

## The Grey Squirrel in Britain

### A major threat to our native biodiversity

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#### Introduction

The North American grey squirrel was deliberately introduced to Britain and other parts of Europe during the 19<sup>th</sup> Century. Since then, despite being released merely as a curiosity to satisfy the Victorian penchant for novelty, the adaptable and hardy grey squirrel has thrived in Britain's parks, gardens and woodlands. Indeed, it has now become so widespread, that it is accepted by many as a natural part of our wildlife, much enjoyed by many people and perhaps one of the most commonly seen British mammals.



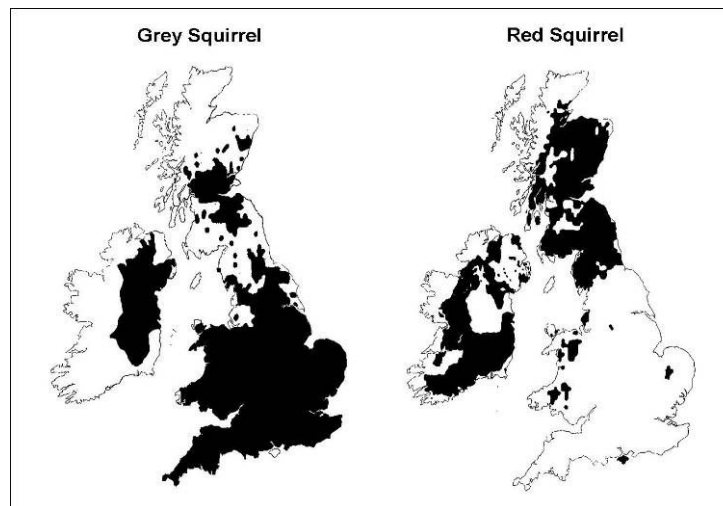
However, despite the obvious charm and appeal of the grey squirrel, it is now clear that its continuing spread through the British Isles is having at least three major impacts on Britain's native flora and fauna, which are poorly adapted to withstand its presence. Most significantly, the grey squirrel has contributed to the catastrophic decline of Britain's native red squirrel (Reynolds, 1985), but they are also responsible for causing significant damage to woodland of both economic and amenity value (Forestry Commission, 2002), and recent scientific studies have reported that they are having a serious impact on Britain's already imperilled woodland birds (Hewson et al., 2004).

The grey squirrel is having such a profound impact on British wildlife that the IUCN have now listed it on their list of the [100 worst invasive species globally](#) and several other conservation groups are calling for radical steps to be taken to prevent irreversible damage being done (Lowe et al., 2000).

#### Impacts of Grey Squirrels on Red Squirrels

Tree squirrels, such as the North American grey- and Eurasian red squirrels, are members of the rodent family and are easily recognisable by their large eyes, small ears, powerful hind limbs and bushy tail. However, there are several key characteristics of the grey squirrel that have allowed it to replace the native red squirrel of Britain and which mean that the two species cannot often co-exist in the same habitat.

The grey squirrel is able to out-compete the red in almost every phase of their life history and it is also thought that the grey squirrel is more resistant to disease than the red (Gurnell, 2004). The inability for the two species to co-exist is clearly seen when their distribution maps are compared. The grey squirrel has now spread to occupy almost all of England with only the far north and a few more southerly areas as yet unoccupied (Pepper and Patterson, 2001).



*Comparison of the distributions of the grey (left) and red (right) squirrels in the UK. Grey squirrels are well established in England and Wales with an estimated population of 2.5 million (Pepper and Patterson, 2001), while red squirrels have retreated to the north.*

In contrast, the red squirrel has seen its range squeezed into those areas as yet unoccupied by the grey. The few remaining strongholds of the red squirrel in England and Wales only exist because they are conifer woodland habitats, where the grey squirrel does not so easily out-compete the red, or because the grey squirrel has been actively prevented from establishing populations in those areas.

