

## Red squirrel strongholds consultation

This consultation introduces the concept of **red squirrel strongholds** as sites for the enhanced management of forests for red squirrels, and presents them within the context of wider work to conserve the red squirrel in Scotland.

Strongholds are part of the Scottish Government's strategy to secure the future of the red squirrel in Scotland.

We would welcome your views on our proposals. **We want to know whether we have identified an appropriate suite of stronghold sites, together with suitable management prescriptions and support, to give red squirrels a future in mainland Scotland, in the eventuality that grey squirrels spread throughout the country.** We are not seeking views on grey squirrel control.

### Responding to the consultation

- We request responses by **26th June 2009**.
- Before submitting a response, please read the consultation information provided, starting with Section 1 'What is a red squirrel stronghold?'
- Section 8 'How to respond to the consultation' provides more information on submitting your response.

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## 1. What is a red squirrel stronghold?

**Red squirrel strongholds are a set of sites, spread across major parts of the red squirrel range in Scotland, where viable red squirrel populations can be sustained over the long term.**

The tree species composition and the woodland layout at these sites will give the native red squirrel an advantage over the introduced grey squirrel, so these sites can act as red squirrel refuges even if grey squirrels spread further than they have already.

Red squirrel strongholds are complementary to wider efforts to improve habitats for the red squirrel and to control grey squirrels in Scotland.

### How many strongholds are there?

Section 5, Where are the strongholds? identifies **18** red squirrel strongholds totalling approximately **100,000 hectares**, spread around Scotland. These sites are all large forests (ranging in size from 2,400 hectares to 14,400 hectares) which have populations of red squirrels.

The final number and area of sites proposed in this consultation is a compromise between the 20 sites and the 80,000 hectares recommended in the [Red Squirrel Action Plan 2006-2011](#) (PDF). For information on the selection process, see Section 9 'methodology'.

### How can these sites help?

These sites can help conserve red squirrels because they have been selected to take advantage of the slightly different habitat requirements of the two squirrel species. For example, grey squirrels require pockets of large seeded broadleaf trees (such as oak, beech, hazel and chestnut) to establish a population, whereas red squirrels can thrive in forests without these species.

**In strongholds we will promote and support habitat management which progressively increases the competitive advantage of red squirrels over grey squirrels, in preparation for the possibility that grey squirrels will reach the site.**

## 2. Why do we need to conserve red squirrels?

### a) The conservation status of red squirrels

The red squirrel is highly valued by the people of Scotland and by visitors, and is seen by some as one of Scotland's 'iconic' species. It is also one of the most threatened mammals in the UK.

The population in Scotland is thought to be around **120,000 animals**. Because of marked losses from the rest of the UK, this represents an ever-increasing proportion of the UK population of red squirrels – at least 75% at the last estimate.

The red squirrel is listed on **Appendix III of the Bern Convention** and is protected by **Schedules 5 and 6 of the Wildlife and Countryside Act**. It is a [Species Action Plan](#) species under the UK Biodiversity Action Plan and has been identified as a species of conservation concern in the Scottish Government's [Species Action Framework](#).

### b) The threat from grey squirrels

The chief threat to red squirrels is the introduced grey squirrel. In most habitats, ecological competition from the larger, more adaptable grey squirrel means that when the two species come into contact, **grey squirrels normally displace red squirrels within 15-20 years**.

Grey squirrels can also carry the **squirrelpox virus**, which is lethal to red squirrels. Local red squirrel populations can be lost within a year in the presence of squirrelpox. The maps referred to below show the current distribution of grey squirrels and squirrelpox in Scotland:

*Map 1. Distribution of grey squirrels in Scotland*  
See the [Scottish Squirrel Survey distribution map](#).

*Map 2. Squirrelpox records in Scotland*  
(See map in the Map Annex or at the following link:  
[www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3g9h](http://www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3g9h) ).

### c) Grey Squirrel Control Strategy

Work is underway to control grey squirrels, to prevent the spread of squirrelpox and to reduce the competitive pressure on red squirrels. The locations and rationale for this work will be set out in Scottish Natural Heritage's forthcoming Grey Squirrel Control Strategy. **This consultation is not seeking views on grey squirrel control.**

Much of the grey squirrel control work is being co-ordinated through the [Saving Scotland's Red Squirrels project](#); a partnership between Scottish Wildlife Trust, Scottish Natural Heritage, Forestry Commission Scotland and the Scottish Rural Property and Business Association. In South Scotland the [Red Squirrels in South Scotland project](#) is working to contain the squirrelpox virus.

