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A survey to determine the presence
of red or grey squirrels in seven
woodland sites in the north west
of the Yorkshire Dales National Park
in 2005 and 2006.

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Summary

In order to learn more about the distribution of red squirrels *Sciurus vulgaris* and grey squirrels *Sciurus carolinensis* in the Yorkshire Dales National Park, feeders and hair tubes were placed in seven different woodlands (with two different survey sites in one particular woodland). At each of these survey sites, a squirrel nest box with an entrance hole 56 mm in diameter was also erected to try and determine use by red and/or grey squirrels.

Visual monitoring of the feeders and collection of hair samples was undertaken by Yorkshire Dales National Park Authority officers and volunteers on four survey dates in 2005 and five survey dates in 2006. Red squirrels were sighted at five of the survey sites and grey squirrels at three survey sites. Analysis of hair samples showed that red squirrels had visited the hair tubes in all eight woodlands (red squirrel hairs were present in samples from the two survey sites in one wood) and grey squirrels visited two woodlands (grey squirrel hairs were present in samples from the two survey sites in one wood). Although not on one of the survey dates, two grey squirrels were seen repeatedly using a nest box on a single occasion, suggesting that a 56 mm entrance hole would not prevent use by greys.

The initial survey has been successful in generating records of both red and grey squirrels and in generating volunteer interest. Therefore, with the permission of the landowners, it is intended to continue the survey work at existing sites and extend the number of hair tube survey sites to a number of other woodlands in the area.

Introduction

The distribution of red squirrels in the Yorkshire Dales National Park is relatively well known within the Cumbrian parishes of Dent, Garsdale and Sedbergh due to the longstanding efforts of the Sedbergh Red Squirrel Group. Since the late 1990s there have been an increasing number of red squirrel records from adjacent areas within the Yorkshire county boundary, notably around Hawes. Since these first reports, Yorkshire Dales National Park Authority officers and North West Red Alert staff have been working with a number of land owners and managers in the Hawes area to try and determine more about the distribution and status of red and grey squirrels in the area.

The records of red squirrels in the Widdale and Snaizholme area have primarily been reported by people living close to, or within woodland areas, where squirrels were usually initially sighted visiting bird tables. At a number of these locations, supplementary feeding specifically for red squirrels has been initiated and has led to habitual use by the squirrels. Given that the majority of red squirrel records in the Widdale and Snaizholme area are biased towards sites such as these, little is known about the wider distribution of squirrels in the area.

Hair tubes are a simple, yet effective, way of determining which species of squirrel is present in a woodland. As squirrels enter the tube to collect food, they leave hairs on sticky pads which, can be examined under a microscope to determine whether they have come from a red or grey squirrel. In order to try and determine a more accurate picture of the distribution of red squirrels and whether there were grey squirrels present in the area,

squirrel feeders and hair tubes were put up in a number of woodlands and monitored throughout the year.

In 2005, the Widdale and Garsdale & Mallerstang areas were designated as one of sixteen key Red Squirrel Reserve areas as part of the North of England Red Squirrel Conservation Strategy. Along with the collation of casual squirrel sightings, the hair tube survey work contributes to the work being undertaken to determine the distribution of red and grey squirrels in the reserve and buffer areas.

Given that red squirrels are smaller than grey squirrels, it was thought that a red-only nest box may help red squirrels get the upper hand over greys and survive in the areas where both species are present. A number of people, notably Bob Bradley and North West Red Alert, had suggested that a nest box for red squirrels which excludes grey squirrels could have a number of obvious conservation benefits. As part of the survey work, squirrel nest boxes with a carefully selected hole size were put up at each monitoring site. In order to test whether the boxes are used by either species, they were put up in what were considered to be red-only areas and at a control site considered to be a grey-only area. This part of the project was not meant to give any definitive answers but to give an indication as to whether red squirrels would use the nest boxes and to see if the hole size would exclude greys. It was intended to be supplementary to other work being undertaken in northern England.

Methodology

The number of sites selected for survey was initially dependent on the number of people who volunteered to assist with the monitoring program. In total, there were enough volunteers to cover seven different sites. There were two main criteria for selecting the sites: i) there were no actual squirrel records from the woodland sites even though they were close to woodlands where there were confirmed red squirrel records or ii) there were unconfirmed records of red squirrels from the woodland. One site was initially selected in what was considered to be a grey squirrel only area to act as a control for the nest box survey. The location of the survey sites are shown on map 1.