**...grey squirrels are now an established part of our forest wildlife,  
with a population of 2.5 million...**

**Pepper and Patterson, 2001  
The Forestry Commission**

So why is it that these apparently similar species cannot live together? John Gurnell of the Mammal Society believes that, *"while there is no evidence that grey squirrels aggressively chase out red squirrels, or that grey squirrels brought a disease with them from North America that effect red squirrels, there can be no doubt that if the grey squirrel had not been introduced to Britain then the red squirrel would still be common in our parks and woodlands"* (Gurnell, 2004).

When the ecology of each species is compared, the reasons for the dominance of the grey squirrel over the red become all too apparent. Grey squirrels can weigh as much as 600 grams, twice that of an adult red squirrel, and live for an average of 7-9 years, compared to 6-8 years for reds. They therefore have a significant physical advantage over the red squirrel. In addition, having evolved in the oak and hickory forests of the north-eastern United States, grey squirrels also have several behavioural advantages over reds (Gurnell, 1996; Gurnell *et al.*, 2004; Kenward *et al.*, 1998).

Unlike the red squirrel, which is primarily arboreal and spends only 33% of its time on the ground, the grey squirrel spends up to 80% of its time foraging on the woodland floor. This adaptation means that, in the autumn, grey squirrels can increase their body weight by as much as 20% while reds, which feed far less efficiently in broadleaved woodland, rarely manage to gain 10% (Kenward *et al.*, 1998).

As neither grey nor red squirrels hibernate and both are therefore active throughout the winter months periods of extreme weather, when they are forced spend several days in the drey without feeding, can have severe consequences for the red squirrel, which cannot store as much fat as the grey. This deficiency is reflected in the fact that only 80% of young red squirrels survive

their first winter and mortality remains as high as 50% in adults (Gurnell, 1994). The discrepancy between the feeding efficiency of the two species, particularly in broadleaved woodland, is further highlighted by the difference in the carrying capacity of this habitat for the two species. For red squirrels this is around 1-2 per hectare, while for greys it can be as high as 5 or even 6 per hectare (Gurnell, 1994).

Another important effect of these behavioural differences is that, while the dispersal of red squirrels is severely hampered in fragmented woodland where the tree canopy is broken, the grey can both forage over a wider area and find new territory more easily (Bryce *et al.*, 2002). This has important implications for both red squirrel conservation and grey squirrel control and is accentuated in a habitat where human impacts such as woodland habitat destruction and fragmentation are also occurring.



In addition to all of these competitive advantages, there is another that the grey squirrel has over the red that could prove to be the most significant for the red squirrels survival. In 1984 in East Anglia, a squirrel was found to be infected with a disease that was identified as a parapoxvirus.

This disease, which is carried asymptotically by grey squirrels, is fatal in red squirrels and, although John Gurnell is not convinced that it has been proven, many other researchers do believe that transmission of a parapox viral disease between the two species is now a major cause of the grey squirrel's displacement of the red (Gurnell, 1994; Rushton *et al.*, 2004). They suggest that it is not that the parapox virus is a novel infection in Britain, but that the greater susceptibility of the red squirrel to the disease puts them at a huge disadvantage when trying to compete in a mixed squirrel population.

### **Impacts of Grey Squirrels on Trees**

Grey squirrels, which live at high population densities in broadleaved woodland, can cause significant damage to trees such as sycamore, beech, oak, sweet chestnut, pine, Norway spruce and larch, by bark-stripping (Broome and Johnson, 2001).

Although this activity results in the death of only 5% of trees, it does dramatically reduce the economic and amenity value of woodland. In 2000 it was estimated that squirrel damage reduced the value of commercially grown trees in the UK by £10 million while also having a significant negative impact on the sustainable management and the amenity value of many woodlands (Forestry Commission UK, 2002).

Perhaps more worrying than this impact, is the recent report that grey squirrels have been observed grazing not only on seeds and nuts, but also on the shoots and tubers of fragile and rare plant species on the woodland floor (Forestry Commission UK, 2002). The true impact that this foraging activity has on woodland biodiversity has not yet been examined.



*An oak tree showing signs of grey squirrel damage*

### **Impacts of Grey Squirrels on Woodland Birds**

In addition to their potential impact on woodland plants, there is an increasing body of evidence that grey squirrels may be partly responsible for recent declines in many woodland bird species. They can exert this impact either through the predation of eggs and young chicks, or because they take over nest sites and consume food such as seeds and nuts which would otherwise be exploited by birds.