The maps in the Map Annex (or at the following link [www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3q9h](http://www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3q9h) ) summarise the priorities for grey squirrel control:

*Map 3a. Draft grey squirrel control strategy map - North and Central Scotland*

*Map 3b. Draft grey squirrel control strategy map - South Scotland*

**Red squirrel strongholds are a contingency plan in case, despite these measures, grey squirrels spread further in Scotland. Strongholds are not an alternative to grey squirrel control.**

### 3. How do strongholds fit into a wider strategy?

#### a) The overall strategy

The government's strategy for red squirrel conservation is described by the [Red Squirrel Action Plan 2006-11](#). The work to select strongholds follows directly from recommendations made in that plan.

Government, non-governmental organisations, private landowners and voluntary sector initiatives are working together to conserve red squirrels in Scotland. Three **parallel and complementary approaches** are being pursued:

- i.) Improving woods for red squirrels
- ii.) Minimising the threat from grey squirrels
- iii.) Research/monitoring.

Each of these approaches will be targeted to the areas where they can make the most difference.

#### i) Improving woods for red squirrels

**What?** Measures to improve the habitat for red squirrels while not increasing its attractiveness to grey squirrels.

**How?** The Scotland Rural Development Plan (SRDP) will provide grant support, and the measures will also be implemented on the National Forest Estate. Guidance on managing woodlands for red squirrels will be produced in due course.

**Where?** Promoted in strongholds. Elsewhere, prioritised taking account of advice and information on the potential of woods for red squirrels. More effort will be focussed on large forest areas containing 2000 hectares or more of conifer woodland, as red squirrel populations there are likely to be more robust, and more able to withstand any colonisation from grey squirrels, than those in smaller forests. The list of Priority Woods previously identified by Poulson et al in 2005 gives a good idea of the kind of woods where effort should be focussed.

#### ii) Minimising the threat from grey squirrels

**What?** Targeted grey squirrel control to support the long-term retention of red squirrels in Scotland.

**How?** The SRDP will provide grant support and control will be carried out on the national forest estate and by publicly-funded grey squirrel control officers.

**Where?** Locations will be described in Scottish Natural Heritage's forthcoming Grey Squirrel Control Strategy (see also maps 3a and 3b in the Map Annex). These are locations where control will: prevent further spread of the squirrelpox virus; contain natural dispersal; and protect strongholds.

#### iii) Research and monitoring

This aspect of the work is not covered by this document, but includes:

- Research into alternative methods of controlling grey squirrels (immunocontraception)
- Research into a vaccine against squirrelpox
- Monitoring of red and grey squirrel populations and distribution
- Monitoring of the effectiveness of grey squirrel control.

#### **b) The function of strongholds within the strategy**

Strongholds have two separate but complementary functions as part of the wider strategy:

- They will be priority sites for habitat improvement to support red squirrels, as part of a wider drive to improve habitats for red squirrels across Scotland.
- They will be the priority sites to be protected against grey squirrel incursion if wider control efforts do not prevent grey squirrels from extending their distribution.

**Over the long term, strongholds will therefore act as hotspots for red squirrels and, under the scenario of grey squirrel spread, will also act as refuges for red squirrels.**

## 4. Will strongholds work?

### a) The rationale for strongholds

We hope we will never need to rely on strongholds to conserve red squirrels. If the control of grey squirrels is as successful as we hope, then grey squirrels will largely be kept apart from red squirrels and the current distribution of red squirrels can at least be maintained, if not expanded.

Grey squirrels have not yet been recorded in any of the stronghold sites, but it is not possible to guarantee that we can prevent this very mobile and resourceful species from spreading beyond its current range. If we want to secure the future of red squirrels in mainland Scotland, it is important that, as well as making every effort to control grey squirrels, we put in place additional safeguards to protect red squirrels.