The nest boxes and feeders were constructed by members of the Yorkshire Dales National Park Authority Ranger Service and Dales Volunteers and made to standard specifications provided by North West Red Alert, including a circular entrance hole of 56mm on each of the nest boxes.

In each woodland area that was selected for survey, a feeder and hair tube were put up at an easily accessible location where it would also be possible to view the feeder from an appropriate distance. The tubes used were made from 300mm lengths of 65mm x 65mm square section PVC drainpipe wired to the top side of near horizontal branches at approximately 1.5m above the ground. Plastic blocks approx 60mm x 60mm x 6mm wrapped in double-sided adhesive tape were affixed to the underside of the top section of each open end of the sample tube. The tube was baited with a mix comprising of maize, hazelnuts, monkey nuts, peanuts and sunflower seeds. At each site a nest box was also put up close to the squirrel feeder.

The feeders and hair tubes were baited and pads attached one week before each survey date. Survey work was initially carried out once every two months from 24 July 2005 until

28 May 2006 with further surveys on 27 August and 26 November 2006 by Dales Volunteers and local residents. On each survey, each feeder was watched from a suitable vantage point to try and obtain some visual sightings of squirrels visiting them. All the feeders were viewed simultaneously between 0900 and 1030 hours. At the end of the observation period, the pads were labelled and removed for analysis. As it is illegal to disturb red squirrels without a licence, each nest box was also observed from an appropriate distance during the survey period for signs of squirrel activity.

The method used to examine the pads was largely that described by Gurnel *et al* (2001). Each pad was viewed under a microscope through the wall of the polythene bag to reduce the risk of sample mix up and cross contamination. Classification relied entirely on the kidney-shaped cross section of most red squirrel hair and the oval cross section of grey.

Under oblique illumination a transversally orientated hair exhibits a readily discernible linear reflection from the cuticle. In the case of red squirrel hair the kidney section presents not one but three curved surfaces, two convex and a concave, to the incident light and this produces up to three linear reflections. The classification technique therefore was to place the hair pad on the stage and continually rotate it to bring each hair to be classified at right angles to the direction of illumination, noting the reflection.

The location of hair tube and squirrel nest box survey sites in the Yorkshire Dales National Park in 2005 and 2006

