italy Forestry 80 (1) 89-98
- d) 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
- e) Lurz, P. & Rushton, S. (2006) Prediction of the Grey Squirrel spread from Italy into adjacent countries. See ESI: <http://www.europeansquirrelinitiative.org/italydownload.html>

16. Modelling Studies

- a) Claire Stevenson PhD. University of Cumbria. Supervisor Owen Nevin. 'Grey squirrel habitat networks and dispersal' Jan 2009 - Using Forest Research BEETLE model for population viability of local squirrel populations (including how to exclude grey squirrels).
- b) 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.
- c) 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.
- d) 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
- e) 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.
- f) 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.
- g) 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).
- h) Christina Garcia MSc (2006) Edinburgh University GIS Project. Red squirrel habitat mapping using Quickbird imager. Supervisors Dr Genevieve Patenaude and Forest Research (Juan Suarez).

17. Pine Marten predation of squirrels - No evidence from scat analysis studies.

- a) 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.'
- b) 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

Squirrels update

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(19 from Achray, 18 from Lomond and 14 from Ardgartan). Only 1 scat (Lomond) had claws and hairs of a grey squirrel.

- C) 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.
- D) National University of Ireland, Galway are embarking on a project to investigate the dynamics of the red and grey squirrels and the pine marten and to ascertain the true role the pine marten is playing in squirrel dynamics.