As well as being sites for the enhanced conservation of red squirrels, **strongholds are a contingency plan in case grey squirrels spread further in Scotland**. Under a scenario where containing natural dispersal had been shown not to work, strongholds would be the last refuges in which red squirrels are conserved, with grey squirrel control efforts being focussed in and around these sites to the exclusion of others.

### b) How strongholds will work

Research has shown that in some habitats, red squirrels are able to sustain a population **even in the presence of grey squirrels**. In these forests, which are distinguished by their lack of large seeded broadleaves (especially oak, but also beech, chestnuts and hazel), grey squirrels cannot normally establish themselves. They may travel from nearby areas to these habitats to feed, but they do not stay to breed.

By selecting the largest and, where possible, most defensible of these forests we believe that we have identified a series of sites which give red squirrels the best possible chance under a Scotland-wide grey squirrel scenario.

To ensure that these sites remain relatively unattractive to grey squirrels, and to increase their value for red squirrels, we will work with land managers to support appropriate management activity over coming decades:

- We will encourage management which improves the carrying capacity of the site for red squirrels, for example:
  - **Retaining some conifers into old age**, to provide additional food
  - **Diversifying the species and ages of trees** to ensure that there is food for red squirrels every year (different species of conifers tend to cone at different times, with differing gaps between coning years)
  - **Making sure the woods are well connected** so that red squirrels can use the whole habitat (though see Squirrelepox concerns, below)
  - **Using continuous cover forestry** techniques.
- We will plan to prevent any future grey squirrel colonisation of the site by:

- **Discouraging the establishment of large seeded broadleaves on or near the site** where these could support resident grey squirrel populations
- **Discouraging the development of woodland networks which could assist grey squirrels** to reach the strongholds
- **Identifying priority areas for grey squirrel control** around the site, and within the site should this prove necessary
- **Monitoring the presence** of greys.

Anecdotal evidence from large conifer forests in south Scotland and northern England which have the characteristics of strongholds suggests that woods managed in this way can give red squirrels a competitive advantage over grey squirrels. More detail on the management of strongholds can be found in section 6, 'What will strongholds mean for land management?'

### c) Squirrelepox concerns

Squirrelepox virus is an added complication for the functioning of strongholds. Most grey squirrels in England carry the virus and in recent years **seropositive** grey squirrels and red squirrels suffering from the symptoms of squirrelepox have been found in parts of south Scotland (see squirrelepox map).

It is not yet known how grey squirrels pass the virus to red squirrels, but we do know that infected red squirrels normally die within 15 days. The rate of displacement of red squirrels by grey squirrels in the presence of squirrelepox is some 15-20 times faster than in areas without the virus.

If current efforts do not prevent squirrelepox – currently only found in south Scotland – from spreading to the wider Scottish grey squirrel population, then over the long term **red squirrels in strongholds will be at risk from the virus**. Local control of grey squirrels is likely to be required to prevent infected grey squirrels from coming into contact with red squirrels.

In extremely large forests (such as Kielder forest in England) models suggest that the speed at which the virus kills red squirrels might, paradoxically, save much of the population from coming into contact with the virus. We do not yet know whether the stronghold woods will be large enough for this to happen. We propose to model the likely progress of the virus within those strongholds most at risk. This will enable us to see if the forest can be managed in such a way as to limit the spread of the virus.

### d) Strongholds – not very good habitat for red squirrels?

Many of the stronghold sites do not currently hold very large populations of red squirrels; indeed, sites with higher populations of red squirrels are often found nearby. Some of these have been identified as Priority Woodlands in previous work (Poulsom et al, 2005), however, the very characteristics of sites which make them favourable for red squirrels (for example presence of hazel, beech, chestnut trees, supplementary feeding) may also make a site vulnerable to grey squirrel incursion, should grey squirrels reach the area.

### e) Strongholds as 'islands'?

If grey squirrels displace red squirrels throughout mainland Scotland, and red squirrels are only found in strongholds and on offshore islands such as Arran, then red squirrel populations will effectively be isolated from one another in island-like refuges.

In theory this could lead to problems of in-breeding and could leave individual populations vulnerable to local extinction. However, even a stronghold with a red squirrel population of only 0.25 animals per hectare would have a population of at least 500 red squirrels, a relatively large gene pool – and translocation of animals between strongholds would be possible.

