Forest Research

Red Squirrels United
Public Attitudes Survey
SUMMARY REPORT

Social acceptability of methods used to manage squirrels in the UK

Mike Dunn

Mariella Marzano

Forest Research is the Research Agency of the Forestry Commission and is the leading UK organisation engaged in forestry and tree related research. The Agency aims to support and enhance forestry and its role in sustainable development by providing innovative, high quality scientific research, technical support and consultancy services.

Contents

List of Figures

List of Tables

Executive summary

- This report is an output from 'Red Squirrels United' which is projected to run from January 2015 to November 2019. The 'development phase' of the project is funded by the Heritage Lottery Fund and led by The Wildlife Trusts in partnership with Newcastle University, Forest Research, Lancashire Wildlife Trust, Red Squirrels Wales, Northumberland Wildlife Trust, Ulster Wildlife and The Wildlife Trusts of South & West Wales. The findings contained within have been compiled by Forest Research.

- The purpose of this report is to inform on the knowledge, opinions and beliefs of public stakeholders on the management of squirrels. Findings relating to awareness of squirrel conservation and attitudes towards grey squirrel (*Sciurus carolinensis)* management will be used to aid the development of locally appropriate campaigns and actions as well as inform future management planning. Forest Research will conduct a follow-up survey after these activities have been implemented.

- In October 2015, a survey was carried out in collaboration with Toluna Group Ltd and partners, via their online panel survey tool. It consisted of two parts - a national overview and a boost sample within and around case study areas. In total, data from 3847 public stakeholders was collected, representative by gender, age group, and region according to UK census statistics.

- Although woodlands are highly valued for the social, cultural and economic benefits they provide, nearly half of the sample are infrequent visitors to woodlands and forests. However, most respondents are aware of the presence of (mostly grey) squirrels in their respective local areas. In comparison to the national sample, those in the Kielder, Merseyside and Wales case studies are more likely to have only red squirrels, and red and grey squirrels, living in their local area.

- A majority of people currently like or would like to see both red and grey squirrels, although red squirrels are more favoured with 'the countryside' the most preferred setting.

- Reds squirrels are regarded as being endangered and are more highly valued than grey squirrels. There is greater agreement that grey squirrels should be controlled, relative to reds if they become overabundant or damage local woodlands.

- While more than three quarters of people have heard at least something about a relationship between red and grey squirrel populations, very few (6.3%) claim to know a lot about it. Since less than 7% of people disagree with the statement that

greys should be controlled if found to be impacting reds, it is likely that evidencing such impact will increase support for the control of grey squirrels.

- Awareness of local red squirrel conservation activities and grey squirrel control programmes is very low among the national sample, but substantially higher in a number of case study areas (particularly Kielder and Merseyside). Northern Ireland is notable among the case studies for the low levels of awareness about these activities and programmes.

- Previous studies have found that greater knowledge of control methods is typically associated with greater acceptance, yet in our survey knowledge levels were found to be low across all methods.

- Humaneness is the most important factor in decisions to support and oppose control methods. This explains why methods which do not involve any direct killing (e.g. contraception and planting trees to limit available food) are considered the most acceptable. In contrast, those methods which may induce suffering (shooting, kill traps and poison) rank as the least acceptable. Control methods are also more likely to be supported if they are proven to be effective at controlling populations, and more likely to be opposed if they lack specificity, i.e. do not distinguish between grey squirrels and other non-target species.

- Control methods are generally more accepted by males, older individuals, respondents with a strong connection to nature (e.g. frequently visit woodlands and forests, are involved in countryside management as part of their occupation), whose local area is populated only by red squirrels, who profess to know most about a relationship between red and grey squirrel populations, and are aware of existing red squirrel conservation programmes and grey squirrel control activities.

- Acceptability of control methods in the Merseyside and Northern Ireland case study areas mirror that of the national sample, but in Kielder and Wales acceptance for many of the methods is much greater.

- In contrast to the Government and the media, environmental groups, forest industry and welfare groups are all well trusted to provide information about squirrel conservation and management. Despite the aforementioned distrust in the media, television is by far the most commonly cited source of information for issues facing the UK countryside and its wildlife (followed by newspapers and the internet).

- Results concur with the general literature on wildlife management, which highlights that non-lethal methods are generally preferred. Knowledge levels about wildlife management are often low amongst publics but males, older individuals and those with higher knowledge levels about pest species and management are likely to show greater support for control methods.

- Evidence from the literature suggests that information provision is rarely enough to change attitudes and other forms of engagement is needed. Community involvement in wildlife management decision-making is key to greater acceptability and support.

Introduction

This survey sought to investigate the knowledge, opinions and beliefs of public stakeholders on management of squirrels. The public are key participants in Red Squirrels United as their actions can influence the conservation success of red squirrels (*Sciurus vulgaris*) through monitoring, as well as the implementation of policies and practices for grey squirrel (*Sciurus carolinensis*) management. Understanding how public stakeholders use and value wildlife within woodlands, particularly squirrels, and their opinions and beliefs about grey squirrel management are crucial to determining public support for management options.

Wildlife management is often considerably more effective if there is successful participation of key stakeholders – notably local community members, relevant policy-makers and scientists. Participatory processes involved in collaborative management can facilitate a better understanding of environmental issues and ensure that management efforts are more relevant to local interests. Participation also leads to the formation of relationships, which is an essential requirement for greater communication, trust and willingness to be involved in grey squirrel management. Information provision is an important component of collaborative management but simply being knowledgeable, e.g. about risks, does not necessarily mean that attitudes or behaviours change. Before developing more interactive and participatory forms of engagement there is a need to understand the underlying factors influencing public attitudes, motivations and decision-making regarding squirrel management. For example, it is critical to understand and assess the social acceptability of what is trying to be achieved. Variations may be contingent upon geography (proximity to species), but also potentially individual environmental values, the objectives of management and direct experiences or perceptions of the methods involved (e.g. their effectiveness or whether it is considered humane).

This on-line survey serves as a baseline for understanding public attitudes towards squirrel management and will be repeated in year 4 of the project. The key objective of the survey was to find out at the national scale and at case study level:

- To what extent is there an acceptance that grey squirrels need to be managed?
- Which management methods are most preferred and acceptable?

Findings from this survey will contribute to the development of the audience engagement strategy for the HLF delivery phase. Survey results will also act as a benchmark for monitoring effectiveness and impact of community and wider public engagement over the lifetime of the project.

Method

A nationwide survey of public stakeholders in the UK was conducted to generate primary data on public attitudes to specific methods used to manage grey squirrels. The survey was produced in collaboration with Toluna Group Ltd, a specialist panel survey company, and administered via their online panel survey tool. The survey collected data from 3758 individuals over the age of 18 and a representative sample was achieved by gender, age group, and region according to UK census statistics.

The survey was delivered online, using a survey tool purpose built by Toluna Group Ltd (http://eu.tolunagroup.com/). The questions were developed by Forest Research social scientists and 'Red Squirrel United' partners and were then subsequently refined and tested with specialists at Toluna (see Appendix A for survey questions).

The sample was drawn from Toluna's panel of registered respondents and two collaborative partners over a two-week period in October 2015. Panel members were invited to participate via email with social groups that have generally lower response rates (e.g. younger males) and case study sites being targeted earliest in the survey effort. The response was reviewed twice a day and assessed in relation to pre-set census-derived quotas. Efforts were subsequently made to stimulate responses from groups that had not reached their quota (i.e. further direct and automated email invitations were sent).

The survey was carried out in two parts with a national overview and a boost sample within and around case study areas. The case studies in this project are typically in low-population areas and so the return rates were lower than anticipated using an online survey approach (see Table 3). The sample will be boosted in the delivery phase through distribution of survey forms in person and through community-based groups in case study areas

Questions concentrated on four key areas: (i) general interest and involvement in nature woodlands; (ii) attitudes towards wildlife; (iii) attitudes towards management methods for grey squirrels; and (iv) opinions about who should take responsibility for management, and who is trusted to perform certain key management tasks.

Final data was provided in MS Excel format, although much initial analysis (descriptive statistics and cross-tabulations) was completed using the survey company's online analytic tool ('Toluna Analytics'). The demographic information collected, as well as respondent's answers to questions on awareness, concern and attitude, was cross-tabulated with responses to selected questions about management acceptance in order to explore potential effects of these on opinions on grey squirrel management (Table 1). The demographic groups used to partition and explore different sets of the data were primarily gender, age, profession and case study location.

Table 1. Cross-tabulations used to explore opinions on squirrel management

Starting question…	Cross-tabulated with…
In general, how acceptable are the following methods for controlling grey squirrels? (seven control methods listed)	Are you male or female?
	How old are you?
	Do any aspects of your job involve countryside management?
	How much do you know about a relationship between red squirrel and grey squirrel populations?
	Are you aware of squirrels living in your local area?
	How frequently do you visit woodlands or forests?
	Do you know of any red squirrel conservation activities in your local area?
	Do you know of any grey squirrel control programmes in your local area?
Where do you live? (coded for case study areas)	Are you aware of squirrels living in your local area?
	Do you know of any red squirrel conservation activities in your local area?
	Do you know of any grey squirrel control programmes in your local area?
	In general, how acceptable are the following methods for controlling grey squirrels?

Key findings

Representativeness

A total of 3758 people over the age of 18 were surveyed. Of the respondents there were an almost equal number of males (47.0%) and females (52.9%)[1], closely matching the 2011 UK census data (males = 49.1%; females = 50.9%) (Office for National Statistics, 2011). The percentage of respondents from each region of the survey also closely matched the 2011 UK census data (Table 2), as did the percentage of respondents within each age band (Table 3) (Office for National Statistics, 2011). Percentages are also given for case study regions (Table 3). For the purposes of exploring the data, the two Wales case studies were combined.

Table 2. Survey population data and 2011 census data for each region

Region	Survey	Percentage	Census data*	Percentage
North East England	216	5.8	2,596,900	4.1
North West England	555	14.8	7,052,200	11.2
Yorkshire	273	7.3	5,283,700	8.4
West Midlands	279	7.4	5,601,800	8.9
East Midlands	235	6.3	4,533,200	7.2
East of England	285	7.9	5,847,000	9.3
South West England	272	7.2	5,288,900	8.4
South East England	450	12.0	8,634,800	13.7
London	398	10.6	8,173,900	12.9
Wales	238	6.3	3,063,500	4.8
Scotland	273	7.3	5,295,400	8.4
Northern Ireland	284	7.6	1,810,900	2.9
TOTAL	**3758**	**100**	**63,182,200**	**100**

*2011 UK census data rounded to the nearest 100

The high degree of similarity between the demographics of our survey data compared with those from the 2011 UK census data indicate that the survey data is representative of the population in the UK. For the purposes of this analysis the age bands were grouped to represent younger people (18-34 years), middle-aged people (35-54 years) and older people (55+ years) in order to facilitate comparisons across sections of the population.

---

[1] Figures rounded to one decimal place. Six people (0.2%) preferred not to say

Table 3. Survey population data and 2011 census data for each of five age band

Age bands	Survey respondents	Percentage	Census data	Percentage
18-24	369	9.8	5,949,817	12.0
25-34	613	16.3	8,431,789	17.0
35-44	610	16.2	8,820,112	17.7
45-54	723	19.2	8,737,554	17.6
55-64	629	16.7	7,422,052	14.9
65+	804	21.4	10,377,127	20.9
Prefer not to say	10	0.3		
TOTAL	**3758**	**100**	**49,738,451**	**100**

Table 4. Case study survey population data

Case Study	Survey respondents	Percentage of national sample
Kielder	74	2.0
Merseyside	173	4.6
Northern Ireland	292	7.8
Gwynedd and Anglesey	74	2.0
Mid Wales	29	0.8
Wales (combined Gwynedd and Anglesey and Mid Wales)*	103	2.7

*Owing to the small number of respondents in Mid Wales, responses from the two Welsh case study areas have been combined herein.