In 2004 Chris Hewson and Rob Fuller of the British Trust for Ornithology (BTO), Brenda Mayle of Forest Research and Ken Smith of the RSPB confirmed that there were three mechanisms via which grey squirrels, living at high density in a woodland, could have an impact on woodland birds (Hewson *et al.*, 2004).

First, they report that, in a Nottinghamshire wood grey squirrels were responsible for nesting failures in 27% of nest boxes and that, on one farm in Norfolk, the control of grey squirrels reduced open nest predation from 85% to just 5-10%. Furthermore, they reported that the arrival of the grey squirrels in Durham coincided with an observed decline in the abundance of open-nesting bird species such as thrushes and finches.

Hewson *et al* (2004) also describe how squirrels compete for nest sites with bird species such as the tawny owl, kestrel, jackdaw, stock dove and starling. They report that, in some areas, the occupation of suitable nest holes by grey squirrels can be sufficient to prevent birds such as tawny owls (right) breeding at all.

The final mechanism for grey squirrels impacting on woodland birds is through the competition for food. Squirrels have been observed to take over caches of food stored by jays, and their diet of insects, buds and seeds, brings them into competition with many other species of woodland bird species, such as nuthatch, hawfinch and bullfinch.



***"Although there is clear evidence that Grey Squirrels may be having an impact, we need to do more research to understand just how serious the effects of Grey Squirrels are for birds, such as Hawfinch."***

**Chris Hewson**  
**BTO**

## **Solving the Problem**

### **Grey Squirrel Control**

Whether to help conserve the red squirrel, to prevent tree damage or to mitigate the impact of grey squirrels on birds; cost effective, humane and selective control of grey squirrel populations may have to be implemented in many areas of the UK in the future. Lethal control is governed by strict legal guidelines, but permission can be obtained to shoot, trap or poison grey squirrels to achieve the goals described previously. The Forestry Commission currently spends £200,000 per year controlling red squirrels, but they estimate that a great deal more would have to be spent for all of their serious impacts on British wildlife to be reversed (Forestry Commission UK, 2002).

The only poison currently allowed for use on squirrels in Britain is warfrin, but this approach is often unappealing to the general public who have great affection for the grey squirrel and is often ineffective if insufficient poison is placed into a woodland. In addition, there is always the possibility of rodenticides having impacts on non-target species of British wildlife.

In light of these problems, non-lethal methods of control are now being developed, which make lethal control un-necessary. Perhaps the most interesting of these is the Forestry Commissions newly developed food hopper, which allows red squirrels to access supplementary food, while heavier greys fall out through a trapdoor in the floor and so cannot feed (Pepper, 1993).

### **Red Squirrel Re-Introduction**

While endangered in Britain the red squirrel is still widespread in other areas of Europe and this raises the possibility of a re-introduction programme being initiated in which European animals are translocated into Britain. This method has been used, with considerable success, during the recent re-establishment of the red kite in Britain following its almost complete extinction by the mid 1980s.

The problem with this approach is that genetic studies have revealed that the red squirrel in Britain is significantly different from those found in Europe and there are many who therefore believe that it should be conserved in its own right (Barratt *et al.*, 1999).

## **The Future**

Although targeted control of grey squirrels is helping to protect the species most vulnerable to its presence at a local level, this resilient and adaptable mammal has found the perfect niche in our broadleaved woodlands, parks and gardens and has become a widely accepted and much loved part of our British wildlife.

What then are we to do if we are to protect our native species? Eradication would be both impossible and socially unacceptable, so are we then doomed to invest indefinitely in small scale attempts to hold the tide at bay. Perhaps the best course of action is to do nothing and accept the grey species as part of our wildlife. If John Gurnell's bleak outlook is true then, for those of us who do want to conserve the red squirrel, we may not have anything to worry about for much longer.

***...time is not on our side, or for that matter, on the side of the red squirrel...***

**John Gurnell**

**The Mammal Society**

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