#### f) Strongholds in a changing climate

The state of our knowledge on climate change has not allowed it to be a factor in selecting strongholds, but a changing climate will certainly affect their management. Research into [the impacts of climate change on Scottish forestry \(PDF\)](#) shows likely future climate scenarios and suggests how forestry will need to adapt in the future. In relation to strongholds:

- **Continuous cover forestry techniques** and **greater use of mixtures of species** (as recommended for strongholds) are central to the way that wider Scottish forestry should adapt to a changing climate
- The **distribution of species** such as oak and beech is likely to change, with the potential for more widespread natural regeneration of both of these species in some areas. It may become more difficult to prevent regeneration of these species within some strongholds
- Conversely, **wetter summers** in western Scotland may make acorn and beechmast years more infrequent and so **reduce grey squirrels' competitive ability**
- **Milder winters** and **longer growing seasons** may increase over-winter survival of pests, and may increase the number of generations in one year. There is no evidence that these changes will favour one squirrel species over the other, but the more adaptable grey squirrel is unlikely to be disadvantaged.

#### g) If they are so good, why not have more of them?

It is appropriate to limit the total number and area of sites because of the potential conflict which some of the prescriptions (especially restriction on large seeded broadleaves) have with other management objectives, including management for other habitats and species.

#### Consultation questions relevant to this section:

1. Do you agree with the rationale and justification for strongholds? If not, why not?
2. Do you think that the management approach for strongholds is appropriate to achieve their objectives? If not, why not?

## 5. Where are the strongholds?

### a) The sites

The following map and tables show the overall distribution of stronghold sites:

*Map 4. Distribution of stronghold sites*

(See Map Annex or the map at the following link:

[www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3kk4](http://www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7q3kk4) )

The table shows a list of the 18 proposed sites, totalling approximately 100,000 hectares, plus two 'reserve sites' as a contingency in case of objections to any of the proposed sites. While the two reserve sites scored the same as some of the proposed sites when the initial scoring exercise (described in the [methodology for site selection](#)) was completed, new records of squirrelpox reveal that the disease is now close to the reserve sites, hence their demotion to reserve status.

*Table 1. List of stronghold sites*

**Note 1:** 'percentage in NFE' refers to the percentage of the woodland area concerned that is part of the National Forest Estate (NFE).

#### Main list of stronghold sites (18 sites)

Site name	Total area (ha)	Woodland area (ha)	% in NFE	SRDP region
Morangie Forest	6,684	5,467	84	Highland
Glen Glass	4,238	3,649	0	Highland
Culbin	3,072	2,977	90	Grampian and Moray / Highland
Black Isle	3,652	3,470	89	Highland
Ordiequish, Whiteash, Ben Aigan	6,210	5,696	85	Grampian and Moray
Daviot Loch Moy	4,322	3,751	57	Highland
Abernethy, Nethy Bridge	4,836	3,476	0	Highland
Inshriach and Glenfeshie	4,329	3,736	79	Highland
Glentochty	2,404	2,224	68	Grampian and Moray
Balmoral to Inver	4,624	3,998	4	Grampian and Moray
Leanachan	4,013	3,643	71	Highland
South Rannoch	3,506	3,378	94	Tayside
Inverliever	9,426	8,549	98	Argyll
Eredine	14,401	11,610	69	Argyll
Kilmichael	9,103	8,200	92	Argyll
Eskdalemuir	12,563	12,055	31	Dumfries and Galloway
Fleet Basin	9,282	8,548	99	Dumfries and Galloway
Glenbranter	8,603	6,079	99	Argyll
<b>Total main list</b>	<b>115,528</b>	<b>100,506</b>	<b>68</b>	

### Reserve list (2 sites)

Site name	Total area (ha)	Woodland area (ha)	% in NFE	SRDP region
Carsphairn Forest	14,083	12,962	48	Dumfries and Galloway
Galloway Forest North	7,477	6,903	81	Dumfries and Galloway
<b>Total including reserves</b>	<b>136,828</b>	<b>12,371</b>	<b>69</b>	

**Note: no stronghold has been specifically identified on Arran.** This island 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.