Use and interest in woodlands and forests

The majority of respondents feel that trees and woodlands in the UK are important for providing a range of functions which benefit social and cultural values and the economy (Figure 1). The top 3 functions for trees and woodlands are: to provide a place for wildlife, a place to de-stress, and for making areas nicer places to live. Fewer respondents feel that woodlands are important in bringing the community together or involving people in local issues.
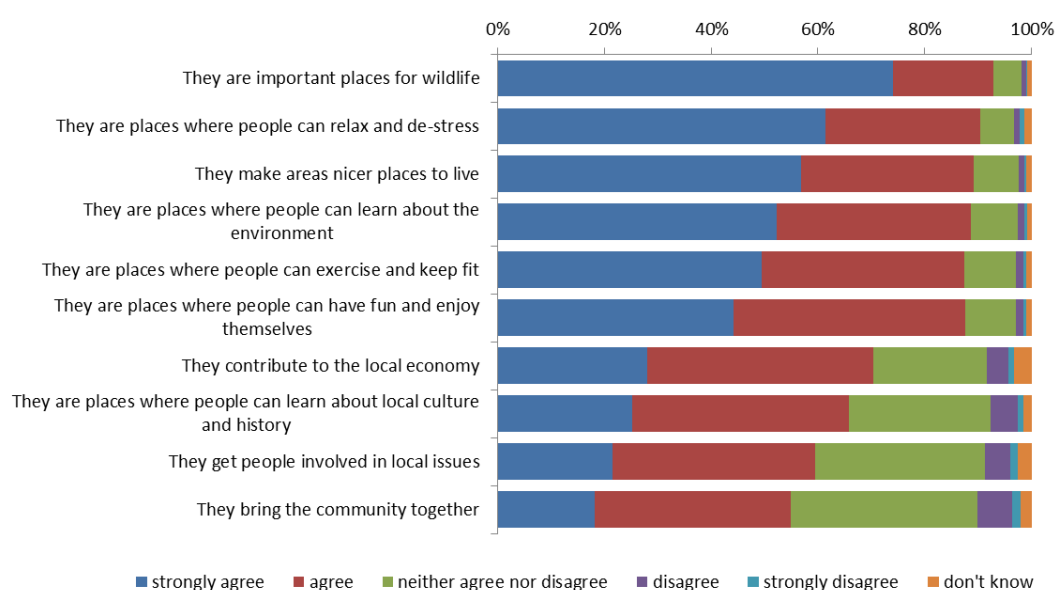
Figure 1. Importance of woodlands and forests to the public (n=3758)

Despite the obvious value the public place on woodlands, nearly half of the sample are infrequent visitors, with 7% stating that they have never visited a woodland. Only 43% reported visiting more than once a month, with 13% of these visiting more than once a week. Recreation, relaxation and viewing wild animals and plants are the most common reasons why people choose to visit woodlands and forests (see Figure 2). However, walking or cycling through woodlands and forests to reach another destination also provides a reason for more than 20% of people to visit.
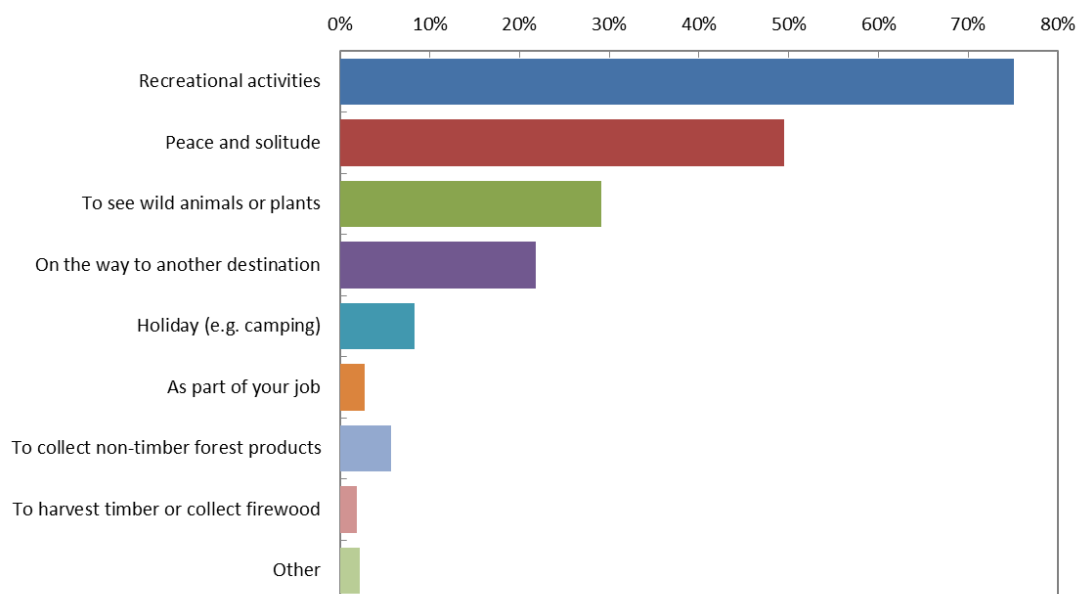
Figure 2. Main reason for respondents' woodland visits (n=3482)

More than three quarters of respondents are concerned or very concerned about the threats to our trees and woodlands from invasive plants, animals and diseases (Figure 3).
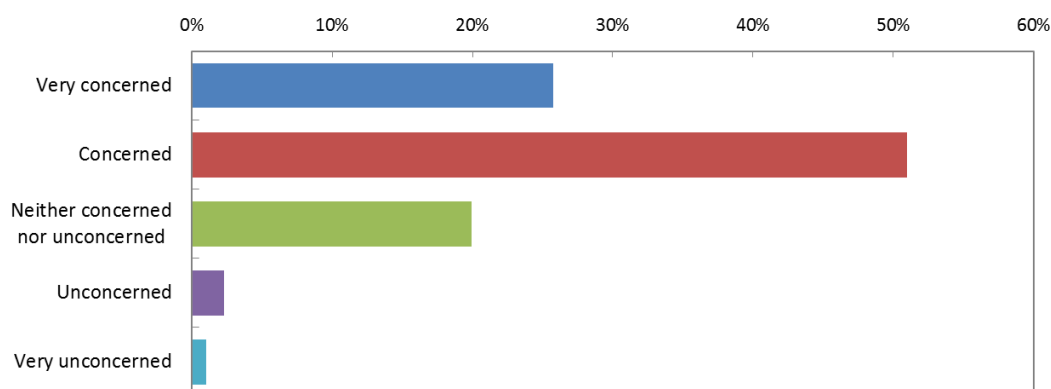
**Figure 3. Concern over the threat to British trees and woodlands from invasive plants, animals and diseases (n=3758)**

Knowledge and attitudes towards squirrels

Most respondents reported that they are aware of squirrels in their local area with the majority stating that there are only grey squirrels (67.6%) (Figure 4). Relatively few respondents claimed to live in areas with both red and grey squirrels (14.1%), and fewer

still in areas with only reds (5.7%). Less than 10% reported that they live in squirrel-free areas although (8%) did not know.
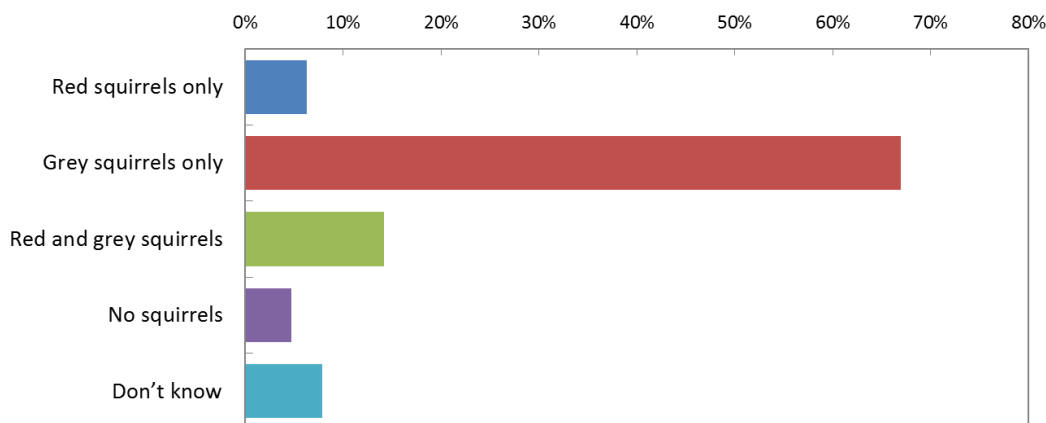
Figure 4. Awareness of squirrels living in respondents' local area (n=3758)