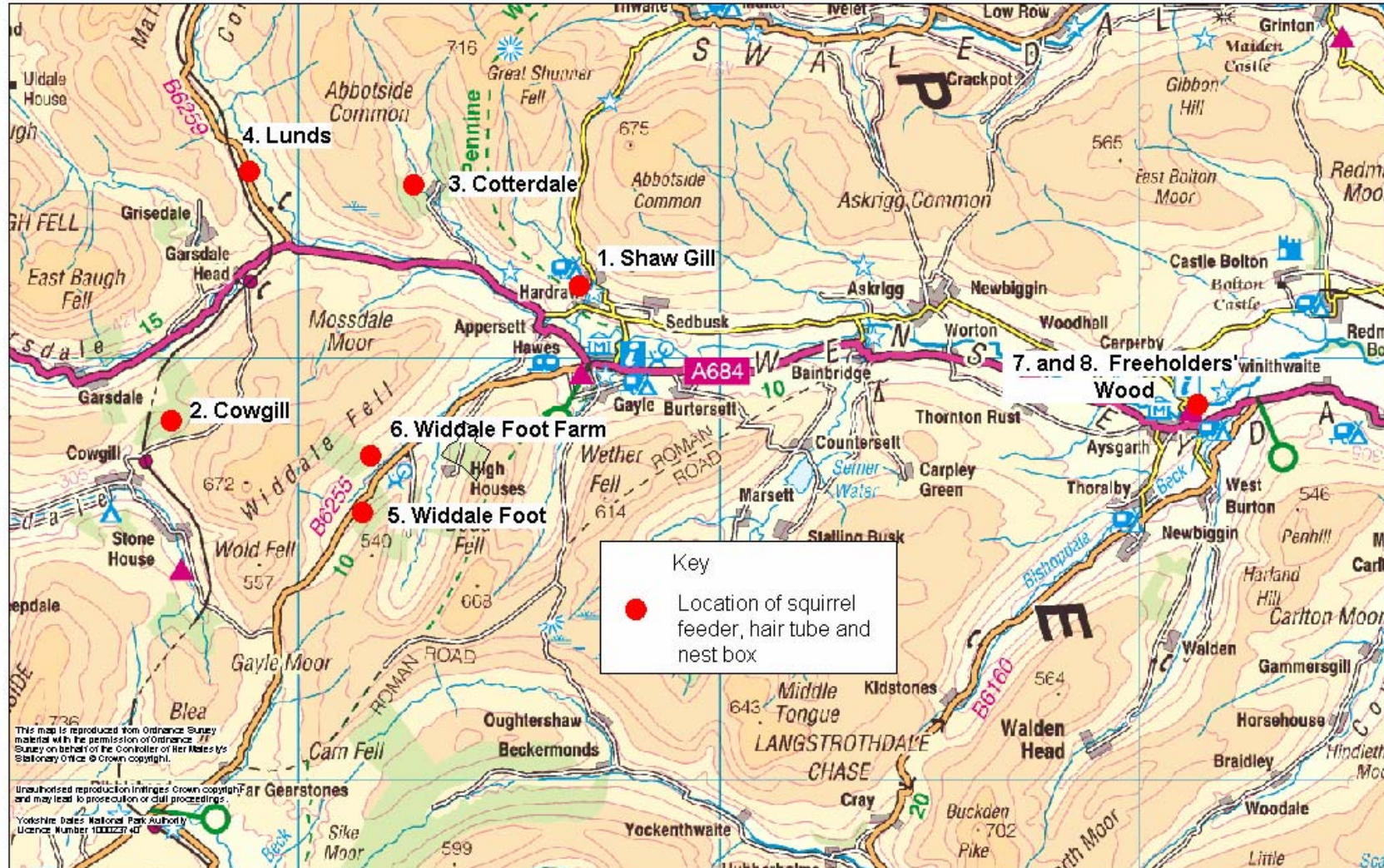


YORKSHIRE DALES
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Results

In 2005 each site was surveyed on 24 July, 25 September, and 27 November with further survey visits on 22 January, 26 March, 28 May, 27 August and 26 November 2006.

The sightings of red and/or grey squirrels recorded at the feeders during the survey work are shown in Table 1.

The results of the hair sample analysis are shown in Table 2.

Table 1. The number of red and grey squirrels sightings at feeders recorded during survey work at eight survey sites in the north west of the Yorkshire Dales National Park in 2005 and 2006 (Key: N = no observations).

Site No.	22 May 05		24 July 05		25 Sept 05		27 Nov 05		22 Jan 06		26 Mar 06		28 May 06		27 Aug 06		26 Nov 06		
	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	
1.	0	1	0	2	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0
2.	1	0	0	0	1	0	0	0	0	0	1	0	0	N	1	0	0	0	0
3.	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
4.	N	N	1	0	0	0	0	0	0	0	3	0	N	N	N	N	0	0	0
5.	N	N	0	0	1	0	0	0	N	N	1	0	1	0	1	0	0	0	0
6.	N	N	2	0	3	0	2	0	N	N	4	0	N	N	N	N	N	N	N
7.	N	N	N	N	0	2	0	0	0	2	N	N	N	2	0	2	N	N	N
8.	N	N	0	0	0	2	0	0	0	0	N	N	N	N	0	0	0	0	0

Table 2. the presence of red and/or grey squirrel hair in samples from eight hair tube survey sites in the north west of the Yorkshire Dales National Park in 2005 and 2006. (Key: ✓ = hair present in sample, ✗ = no hair, 0 = no samples taken, P = problems with the pads and no sample taken).