#### b) Changes to boundaries already made

Consultation has been carried out with relevant land managers that we were able to identify, to see whether they would be prepared to manage their land in accordance with the principles outlined in section 6, 'What will strongholds mean for land management?'. The boundaries have been modified in the light of feedback received.

We are aware, however, that we have not been able to consult with all land managers within or adjacent to strongholds, nor have we received feedback from some who were consulted. In addition, differing advice was received from different respondents on the boundaries or suitability of certain strongholds.

In some cases, boundaries have been further modified to remove anomalous boundaries created by the original GIS processes. **The modified list of sites and the modified boundaries of sites presented during this consultation phase are those on which we are now seeking comment.**

Maps showing the boundaries of each individual stronghold can be viewed from the links in the web version of the consultation, or are supplied as a Map Annex in printed versions of this document.

#### Consultation questions relevant to this section

3. Do you have comments on the suitability of any particular site or sites to act as a stronghold? Please state which site(s).

4. Do you think that the boundary of any particular site or sites should be changed? Please state which site(s), how the boundary should be changed, and why.

## 6. What will strongholds mean for land management?

This section provides detail on stronghold management requirements, and the support that will be available.

### a) Management requirements

The stronghold sites will vary considerably in their characteristics, and it is neither possible nor desirable to produce a 'one-size-fits-all' management prescription for strongholds. There will, however, be five main issues to consider at all sites:

- i.) Red squirrel-friendly woodland management
- ii.) Woodland connectivity
- iii.) Presence of large seeded broadleaves
- iv.) Site defendability
- v.) Control of grey squirrels.

Wherever a significant forest area is managed, having a Long Term Forest Plan is strongly recommended. This provides a long-term strategic management plan for the woodland area which should include management prescriptions for the main species, such as red squirrels.

#### i) Red squirrel-friendly woodland management

To improve the population of red squirrels that a stronghold can support, it will be necessary to increase the amount of food available. Maintaining a diverse age range of conifers will help to sustain food supplies over the long term.

Depending on the species involved, an 'ideal' age class structure might include around one third of each of the following tree age classes: younger than 15 years; 15-30 years, older than 30 years.

Furthermore, within extensive plantations of a single species such as Sitka spruce, at least 20% of other species should be encouraged over time. These should be species such as Scots pine, larch, Norway spruce, lodgepole pine, firs, yew and hawthorn, all of which have direct value for red squirrels; and/or other native broadleaved species such as birch, rowan, ash, willow, aspen and alder which have general conservation value but do not encourage grey squirrels.

We recognise that in some woods, for example, native pinewoods, opportunities for species diversification using non-native species may be limited or absent.

[Continuous cover forestry systems](#) can help provide continuity of food supplies and canopy cover, and can encourage seed production, and could potentially be a valuable management technique for strongholds.

Long-term forest plans on these sites will need to provide for appropriate diversification, in balance with other objectives for the site – and should seek to work with neighbouring stronghold landowners to achieve this at a landscape scale.

#### ii) Woodland connectivity within the stronghold

The stronghold sites have been chosen because they are large woodland networks which red squirrels can use. Red squirrels tend not to cross large tracts of open

ground, so to maintain the network it will be important to plan felling and restocking carefully.

Consideration of woodland connectivity is complicated by the presence of squirrelpox. Advice on whether breaks in the network are desirable will be provided for those strongholds which are particularly vulnerable.

Long-term forest plans on these sites will need to provide for appropriate canopy connectivity.

### **iii) Large seeded broadleaves**

Patches of large seeded broadleaved species (especially **oak**, but also **beech**, **chestnut** and **hazel**) encourage grey squirrels. Sites have been chosen so as to minimise the amount of such species present, but nevertheless some will remain. We will seek to keep the proportion within a stronghold very low by:

- Discouraging inappropriate planting of large seeded broadleaves within a stronghold by withholding grant aid for their establishment
- If appropriate (and if compatible with other objectives for the site), seeking opportunities to remove large seeded broadleaves which could aid grey squirrel incursion to the site.

What size 'patch' of large seeded broadleaves is acceptable? This will vary from site to site, but patches larger than 0.25-0.5ha, making up more than 5% of the total stronghold area, are likely to increase the risk of grey squirrels taking up residence.