When we asked respondents whether they like or would like to see red and grey squirrels in different settings, the majority stated that they wish to see both (Figure 5). In comparison to grey squirrels, around 25% more of the sample agreed that they like or would like to see red squirrels in any given setting. However, around 50% of respondents also said they like or would like to see grey squirrels in any given setting. A small number, around 10%, have no interest in seeing any squirrels.
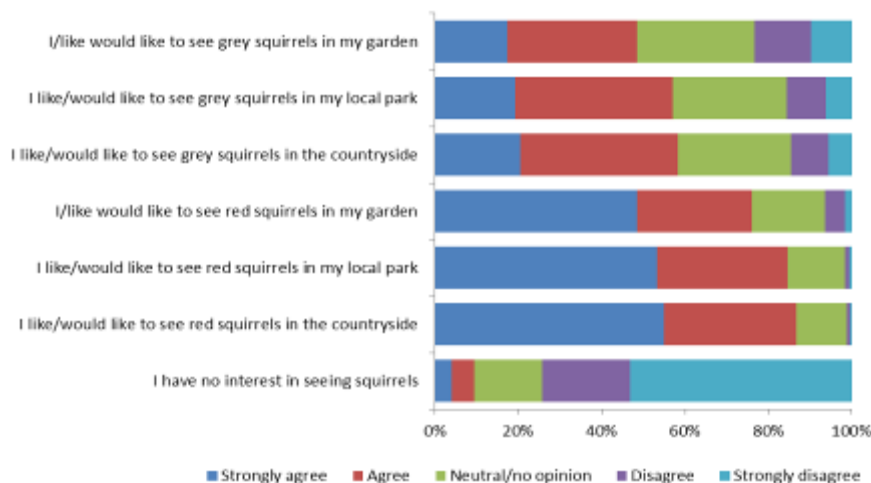
Figure 5. Desire to see squirrels in different settings (n=3758)
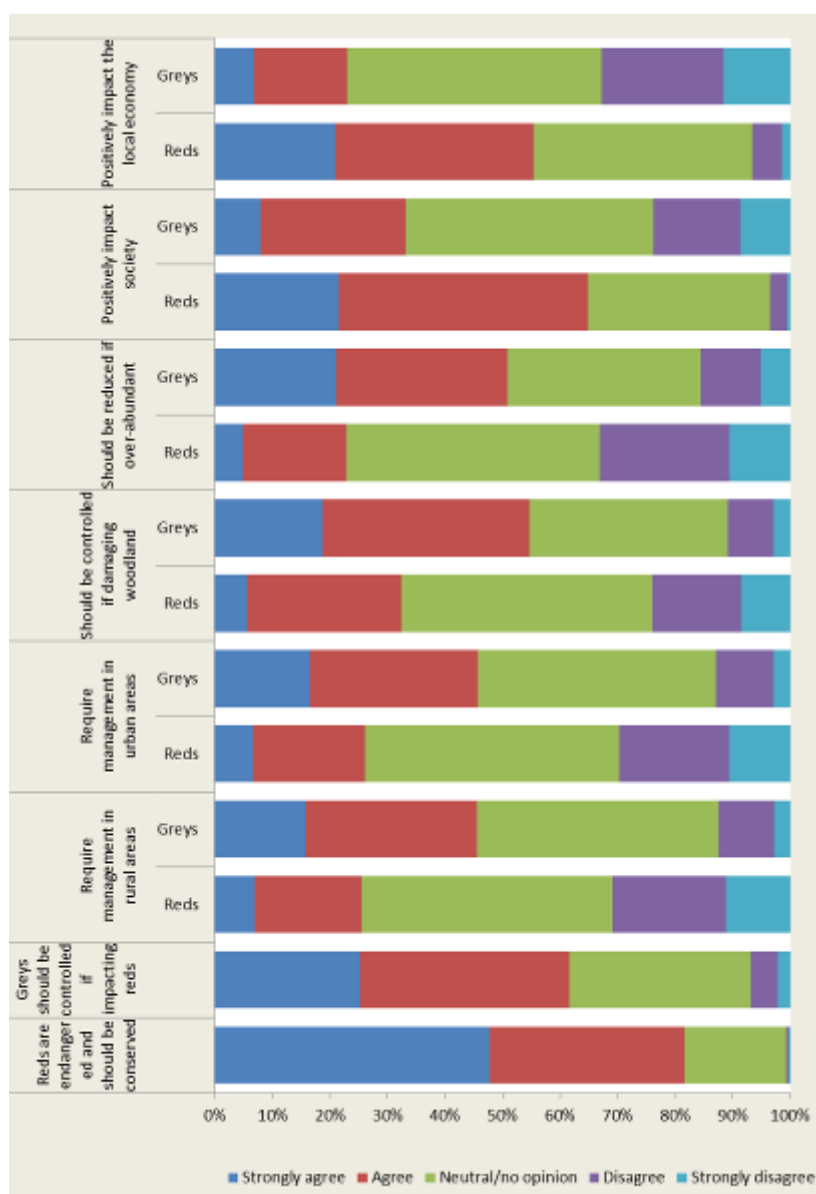
Figure 6. Perceptions about red and grey squirrels (n=3758)

We presented respondents with eight attitudinal statements that related to both red and grey squirrels (Figure 6). Red squirrels are believed to have a positive impact on the local economy and society in general in comparison to grey squirrels. Over 80% agreed that red squirrels are endangered and require conservation. They are highly valued compared to grey squirrels with the implication that any potential negative impacts are more likely to be tolerated. Fewer people agree that red squirrels require management in urban or rural areas and that the number of red squirrels should be reduced if they become overabundant or are found to be damaging local woodland. Few respondents (less than 10%) disagreed with the need to control grey squirrels, particularly if found to

be impacting on red squirrels but a reasonable proportion of respondents also indicated that they had no opinion. The neutral/no opinion option was relatively high for most of the attitudinal questions perhaps suggesting that some people are undecided about management issues and would benefit from further engagement. Notably, 59.7% agreed that there should be no management of squirrel populations and that nature should be allowed to take its course.

Knowledge and acceptance of squirrel management

When seeking to implement wildlife management, it is critical to understand and assess the social acceptability of what is trying to be achieved. Knowledge and awareness of wildlife issues and management methods can influence attitudes and behaviour. When asked what they know about the relationship between red and grey squirrels, most respondents indicated that they had either heard of (but know little about it) or know something about it (Figure 7). Less than 10% reported that they know a lot, while 22.5% of respondents indicated that they were completely unaware of a relationship.
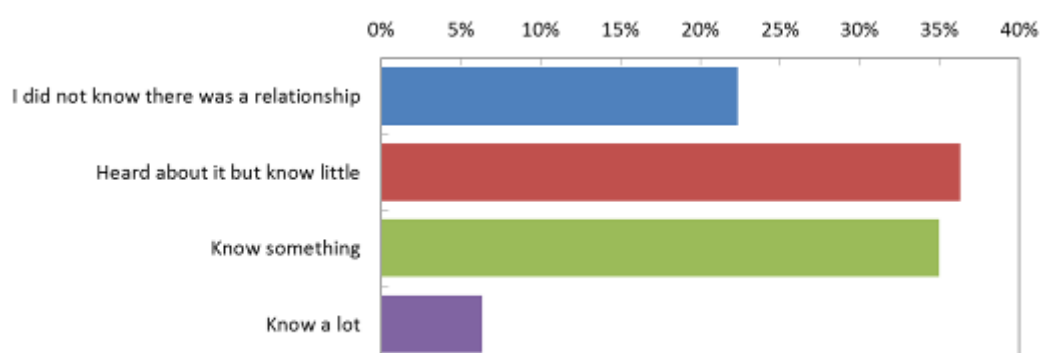
Figure 7. Knowledge of relationship between red and grey squirrel populations (n=3758)

Awareness of management for squirrels generally is very low amongst the respondents with nearly 10% aware of red squirrel conservation activities and even less (5%) aware of grey squirrel control (Figure 8).
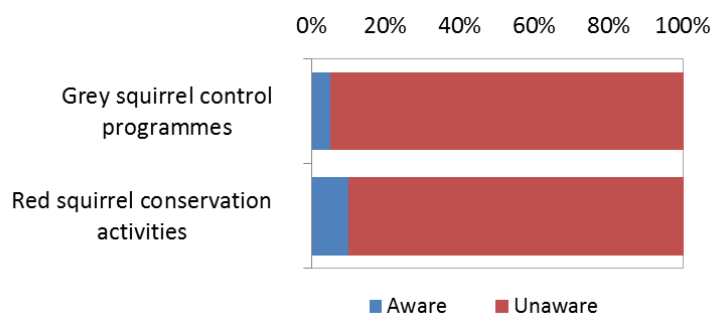
Figure 8. Awareness of squirrel control programmes and conservation activities in respondents' local area (n=3758)

Knowledge of methods for grey squirrel control is also very low amongst the sample as a whole with less than 5% of respondents reporting to 'know a lot' about any of the methods. Control methods that people reported to have some knowledge of include shooting, kill traps and live capture traps (Figure 9).
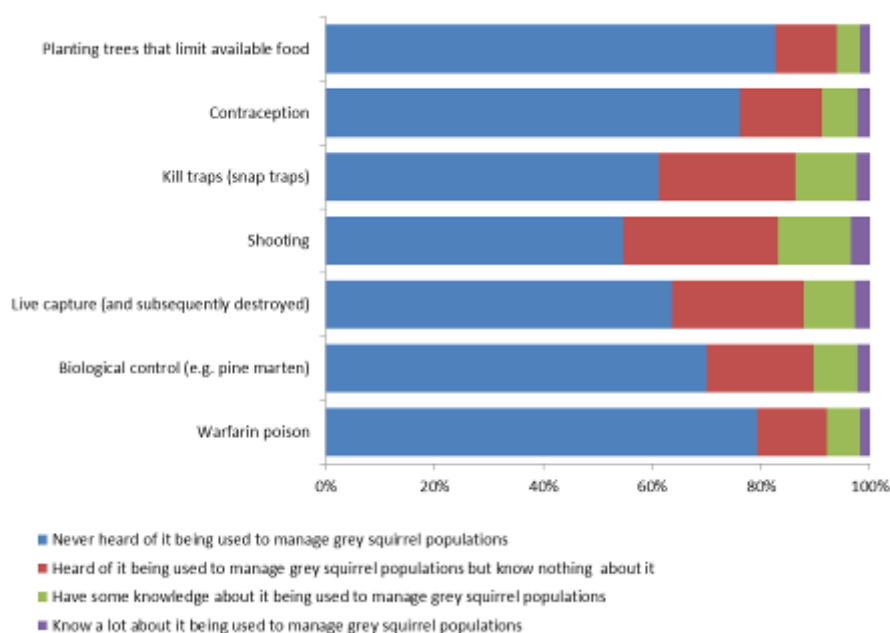
Figure 9. Knowledge of squirrel control methods (n=3758)

Despite low levels of awareness, there were a range of responses on acceptability of control methods (Figure 10). Contraception is considered to be the most acceptable control method with 61.5% indicating that it is either acceptable or highly acceptable. This was closely followed by planting trees that provide grey squirrels with no food (51.2%). Biological control is the third most acceptable with 42.2% in the highly acceptable or acceptable range although nearly 30% of respondents regard this method as unacceptable or highly unacceptable. A majority of respondents believe Warfarin poison, kill traps and shooting to be unacceptable means of control.
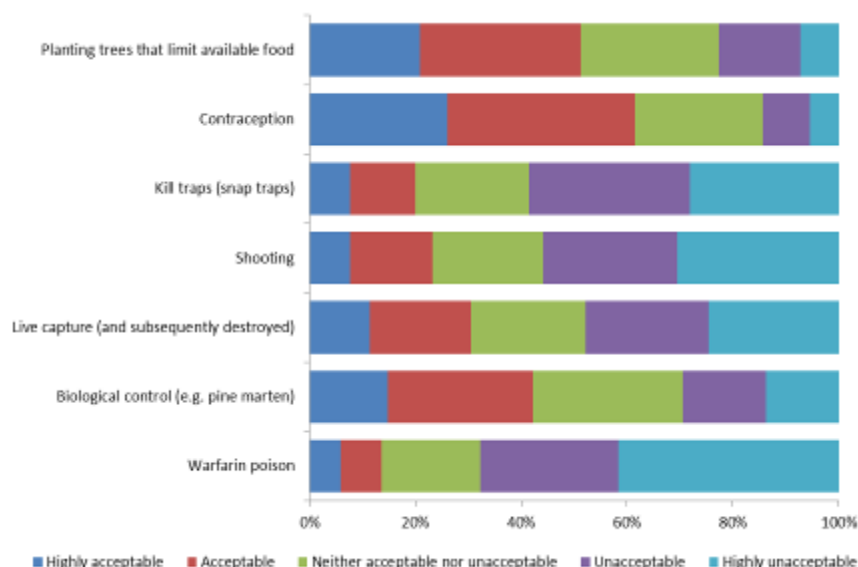
Figure 10. Acceptability of squirrel control methods (n=3758)