Site No.	22 May 05		24 July 05		25 Sept 05		27 Nov 05		22 Jan 06		26 Mar 06		28 May 06		27 Aug 06		26 Nov 06	
	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey	Red	Grey
1.	0	0	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	0	0	✓	✓
2.	✓	✗	✓	✗	✓	✗	P	P	✓	✗	✓	✗	P	P	✓	✗	✓	✗
3.	✓	✗	✓	✗	✓	✗	P	P	P	P	✓	✗	✓	✗	✓	✗	✓	✗
4.	0	0	✓	✗	✓	✗	✓	✗	P	P	✓	✗	✗	✗	✓	✗	✓	✗
5.	0	0	✓	✗	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✗	0	0
6.	0	0	✓	✗	✓	✗	✓	✗	✓	✗	✓	✗	✗	✗	✗	✗	0	0
7.	0	0	0	0	✗	✓	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓
8.	0	0	✗	✓	✓	✓	✗	✓	✗	✓	✗	✗	✓	✓	✓	✓	✓	✓

The combined results of the observations of the feeders and hair sample analysis from each site are shown in Table 3.

Table 3. The presence of red and/or grey squirrels at eight survey sites in the north west of the Yorkshire Dales National Park in 2005 and 2006 determined by observations of the feeders and analysis of the hair samples.

Site No.	Sightings at feeder		Hair Samples	
	Red	Grey	Red	Grey
1. Shaw Gill	No	Yes	Yes	Yes
2. Cowgill	Yes	No	Yes	No
3. Cotterdale	Yes	No	Yes	No
4. Lunds	Yes	No	Yes	No
5. Widdale Foot	Yes	No	Yes	No
6. Widdale Foot Farm	Yes	No	Yes	No
7. Freeholders' 1	No	Yes	Yes	Yes
8. Freeholders' 2	No	Yes	Yes	Yes

The analysis of the hair samples shows that red squirrel were present at all of the sites that were selected for survey.

The simultaneous observations at each site were undertaken in an attempt to see whether squirrels were present at each site at the same time on the same day. The most successful survey date was 26 March 2006 when red squirrels were recorded at Cowgill (one red squirrel), Cotterdale (one), Lunds (three), Widdale Foot (one) and Widdale Foot Farm (four).

The observations of the nest boxes did not provide any evidence of occupation or use on the survey days. However, whilst walking past one of the sites in Freeholders' Wood in mid-August, one of the surveyors observed two grey squirrels repeatedly going in and out of the nest box. This suggests, albeit based on a single observation, that a 56mm nest hole diameter is insufficient to deter use by grey squirrels.

Discussion

The survey work in 2005 and 2006 has shown that red squirrels are present in the seven woodlands that were surveyed and has increased our knowledge of red squirrel distribution in the area. The presence of red squirrel hairs in hair pad samples taken from Shaw Gill, and in particular Freeholders' Wood, are noteworthy. The samples from Shaw Gill on three consecutive survey dates confirm previous reports that red squirrels are present. However, the grey squirrels hairs recorded from each sample taken were not surprising given that it is predominately broad-leaved woodland.

The red squirrel hairs recorded at sites 7 and 8 in Freeholders Wood were completely unexpected and as such, the first samples were sent to Peter Lurz who confirmed that they were red squirrel hairs. Prior to the survey, Freeholders Wood, approximately 12km from the edge of the Widdale Reserve grey squirrel buffer area, was considered to be a grey only area. Red squirrel hairs were recorded in samples taken on four different survey dates from the two sites in Freeholders' Wood. At both sites, the presence of at least one red squirrel was recorded on three consecutive survey dates in May, August and

November 2006. Despite Freeholders' Wood being a popular visitor attraction, there have been no recent reports of red squirrels in the area.

It should be noted that red squirrels were only first reported to be returning to Yorkshire part of the National Park in the late 1990s. As such, the issues surrounding red and grey squirrel conservation and management are relatively new to many people in the area, unlike many adjacent areas of Cumbria where red squirrel have been present for many years. The initial project has not only been successful in providing additional information on the distribution of red and grey squirrels in the area, but has also helped to raise awareness of the conservation work that is required in and around the Widdale Red Squirrel Reserve and Buffer area. It has been extremely successful in developing volunteer interest to such an extent that it will be possible to continue the hair tube survey work.

Whilst it would be preferable to undertake some additional work to determine squirrel density, the majority of the conifer plantations in the area are at, or approaching, the thinning phase of management. As such, the trees are currently too tightly spaced and enclosed to undertake the standard visual transect surveys. Therefore, with the permission of the landowners, it is intended to continue the hair tube work at the current sites and also increase the number of survey sites in other woodlands in the Reserve and Buffer area. Nest boxes will not be put up at any new site selected for survey.

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