### **iv) Site defendability**

Woodland establishment in the vicinity of strongholds which could make it easier for grey squirrels to reach the site will also be discouraged. This applies particularly to the establishment of large seeded broadleaves adjacent to a stronghold, and to the creation of networks of woodland increasing the connectivity of a stronghold in the wider landscape.

The concept of woodland-free buffer zones for strongholds is not being pursued, both because of the high degree of existing connectivity in some sites, and because such buffers are unlikely to be effective against the highly mobile grey squirrel.

### **v) Control of grey squirrels**

If grey squirrels do eventually reach a stronghold site, control is likely to be necessary to protect the red squirrel population (for example, if the grey squirrels are carrying the squirrelpox virus, or if grey squirrels prove more capable of using the habitat than predicted).

Land managers will be encouraged to plan for this eventuality, and would be expected either to carry out grey squirrel control (funded through grant aid) or to permit publicly funded grey squirrel controllers to work on the land. Continual monitoring of the distribution of grey squirrels will show us when this situation is reached.

## **b) Support available for stronghold management**

Grant aid for red squirrel-friendly habitat management and grey squirrel control is available through the **Scotland Rural Development Plan: Rural Development Contracts**. Under the new competitive system proposals are judged by Regional Proposal Assessment Committees (RPACs). Management proposals in and around

strongholds are expected to be a high priority for funding under this and future grant schemes.

The SRDP website has more information on the grants:

- [Grants to support red squirrel habitat management](#)
- [Grants to support grey squirrel control](#)

In addition to the grants Forestry Commission Scotland will prioritise to strongholds any additional resources which become available for red squirrel habitat surveys and modelling of habitats to inform long term management planning.

### **c) Securing the long term future of strongholds**

To help secure the long term future of strongholds we will:

- Ask the **owners and managers of land** within the strongholds to confirm that they are willing to participate, in accordance with the management principles outlined in section a) above. We will write to the owners and managers of the finalised list of strongholds following the conclusion of this consultation process.
- Encourage the **owners of land within strongholds** to enter into Long Term Forest Plans which include consideration of the management principles outlined in section a) above.
- Notify **Local Authorities** of the existence of red squirrel strongholds and ask that these be taken into account in development control decisions.

### **d) Review**

The implementation of strongholds will be monitored, and the success of this policy will be evaluated within five years in order that any necessary changes to the sites, management prescriptions and support for strongholds can be made.

#### **Consultation questions relevant to this section:**

5. Do you think that the proposed support for management will be sufficient to achieve stronghold objectives? If not, what support is needed?

## 7. Summary of the consultation questions

Overall, we want to know whether we have identified an **appropriate suite of stronghold sites, together with suitable management prescriptions and support**, to give red squirrels a future in mainland Scotland, in the eventuality that grey squirrels spread throughout the country.

All comments on the proposals are welcome, but you may find the following questions helpful as a guide:

1. Do you agree with the **rationale and justification** for strongholds? If not, why not?
2. Do you think that the **management approach** for strongholds is appropriate to achieve their objectives? If not, why not?
3. Do you have comments on the **suitability of any particular site or sites** to act as a stronghold? Please state which site(s).
4. Do you think that the **boundary** of any particular site or sites should be changed? Please state which site(s), how the boundary should be changed, and why.
5. Do you think that the **proposed support for management** will be sufficient to achieve stronghold objectives? If not, what support is needed?

## 8. How to respond to the consultation

We request responses to this consultation by **26th June 2009**.

To help our analysis, please use the Response Form in Annex 1 to provide your response. The form includes a section to indicate your confidentiality preferences.

Please ensure you include the following in your response:

- Your name
- The organisation that you represent (if applicable)
- Your contact details
- An indication of whether you are content for your details and/or response to be published, in accordance with Data Protection considerations.

All responses, together with any comments or questions, should be emailed to [strongholds@forestry.gsi.gov.uk](mailto:strongholds@forestry.gsi.gov.uk); or posted to:

**Red Squirrel Strongholds**  
Forestry Commission Scotland  
231 Corstorphine Road  
Edinburgh  
EH12 7AT

If you have any queries about this consultation process please contact **Jo Ellis** at the above address, or on **0131 314 0303**.