When asked which factors most influence their decision to support or oppose a control method, the perceived humaneness of a method was the most important factor (Figure 11). This most likely explains why methods which do not involve any direct killing (e.g. contraception and planting trees to limit available food) are considered the most acceptable while in contrast, those methods which may induce suffering (e.g. shooting, kill traps and poison) rank as the least acceptable. Control methods are also more likely to be supported if they are proven to be effective (55.7% ranking it as the most or second most important factor in their decision to support a control method), and more likely to be opposed if they lack specificity, i.e. do not distinguish between grey squirrels and other non-target species. Cost and safety are the least influential factors.
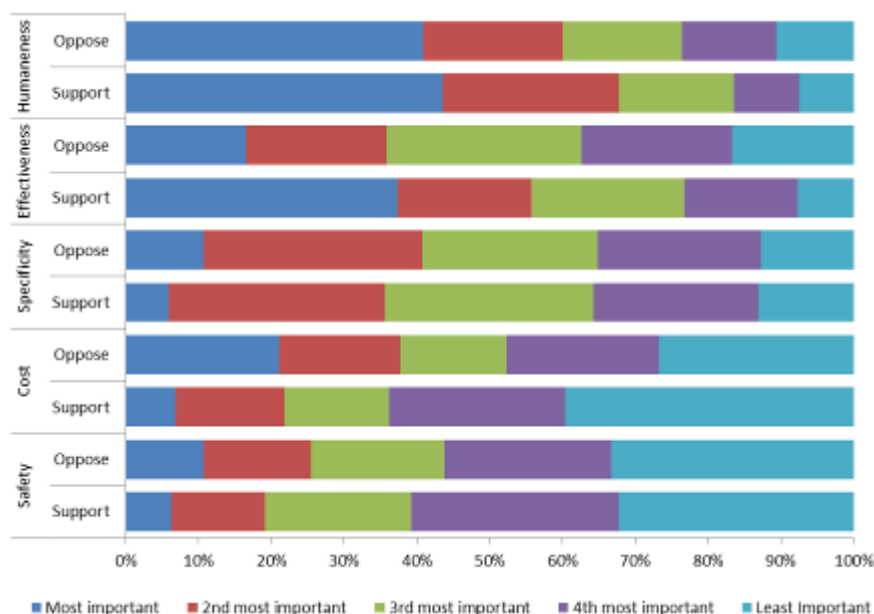
Figure 11. Importance of factors in the decision to support or oppose a control method (n=3758)

Males are more likely to consider all of the control methods to be more acceptable than females (Figure 12). The difference is least pronounced in the case of contraception, which ranked as the most acceptable method for both groups. However, there is a greater difference when considering methods that involve the killing of squirrels (e.g. shooting, trapping, capturing and poisoning), which males are twice as likely to find acceptable than females.
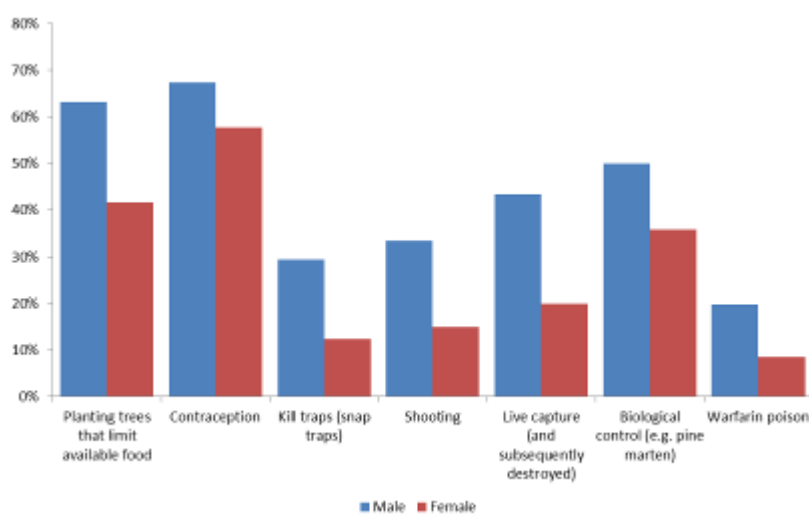
Figure 12. Control methods deemed acceptable differentiated by gender (n=3752)

Older respondents consider grey squirrel control methods to be more acceptable than younger people (Figure 13). Warfarin poison proved to be the only exception, being more acceptable amongst the younger demographic. Despite this, Warfarin poison is the least acceptable control method among all age groups.
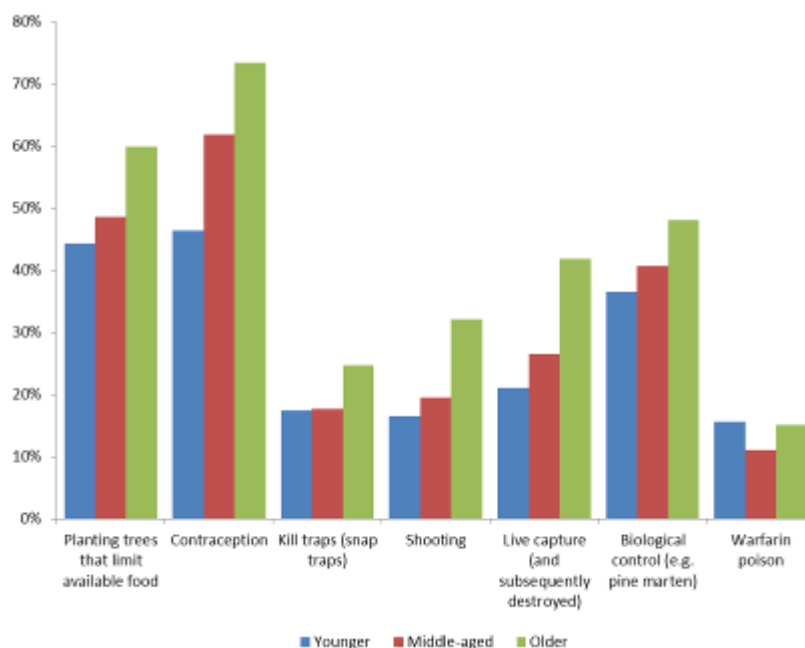
Figure 13. Control methods deemed acceptable differentiated by age (n=3748)

Around 10% of respondents indicated that their occupation involves countryside management. This group are typically more accepting of control methods, particularly in the cases of 'Kill traps', 'shooting', 'live capture', and 'Warfarin poison' (Figure 14). The exception is 'contraception' which is deemed acceptable by more than half of all respondents. It is likely that people who have a livelihood link to countryside management have greater awareness of wildlife-related problems and are also more knowledgeable about the different control methods. Greater awareness/knowledge can lead to higher acceptability of management.
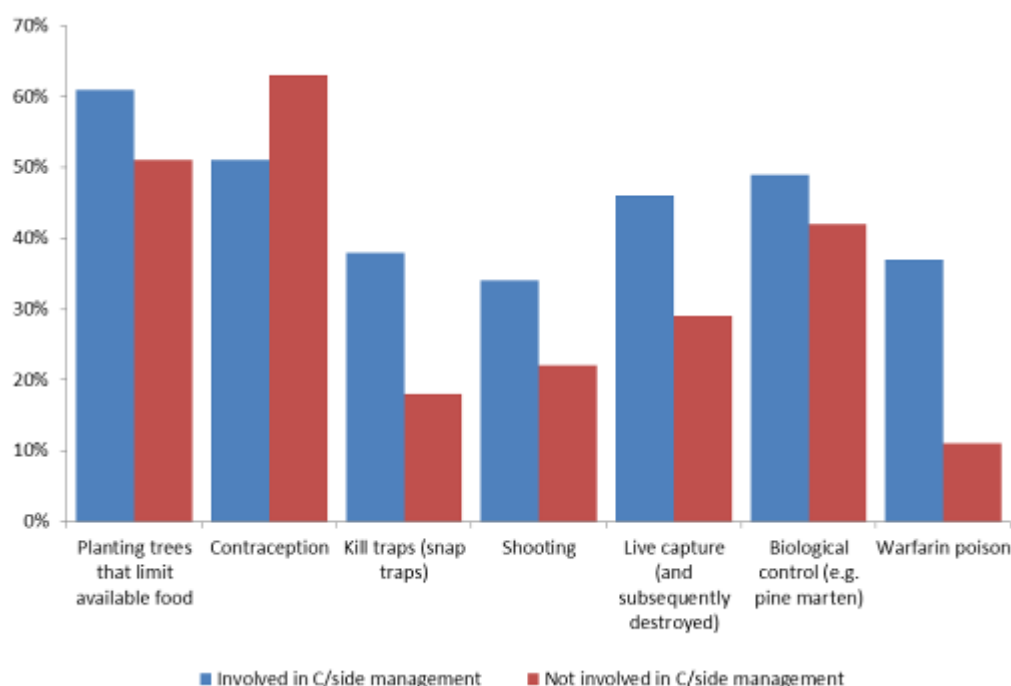
Figure 14. Control methods deemed acceptable differentiated by employment in an occupation involving countryside management (n=3758)

Respondents who reported to be knowledgeable about the relationship between red and grey squirrel populations (and the potential threat that grey squirrels pose) are more likely to find lethal control methods for grey squirrel populations acceptable (Figure 15).
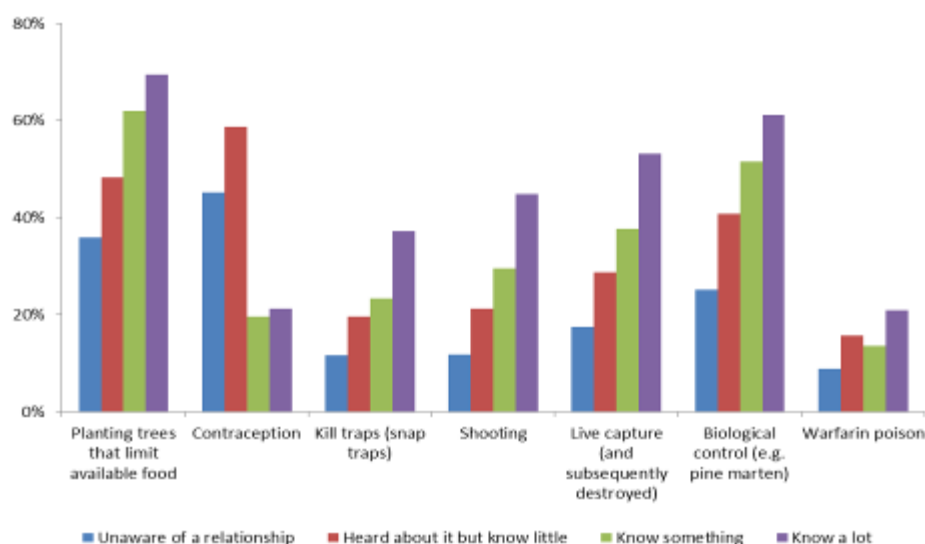
Figure 15. Control methods deemed acceptable differentiated by knowledge of a relationship between red and grey squirrel populations (n=3758)

Those who live in an area populated only by red squirrels typically find methods to control grey squirrels more acceptable (Figure 16). There were similar levels of acceptance towards the control methods in areas populated only by grey squirrels and by both red and grey squirrels although support was marginally higher in areas with red and grey squirrels. Those who reported to have no squirrels in their local area, or were unaware of what types of squirrels (if any) were present, are the least accepting of grey squirrel control methods. Lack of experience of seeing squirrels may possibly equate to a limited desire to accept any type of management.
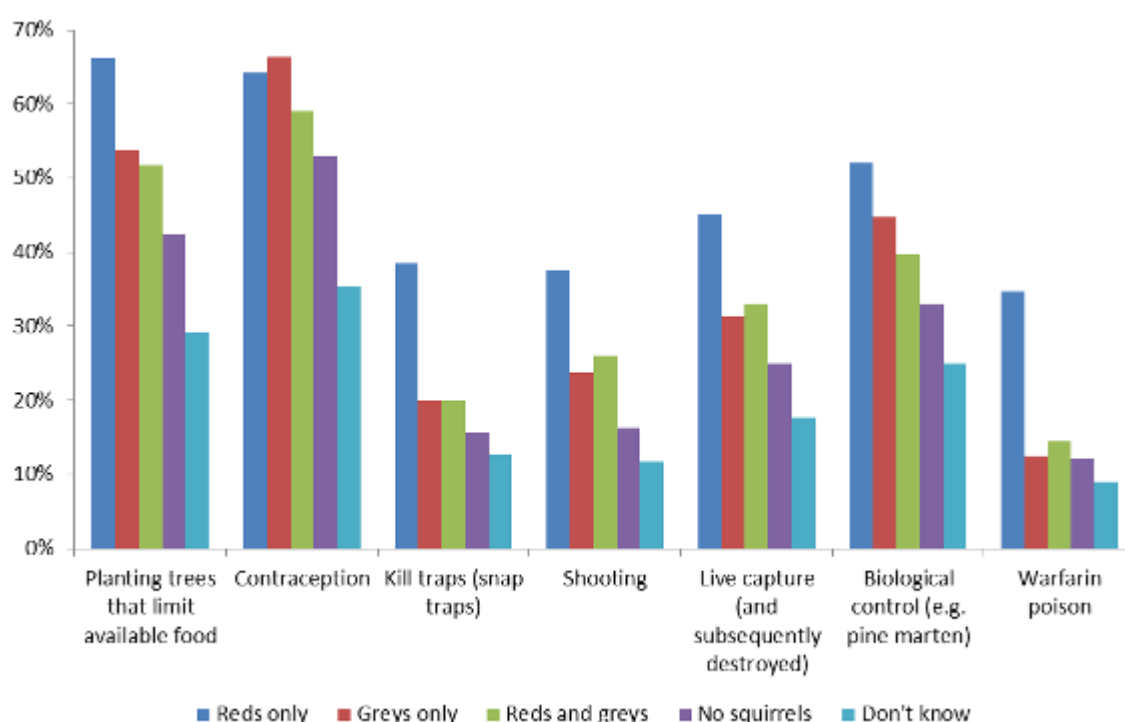
Figure 16. Control methods deemed acceptable differentiated by awareness of squirrel populations in respondents' local area (n=3758)

However, respondents who frequently visit woodlands and forests are more likely to consider grey squirrel control methods to be acceptable suggesting that a greater connection to nature may be an important factor in attitudes towards wildlife management (Figure 17).
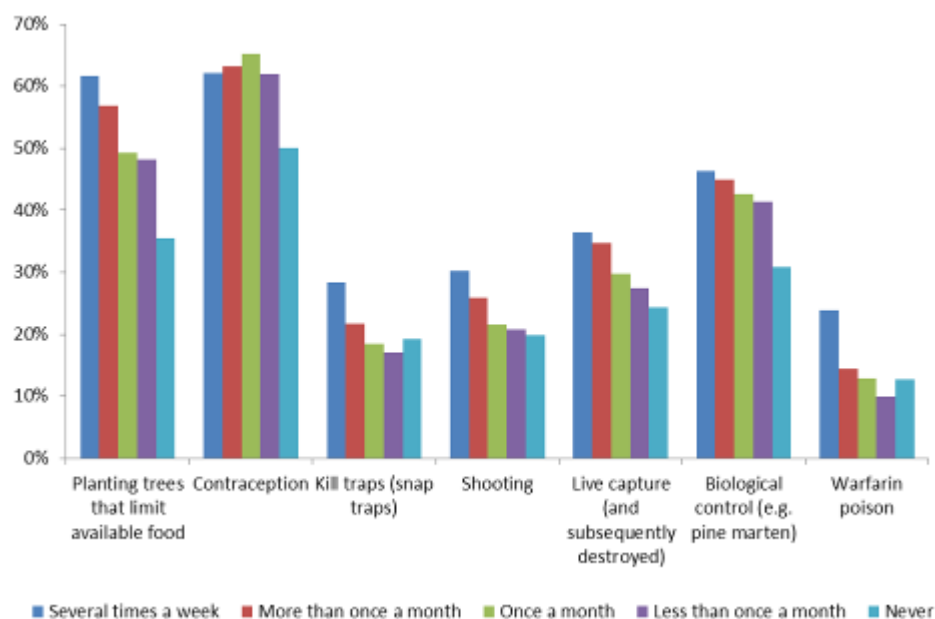
Figure 17. Control methods deemed acceptable differentiated by frequency of visits to woodlands or forests (n=3758)
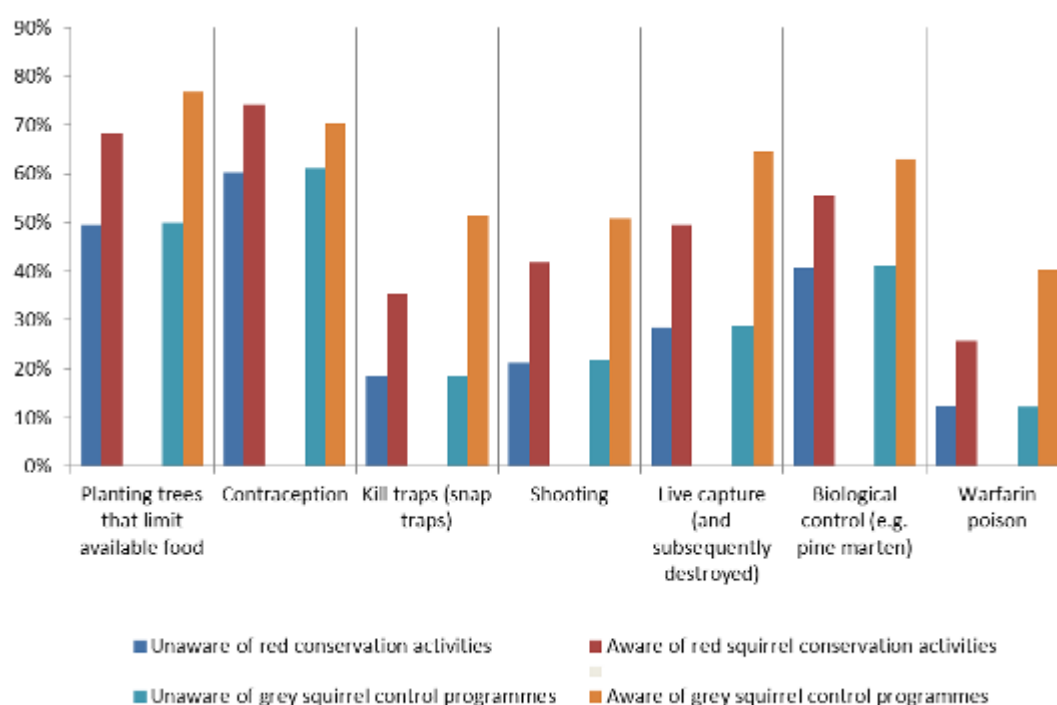
Figure 18. Control methods deemed acceptable differentiated by awareness of local conservation and control activities and programmes (n=3758)

Respondents who are aware of grey squirrel control programmes and red squirrel conservation activities are more likely to consider grey squirrel control methods as acceptable (Figure 18). Greater exposure to, and therefore awareness of, management programmes and activities can influence acceptability levels but we should keep in mind that current awareness levels are low (see Figure 5).

Trust and Communication

There is generally a high level of trust in the organisations or entities listed (Figure 19) to provide reliable information about squirrel conservation and management. The highest trust is placed in Environmental groups (73% strongly agree or agree) and the forest industry (72.9%) followed by animal welfare groups (68.1%) and scientists (61.3%). Lowest trust is placed in the media (32.5%) and the government (28.3%).
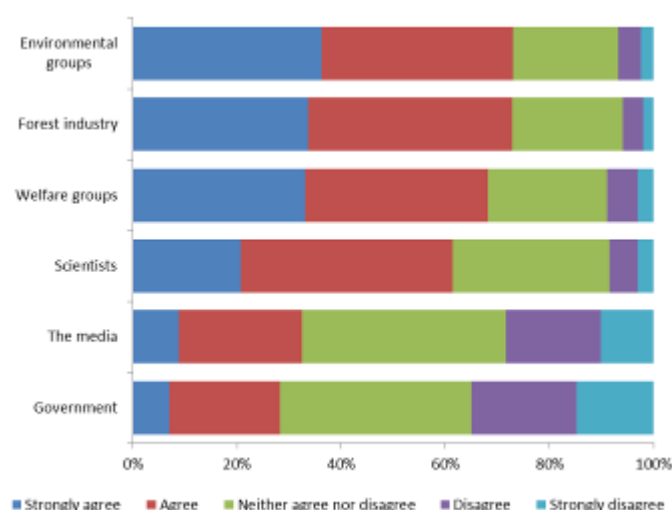
Figure 19. Trust in entities to provide reliable information about squirrel conservation and management (n=3758)

Despite lower levels of trust in the media, television, newspapers and the internet are the most common sources of information about the countryside and wildlife (Figure 20). These media forms are important sources for raising awareness but more trusted organisations need to engage with individuals, organisations and communities to increase acceptability and support for management measures.
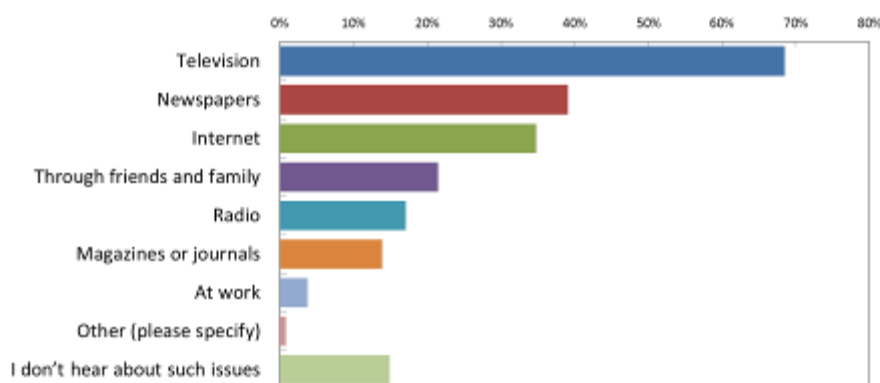
Figure 20. Sources of information for issues facing the UK countryside or its wildlife (n=3758)