## 9. Methodology, references and acknowledgements

### Methodology

1. Habitat networks for red squirrels were identified using Geographic Information System (GIS).

Habitat networks are connected woodland areas which red squirrels can readily move between.

Networks were required to have at least 1 patch of conifer habitat greater than 200ha in size. This is the minimum patch size believed to be required to support a self-sustaining, viable population of red squirrels (Pepper & Patterson, 1998) and was included to act as a source for smaller patches of woodland within the network. The networks were also required to contain at least 2000ha of conifer forest in total, as areas above this size are considered to be “ideal to conserve a population of red squirrels with a high chance of success” (Pepper & Patterson, 1998).

2. Networks with no records of red squirrels within the boundaries within the last 10 years were excluded.

3. Networks with more than 5 grey squirrel records within the last 10 years were excluded.

4. Sites were scored for the following criteria using nationally-available datasets:

- Functional distance (as the squirrel moves) to the nearest grey squirrel
- Proximity to grey squirrels with squirrelpox
- Percentage area overlap with ancient, semi-natural broadleaf woodland
- Area of network defined as conifer woodland.

5. Sites were scored for the following criteria by discussing maps of the sites with Forestry Commission Scotland and Scottish Natural Heritage field staff:

- Proportion of large seeded broadleaves
- Conflict with existing or planned built development
- Conflict with other conservation objectives
- Silvicultural factors constraining stronghold management
- Likely defendability against grey squirrel incursion
- Red squirrel presence

6. The objective criteria were scored from 0 to 4 or 5 while information gathered through staff consultation was scored from 0-2 or 3.

7. Scores were totalled, with the best 18 sites being presented as candidate stronghold sites.

8. The list of candidate stronghold sites was modified following discussions with land managers.

More information on the methodology is available on request.

## References

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Lurz, P; Garson, P; Rushton, S. (1995). The ecology of squirrels in spruce dominated plantations: implications for forest management. *Forest Ecology and Management* 79.

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Other sources of assistance include members of the Scottish Squirrel Group, local red squirrel conservation officers and staff from the University of Newcastle.

## Annex 1: Red Squirrel Strongholds Consultation Response Form

Name:

Organisation (if appropriate):

Postal Address:

Consultation title: RED SQUIRREL STRONGHOLDS

1. Are you responding as: (please tick one, or delete those that don't apply)

	The owner or manager of part of a proposed stronghold area (go to <b>2a</b> )
	Another individual or land manager (go to <b>2a</b> )
	On behalf of a group or organisation (go to <b>2c</b> )

### 2a. INDIVIDUALS:

Do you agree to your response being made available to the public (in Forestry Commission library and/or on Forestry Commission website)?

	Yes (go to <b>2b</b> )
	No, not at all. We will treat your response as confidential.

**2b. Where confidentiality is not requested**, we will make your response available to the public on the following basis (**please choose one** of the following)

	Yes, make my response, name and address all available
	Yes, make my response available, but not my name or address
	Yes, make my response and name available, but not my address

### 2c. ON BEHALF OF GROUPS OR ORGANISATIONS:

Your name and address as respondees will be made available to the public (in the Forestry Commission library and/or on Forestry Commission website). Are you content for your response to be made available also?

	Yes
	No

### 3. SHARING RESPONSES/FUTURE ENGAGEMENT

We will share your response internally. Are you content for the Forestry Commission to contact you again in the future in relation to this consultation response?

	Yes
	No

### 4. CONSULTATION QUESTIONS

1. Do you agree with the **rationale and justification** for strongholds? If not, why not?
2. Do you think that the **management approach** for strongholds is appropriate to achieve their objectives? If not, why not?
3. Do you have comments on the **suitability of any particular site or sites** to act as a stronghold? Please state which site(s).
4. Do you think that the **boundary** of any particular site or sites should be changed? Please state which site(s), how the boundary should be changed, and why.
5. Do you think that the **proposed support for management** will be sufficient to achieve stronghold objectives? If not, what support is needed?

**The final date for receipt of responses is Friday 26 June 2009.**

## **Map Annex**

Printed maps are supplied when a printed version of the consultation is requested. For those viewing online, all maps can be viewed on the consultation web pages at [www.forestry.gov.uk/strongholdsconsultation](http://www.forestry.gov.uk/strongholdsconsultation).