Respondents believe that the local community and wider public should be consulted when squirrel management is being planned and that evidence should be provided (although 42.6% and 43.8% are undecided or disagreed) (Figure 21). Despite this desire to be involved in the decision-making process, 55.6% respondents agree that it is sometimes necessary for forest managers to undertake management which the local community and wider public may not agree with.
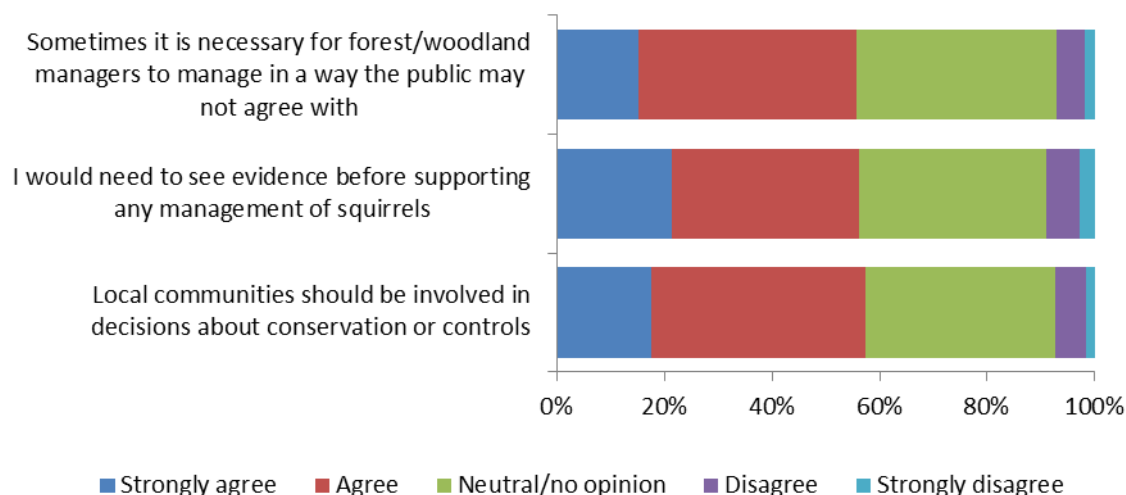
Figure 21. Attitudes towards decision making for issues of control and conservation (n=3758)

Case study perspectives

Despite the low sample size in some of the case study areas, we can still provide some useful perspectives. In comparison to the national sample (n=3758), people in the Kielder, Merseyside and the Wales case study areas are more likely to state that they have only red squirrels, and red and grey squirrels, living in their local area (Figure 22).
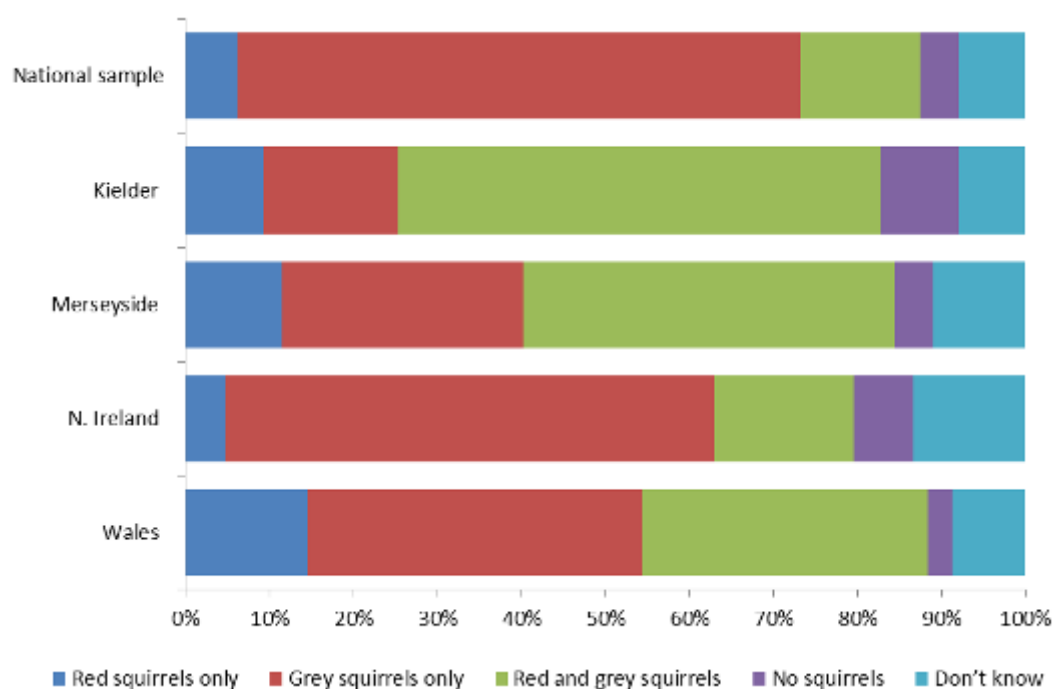
Figure 22. Squirrels living in respondents' local area differentiated by case study area (n=642)

Awareness of red squirrel conservation is substantially higher within the Kielder, Merseyside and the Wales case study areas than among the national sample, reflecting the existing focus on conservation activities in these areas (Figure 23). In contrast, only 5.4% of those in the Northern Ireland case study are aware of such activities, a figure lower than that observed in the national sample (9.7%). Awareness of grey squirrel control programmes is lower than awareness of red squirrel conservation activities for the national sample (5.0%) and each of the case study areas. Awareness of control programmes is greatest in Kielder (28.0%) and Merseyside (10.3%), while Northern Ireland and Wales exhibited a level of awareness similar to that in the national sample.
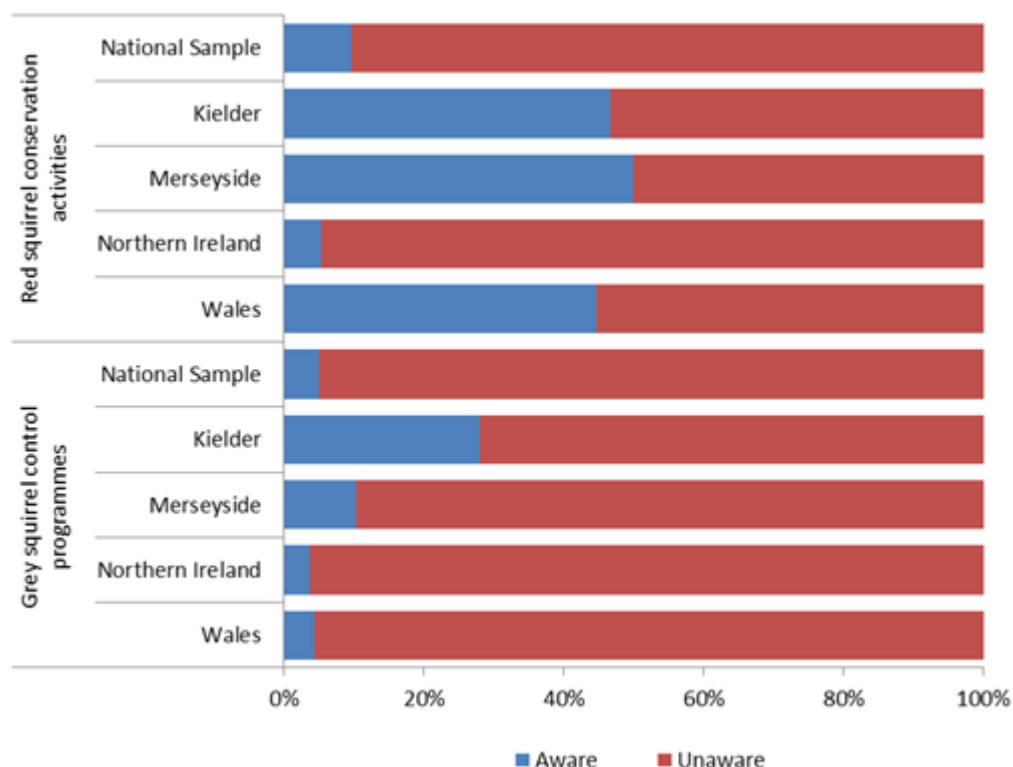
Figure 23. Awareness of local squirrel conservation activities and control programmes differentiated by case study area (n=642)

Acceptability of the control methods are ranked in the same order across the case study areas, and the national sample (Figure 24). In the Merseyside and Northern Ireland case study areas, the percentage of respondents who consider the control methods to be acceptable closely matches that observed in the national sample. Respondents from the case study areas of Kielder and Wales typically regard the control measures to be more acceptable than those in the national sample and other case study areas. However, non-lethal methods are generally preferred.
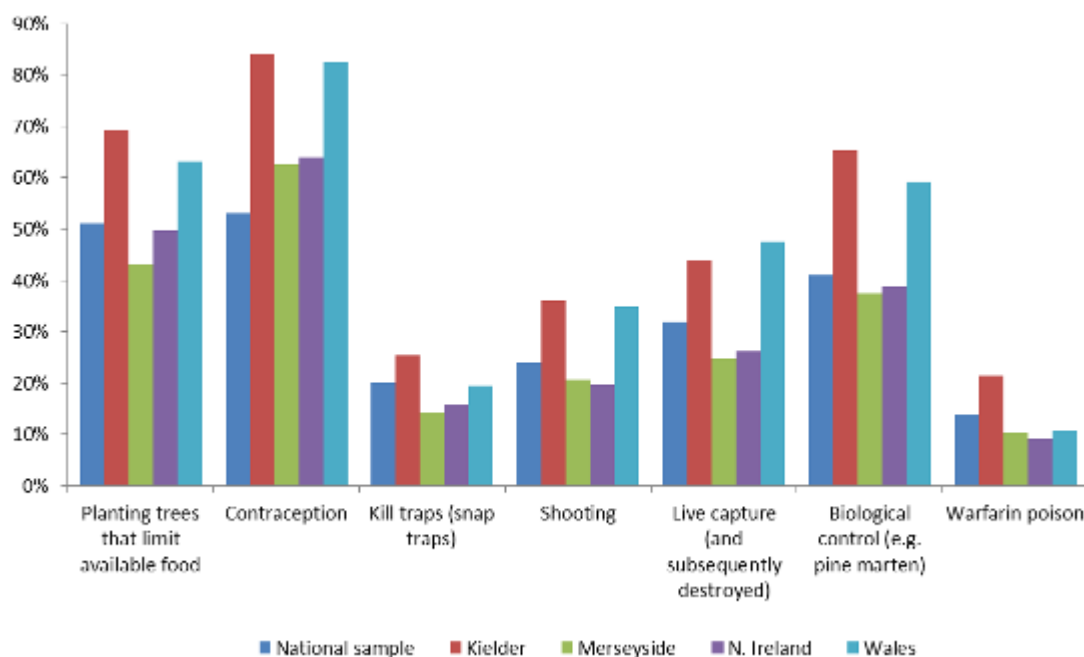
Figure 24. Control methods deemed acceptable differentiated by case study area (n=642)

Summary

The public places high value on trees and woodlands and the social, cultural and economic benefits they provide even if they do not frequently visit these places. Red squirrels are also highly valued and the majority of respondents felt efforts should be made to conserve them. Awareness of red squirrel conservation activities and grey squirrel control is low nationally, although higher in several case study areas (e.g. Kielder and Merseyside). Despite low levels of knowledge, non-lethal measures were considered the most acceptable although support for lethal control measures increased with greater awareness and knowledge. Humaneness, specificity and proven effectiveness are key factors influencing support or opposition to control methods.

The large proportion of people who did not know how acceptable they found the management methods indicates that respondents with least awareness about an issue are the most undecided about whether a method is acceptable or not. Members of a community who are still undecided on how acceptable they find a management method are an important target group when attempting to generate support for management and may be easier to influence than those who have already decided a method is unacceptable. Media channels will be useful for raising awareness but engagement with communities will need to be carried out with trusted organisations.

The results concur with a number of studies on wildlife management that include evidence of public attitudes towards different control methods. For example, evidence suggests that men and older people show more support for control methods while younger people and females show less support for lethal forms of management intervention (Akiba et al 2012; Fraser 2006; Bremner and Park 2007). Beliefs and values held by publics can have a strong influence over preferences for management methods (Fuller et al 2015). Fraser (2006) found that ethical and moral beliefs are a heavy influence on social acceptability of control methods. Values can be related to gender, age and level of education as well as geographical location with various articles indicating that rural residents are more likely to support management interventions than urban residents (Fuller et al 2015). Other influential values systems identified in the literature are focussed around economic and environmental considerations. For example, people who placed higher importance on economic values are more likely to support management interventions that reduce financial losses than those who hold environmental values that include ideals about the 'right to life' and reduction of suffering (Dandy *et al.* 2012; Fitzgerald *et al.* 2007; Konig 2008; Sharp *et al.* 2011). However, demographic variables and value systems are often interlinked so private landowners who are more likely to live in a rural location and tend to have higher economic values in relation to the wildlife issue are more likely to support management actions (Fuller et al 2015). Values are deep-rooted and difficult (though not impossible) to change, which has important implications for Red Squirrels United. For example, there is ample evidence available to show that the provision of information rarely changes negative attitudes which were formed prior to any intervention programme alone and other engagement methods are needed (Fraser 2004; Lauber and Knuth 2006; Selge *et al.* 2011; Stankey and Shindler 2006).

As a starting point it is important to gauge awareness of, and knowledge about, wildlife problems and potential management actions. From the literature we find that generally knowledge levels of about wildlife control programmes amongst publics are low (Bremner and Park 2007 Defra 2009). Nevertheless, studies show that where there is support for management, control methods which are humane and species-specific are more acceptable than those deemed to have the opposite features (Fraser 2006, Bremner and Park 2007, Defra 2009). Non-lethal methods for control are generally preferred by publics (cf König 2008 Dandy et al. 2011, 2012). Contraception and biological control are seen as more humane and species-specific (Fraser 2006). For example, a survey of general public attitudes and preferences on badger management found that the majority (87%) were in favour of using non-lethal methods (Bennett and Willis 2008). Badger contraception and tunnels received more support than culling through trapping or shooting (Bennett and Willis 2008). A New Zealand study on public attitudes to pest control methods learned that poison is seen as inhumane and non-species specific and therefore not acceptable (Fraser 2006). Other studies have reported similar findings (Bremner and Park 2007). Studies that provide the option of reducing the quality of the habitat for pest species found that this is likely to be more acceptable

than lethal control (see for example the case of urban foxes in Germany, König 2008). Focussing on grey squirrels, Barr et al (2002) explored the perceptions of professionals and 'interested enthusiasts' in Britain. Results show that there was less concern about control of grey squirrels in areas where only red squirrels are present. There was a preference for maintaining balance rather than wholesale grey squirrel eradication. When comparing shooting, trapping, poisoning and IMC (immunocontraception), IMC was seen as most humane. Poisoning was considered most effective methods (although the danger of being non-specific was noted) but the least humane and therefore not acceptable.

Generally, where knowledge levels about a pest species was higher, there was also greater support for control (Bremner and Park 2007; Akiba et al 2012). In their survey of the Scottish public on attitudes to management of non-native invasive species, Bremner and Park (2007) found that prior knowledge of grey squirrel control programmes influenced levels of support. Perceptions and/or experience of nuisance/damage also increases support for control methods (Akiba et al 2012; Ash and Adams 2003). Other factors that influence support for culling or eradication include evidence of the effectiveness of control methods (Bennett and Willis 2008) in terms of the methods itself as well as the expertise of those responsible for carrying out the method (Lauber and Knuth 2004; Shine and Doody 2011; Wilkinson and Fitzgerald 2006). Difficulties arise when certain species can only be successful removed using a method that people do not support (Bremner and Park 2007). For example, Grey squirrels have been described in Barr et al (2002) as a 'charismatic pest' and grey squirrel control can be a sensitive issue (e.g.http://www.bbc.co.uk/news/magazine-34603394). Proof should also be presented to show that preventative action has been tried and failed and other non-lethal methods have been proven not to work (Defra 2009, Dandy et al 2011). Ideally control methods should have long-term effectiveness (Ash and Adams 2003), although management methods that require ongoing effort receive less support (Dandy et al 2012).

Publicising information about wildlife damage may increase awareness and potentially support for management (Akiba et al 2012), and Bremner and Park (2007) highlight the importance of public support for conservation activities. They suggest the species involved and methods of control will influence levels of public support and cite an example from Italy where animal rights groups objected to grey squirrel eradication trials, which effectively halted management activities (Bertolino and Genovesi 2003 cited in Bremner and Park 2007; cf Barr et al 2002). Management actions are more likely to be supported if there is community involvement in decision-making and they have an opportunity to consider the outcomes of management practices (Stankey and Shindler (2006). As noted earlier, information is rarely enough to change attitudes on its own (e.g. Rogers et al 2013) but at least it should address the values and concerns held by each section of the public that is location and situation-specific. Management interventions that are tailored to local dynamics can impact substantially on levels of

support amongst publics (Lauber et al 2007; McNeely 2005). Moreover, communication through recognised and trusted bodies about why a particular method is being used and why alternative methods may be inappropriate or ineffective can increase public confidence in management (Defra 2009; Stankey and Shindler 2006). Bremner and Park (2007) suggest further research is needed on how information provision and engagement influences attitudes especially in relation to efficacy of control options and impacts on animal suffering.

References

Akiba, H., Miller, C.A., Matsuda, H. 2012. Factor influencing public preference of raccoon eradication plan in Kanagawa, Japan. Human Dimensions of Wildlife. 17:3, 207-219.

Ash, S.J., Adams, C.E. 2003. Public preferences for free-ranging domestic cat (*Felis catus*) management options. Wildlife Society Bulletin. 31:2, 334-339.

Barr, J.F., Lurz, P.W.W., Shirley, M.D.F., Rushton, S.P. 2002. Evaluation of immunocontraception as a publicly acceptable form of vertebrate pest species control: The introduced grey squirrel in Britain as an example.Environmental Management 30(3):342-351.

Bennett, R.M., Willis, K.G. 2008. Public values for badgers, bovine TB reduction and management strategies. Journal of Environmental Planning and Management. 51:4, 511-523.

Bremner, A. and Park, K. 2007. Public attitudes to the management of invasive non-native species in Scotland. 139, 306-314.

Dandy, N., Ballantyne, S., Moseley, D., Gill, R., Peace, A., Quine, C. 2011. Preferences for wildlife management methods among the peri-urban public in Scotland. European Journal of Wildlife Research. 57, 1213-1221.

Dandy, N., Ballantyne, S., Moseley, D., Gill, R., Quine, C., Van Der Wal, R. 2012. Exploring beliefs behind support for and opposition to wildlife management methods: a qualitative study. European Journal of Wildlife Research. 58, 695-706.

DEFRA. 2009. Wildlife management and invasive non-native species. Report of Research Findings among the General Public, Anglers and the Horticultural Retail Trade. Prepared for the COI, on behalf of its clients, the Department for the Environment, Food and Rural Affairs and the GB Non-Native Species Secretariat. pp142.

Fitzgerald, G., Fitzgerald, N., Davidson, C. 2007. Public attitudes towards invasive animals and their impacts. Invasive Animals Cooperative Research Centre, Canberra, Australia. pp57.

Fraser, A. 2006. Public attitudes to pest control: A literature review. Department of Conservation, Wellington, New Zealand. pp36.

Fuller, L., Dandy, N., Marzano, M. (2015). Assessing public attitudes to, and support for, tree disease control methods and their impacts. A report for WP4 for the Project TH0111 'social and Economic analyses of Dothistroma Needle Blight control. Defra, London.

König, A. 2008. Fears, attitudes and opinions of suburban residents with regards to their urban foxes. European Journal of Wildlife Research. 54, 101-109.

Lauber, T.B., Knuth, B.A. 2004. Effects of information on attitudes toward suburban deer management. Wildlife Society Bulletin. 32:2, 322-331.

Lauber, T.B., Knuth, B.A., Tantillo, J.A., Curtis, P.D. 2007. The role of ethical judgements related to wildlife fertility control. Society and Natural Resources. 20:2, 119-133.

Mcneely, J. 2005. Human dimensions of invasive alien species. In *Invasive alien species.* Editors: H. Mooney, R. Mack, J. Mcneely, L. Neville, P. Johan, and J. Waage. Island Press, Washington D.C., USA. p285–309.

Rogers, S.C., Hoover, W.L., Allred, S.B. 2013. Public acceptability of forest management practices at Morgan-Monroe State Forest. In: Swihart, Robert K.; Saunders, Michael R.; Kalb, Rebecca A.; Haulton, G. Scott; Michler, Charles H., eds. The Hardwood Ecosystem Experiment: a framework for studying responses to forest management. Gen. Tech. Rep. NRS, 254-286.

Selge, S., Fischer, A., van der Wal, R. 2011. Public and professional views on invasive non-native species – A qualitative social scientific investigation. Biological Conservation. 144:12, 3089-3097.

Sharp, R.L., Larson, L.R., Green, G.T. 2011. Factors influencing public preferences for invasive alien species management. Biological Conservation. 144, 2097-2104.

Shine, R., Doody, J.S. 2011. Invasive species control: understanding conflicts between researchers and the general community. Frontiers in Ecology and the Environment. 97, 400-406.

Stankey, G.H., Shindler, B. 2006. Formation of social acceptability judgements and their implications for management of rare and little-known species. Conservation Biology. 20:1, 28-37.

Wilkinson, R., Fitzgerald, G. 2006. Public attitudes toward possum fertility control and genetic engineering in New Zealand. Landcare Research Science, Series 29. pp50.

Annex 1

PUBLIC SURVEY REGARDING ATTITUDES THE ACCEPTABILITY OF METHODS USED TO MANAGE SQUIRRELS

This survey asks for your opinion on wildlife management methods in the UK. We are particularly interested in your attitudes towards squirrels and their management. Your replies will help us better understand public opinion. We will be able to inform conservation managers about your views, and influence the way people might be better engaged in grey squirrel control.

The survey is organised by the Sciuriosity project. The information you provide will be seen and analysed only by the Sciuriosity team. We do not keep any records that can identify you. We use the demographic information asked for at the beginning of the survey to understand more about the kinds of people who have answered the survey and which kinds of people have been represented.

Thank you for taking the time to complete this questionnaire. Please remember, there are no correct answers; it is your opinion that we are interested in.

First, some questions about you.

Q1. Are you?
1. Male
2. Female
3. Prefer not to say

Q2. How old are you?
1. Under 18
2. 18-24
3. 25-34
4. 35-44
5. 45-54
6. 55-64
7. 65+
8. Prefer not to say

Q3. Where do you live?

		RECODE FOR QUOTA
1	Scotland	SCOTLAND
2	Yorkshire and The Humber	NORTH
3	North West	
4	North East	
5	East Midlands	MIDLANDS
6	West Midlands	
7	East of England	SOUTH
8	Wales	
9	South East	

10	South West	
11	Greater London	LONDON
12	Central London	
13	Northern Ireland	NORTHERN IRELAND

Q4. What is the first part of your postcode?

We ask for postcode data so that we can understand more about the social characteristics of the area you live in and the types of woodlands and forests you may be familiar with. This information will not identify you or your home address.

By this we mean a maximum of 4 digits in the following format: LN, LLN, LNN, LLNN, LNL

Q5. What is the highest level of qualification you have?

1.   GCSEs or Standards
2.   AS levels/A-levels/Scottish Highers/Advanced Highers or equivalent
3.   Apprenticeship or vocational training course
4.   Undergraduate degree
5.   Postgraduate degree
6.   Professional qualification
98. Other
99. None

Q6. What is your current employment status?
1.   High managerial, administrative or professional - e.g. doctor, lawyer, company director (50+ people), judge, surgeon, school headmaster etc.
2.   Intermediate managerial, administrative or professional - e.g. school teacher, office manager, junior doctor, bank manager, police inspector, accountant etc.
3.   Supervisor, clerical, junior managerial, administrative or professional - e.g. policeman, nurse, secretary, clerk, self-employed (5+ people) etc.
4.   Skilled manual worker - e.g. mechanic, plumber, electrician, lorry driver, train driver etc.
5.   Semi-skilled or unskilled manual worker - e.g. baggage handler, waiter, factory worker, receptionist, labourer, gardener etc.
6.   Housewife
7.   Unemployed
8.   Student
9.   Retired and on state pension
10. Retired and on private pension
11. Prefer not to say

Q7. What is your ethnic or cultural background?
1.   White
2.   Black or African American
3.   Mixed (White and Black Caribbean/White and Black African/ White and Asian)

4. Asian
5. Chinese
98 Any other (please specify)
97. Prefer not to answer

Q8. Do any aspects of your job involve countryside management?
1. Yes
2. No

Q9. Do you belong to any of the following organisations?
Please select any that apply.
1. National Trust
2. Royal Horticultural Society (RHS)
3. Wildlife Trust
4. Council for the Protection of Rural England (CPRE)
5. RSPB
6. Wildfowl and Wetlands Trust (WWT)
7. Woodland Trust
8. The Ramblers
9. Friends of the Earth
10. Greenpeace
11. National Farmers' Union
12. Country Landowners and Business Association
13. Scottish Rural Property and Business Association
14. Small Woods Association
15. The Sylva Foundation
16. Any other conservation or environment-related organisations (please specify)….
99. None of these - exclusive

This part of the survey is about your interest in woodlands and forests.

Q10 How would you describe your involvement with nature?
Please choose the most appropriate statement. When we say natural spaces we mean any outdoor space that has nature in it, including rivers and streams, beaches, a courtyard, roof garden driveway or balcony with container plants, zoos, farms, and nature reserves.

1. I am often outside in my garden or visiting parks, woods or other natural spaces
2. I am sometimes outside in my garden or visiting parks, woods and other natural spaces
3. I am rarely outside in my garden or visiting parks, woods and other natural spaces
4. I am never outside in my garden or visiting parks, woods and other natural spaces

Q11. How frequently do you visit woodlands or forests?

1. Several times a week
2. More than once a month

3. Once per month
4. Less than once per month
5. Never

Q12. Which woodlands do you most frequently visit?
[open] –

Q13. What are the main reasons for your woodland visits?
You can tick more than one option.

1. For recreational activities (e.g. walking/hiking, dog walking, jogging, biking, horse-riding, hunting

2. Walk/cycle through on the way to another destination

3. For peace and solitude (e.g. emotional wellbeing)

4. Holiday (e.g. camping)

5. As part of your job

6. To collect non-timber forest products e.g. mushrooms, blackberries.

7. To harvest timber or collect firewood

8. To see wild animals or plants

98. Other (please specify)

Q14. *Britain's trees, woods and forest are facing threats from pests and diseases that can attack them. You may have heard about some recently. Pest and disease outbreaks can have big impacts on how trees and forests look, how economically valuable they are, and whether people visit them.* **How concerned are you about the threat to our trees and woodlands from invasive plants/animals/diseases?.**
1. Very unconcerned
2. Unconcerned
3. Neither concerned nor unconcerned
4. Concerned
5. Very concerned

Q15. Now thinking specifically about woodlands and forests, indicate whether you agree or disagree on why they are important to the public. Because...

(1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree, and (97) don't know

1. They contribute to the local economy
2. They are places where people can relax and de-stress
3. They are places where people can exercise and keep fit
4. They are places where people can have fun and enjoy themselves
5. They are places where people can learn about the environment

6. They are places where people can learn about local culture or history
7. They are important places for wildlife
8. They bring the community together
9. They make areas nicer places to live
10. They get people involved in local issues

This part of the survey is about your attitude towards wildlife.

Q16 Which of the following wild animals do you currently see in the woodlands that you visit? MC
1. Grey squirrels
2. Deer
3. Badgers
4. Foxes
5. Rabbits
6. Rats
7. Red squirrels
8. Bats
9. Hedgehogs
10. Hares
97. I do not see any animals
98. Other (please specify)
99. I do not visit woodlands

Q17 Are you aware of squirrels living in your local area?
(tick one that applies)
1. Red squirrels only
2. Grey squirrels only
3. Red and grey squirrels
4. No squirrels
97. Don't know

Q18 How much do you know about the relationship between red squirrel and grey squirrel populations?
(tick one that applies)

1. I did not know there was a relationship
2. Heard about it but know little
3. Know something
4. Know a lot

Q19. Do you know why red squirrels are declining? If so, can you explain why?
[open] –

Q20. Please give your level of agreement with the following statements
[Strongly agree (5), Agree (4), neutral/no opinion (3), Disagree (2), Strongly disagree (1)]

1. I like/would like to see grey squirrels in the countryside

2. I like/would like to see grey squirrels in my local park
3. I like/would like to see grey squirrels in my garden
4. I like/would like to see red squirrels in the countryside
5. I like/would like to see red squirrels in my local park
6. I like/would like to see red squirrels in my garden
7. I have no interest in seeing squirrels

This part of the survey is about the management of grey squirrels.

Q21. To what extent do you agree or disagree with the following statements:
[Strongly agree (5), Agree (4), Neutral/No opinion (3), Disagree (2) Strongly disagree (1)]

1. Red squirrels have a positive impact on the local economy (e.g. jobs, tourism)
2. Red squirrels have a positive impact on society (e.g. knowing they exist)
3. Red squirrels are endangered and efforts should be made to conserve them
4. If red squirrels become over-abundant numbers should be reduced
5. Red squirrels should be controlled if they damage local woodlands
6. Red squirrel management is necessary in urban areas
7. Red squirrel management is necessary in rural areas
8. Grey squirrels have a positive impact on the local economy (e.g. job, tourism)
9. Grey squirrels have a positive impact on society (e.g. knowing they exist)
10. If grey squirrels become over-abundant numbers should be reduced
11. Grey squirrels and red squirrels can easily coexist in the same area
12. Grey squirrels should be controlled if they have an impact on red squirrels
13. Grey squirrels should be controlled if they damage local woodlands
14. Conserving both red and grey squirrel populations is important
15. Grey squirrel management is necessary in urban areas
16. Grey squirrel management is necessary in rural areas
17. There should be no management of squirrel populations and nature should take its course
18. Local communities should be consulted when squirrel control is being planned
19. Local communities should be involved in decisions about conserving or controlling squirrels
20. I would need to see evidence of impact before supporting any management of squirrels
21. I believe that sometimes it is necessary for forest and woodland managers to undertake management which the local community and wider public may not agree with

   Q21a. You agreed with the fact that local communities should be consulted, please could you explain why? [open]

   Q21b. You agreed with the fact that local communities should be involved, please could you explain how you think communities could be involved? [open]

Q22 Do you know of any red squirrel conservation activities in your local area?
1. Yes
2. **No**

If code 1:

Can you tell us what you know about them? [open]

Q23 Do you know of any grey squirrel control programmes in your local area?
1. Yes
2. No

If code 1:
Can you tell us what you know about them? [open]

Q24 Have you heard of the following control methods that can be used to eradicate or reduce numbers of grey squirrels?

Some definitions that may help:

Control – usually involves the use of lethal methods to remove a species (e.g. culling) or reduce its numbers (e.g. changes to habitat to limit the resources available to animals). Control methods can suppress populations but never completely eradicates them

Eradication – usually means total removal of a species and where there is no natural means of re-colonisation

	1.Never heard of it being used to manage grey squirrel populations	2.Heard of it being used to manage grey squirrel populations but know nothing about it	3.Have some knowledge about it being used to manage grey squirrel populations	4.Know a lot about it being used to manage grey squirrel populations
1. Planting trees that provide grey squirrels with no food				
2. Contraception				
3. Kill traps (snap traps)				
4. Shooting				
5. Live capture traps (and subsequently destroyed)				
6. Biological control (e.g. introducing other predators such as pine marten)				
7. Warfarin poison				

Q25. In general, how acceptable are the following methods for controlling grey squirrels?

5 point scale from 5.highly acceptable 4. Acceptable 3 Neither acceptable nor unacceptable 2. Unacceptable to 1.very unacceptable
1. Planting trees that provide grey squirrels with no food
2. Contraception
3. Kill traps (snap traps)
4. Shooting
5. Live capture traps (and subsequently destroyed)
6. Biological control (e.g. introducing other predators such as pine marten)
7. Warfarin poison

Q26 What are the most important factors in your decision to support or oppose a control method? *Please rank from most important (1) to least important (5)* Rank

	1.Support	2.Oppose
1. Effectiveness – How well the method will control the population		
2. Cost – The amount of time and money required to carry out the method		
3. Humaneness – the level of suffering a squirrel is likely to experience		
4. Specificity – whether the method is likely to impact other, non-target species		
5. Safety – whether there is a risk to those carrying out the method		

Q27 Do you believe the different control methods for grey squirrels would be acceptable….?
In each cell please put 1.Yes if you agree the method is acceptable, 2.No if you disagree, 3. Do not know (or leave Please Select) if you do not know or have no opinion on the matter.

	Planting trees that provide grey squirrels with no food	Contraception	Kill traps (snap traps)	Shooting	Live capture traps (and subsequently destroyed)	Biological control (e.g. introducing other predators such as pine marten)	Warfarin poison
If grey squirrels were found in							

woodlands where there are red squirrels							
If grey squirrels were hindering woodland regeneration							
If grey squirrels were damaging woodland near you used mainly for producing timber and other wood products							
If grey squirrels were damaging woodland near you which was an important site for other wildlife and nature conservation							
If grey squirrels were damaging woodland near you used mainly for dog-walking, mountain-biking and other recreation.							
If you found grey squirrels							

in your garden						

Q28 Would like to add any comments/thoughts on what prompted your choices in the previous question?
[open]

This part of the survey is about communication.

Q29 where do you hear about issues facing the UK countryside or its wildlife?
1. Television (TV Programmes, TV News, TV Advertising)
2. Newspapers
3. Internet
4. Radio
5. Magazines or journals
6. At work
7. Through friends and family
8. I don't hear about such issues - exclusive
98. Other (please specify)

Q30. Who do you trust to provide you with correct and relevant ['reliable'] information about managing red and grey squirrels? Please indicate your level of agreement with the following statements apply positive to negative – code 5 to code 1

	Strongly disagree (1)	Slightly disagree (2)	Neither agree nor disagree (3)	Slightly agree (4)	Strongly agree (5)
1. I trust the forest industry (e.g. forest agents, membership organisations) to give me reliable information about squirrel conservation and management					
2. I trust environmental groups (e.g. Wildlife Trust) to give me reliable information about squirrel conservation and management					

3. I trust animal welfare groups to give me reliable information about squirrel conservation and management					
4. I trust the government to give me reliable information about squirrel conservation and management					
5. I trust the media to give me reliable information about squirrel conservation and management					
6. I trust scientists to give me reliable information about squirrel conservation and management					

Should you want more clarification/information on this subject, please follow the hyperlink.

http://www.wildlifetrusts.org/news/2015/09/10/£12m-national-lottery-grant-protect-uk's-red-squirrels?no_redirect=true

Thank you for your time and opinions.