



Ulster Wildlife

Squirrel and pine marten presence/absence survey 2018 report



Photo credit: Pam Hardeman



1. Introduction

Red squirrel (*Sciurus vulgaris*) populations are threatened across the UK and Ireland by the invasive grey squirrel (*Sciurus carolinensis*). In Ireland the grey squirrel was originally introduced in 1911 in Co. Longford from North America. Since then it has spread throughout the island of Ireland leaving only a few areas in the west untouched (Carey *et al.* 2007).

The grey squirrel is a threat to the red squirrel due to competition and its ability to take advantage of food resources the red squirrel cannot (Wauters *et al.* 2000, 2002; Gurnell *et al.* 2004). This means the red squirrel is driven out of these habitats in search for resources elsewhere. In figure 1 you can see that this pattern is repeated throughout Great Britain and the island of Ireland.

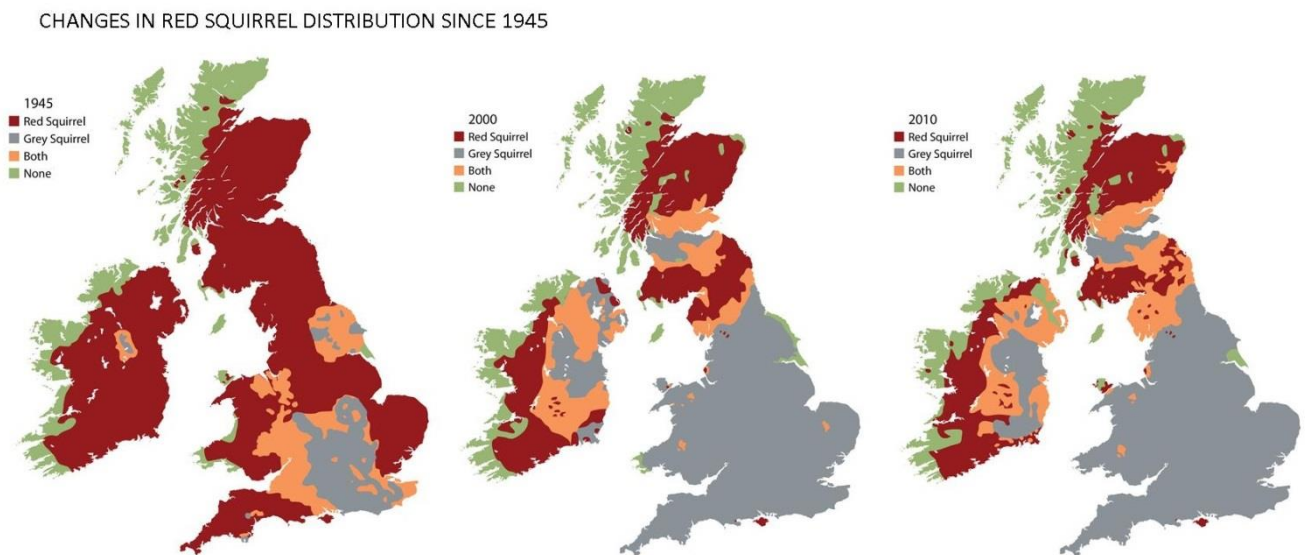


Figure 1. The distribution of grey and red squirrels from 1945 through to 2010.

The grey squirrel also carries a virus that can infect red squirrels causing lesions around their eyes, mouth and genitalia eventually leading to a slow death from starvation. This virus can kill a red squirrel within 2 weeks (Rushton *et al.* 2006).

It will be incredibly beneficial to analyse the location of both squirrel species to aid red squirrel conservation. Not only will it help current projects and volunteer groups target their conservation efforts and use resources in the most efficient way, it will also add to known databases of these species for researchers to further study the effect an invasive mammal is

having on a native species in a very similar ecological niche. In recent studies it has been suggested that the pine marten may have some effect on the abundance and density of grey squirrels. Sheehy and Lawton (2014) suggests that the recovery and subsequent population increase of pine marten (*Martes martes*) in Ireland will lead to a population decrease in grey squirrels. Due to this relationship it was deemed important to record the presence and absence of pine marten as well as the two squirrel species in this survey. If this survey is continued in the future the data can be used to show the change in range of these species, and the success or failures of conservation efforts.

2. Survey sites and method

This survey directly follows on from the survey conducted by Dr. Dave Tosh in 2014/2015. The sites selected for the survey were based on the 348 sites that were visited in 2014/2015 (figure 2; left picture).

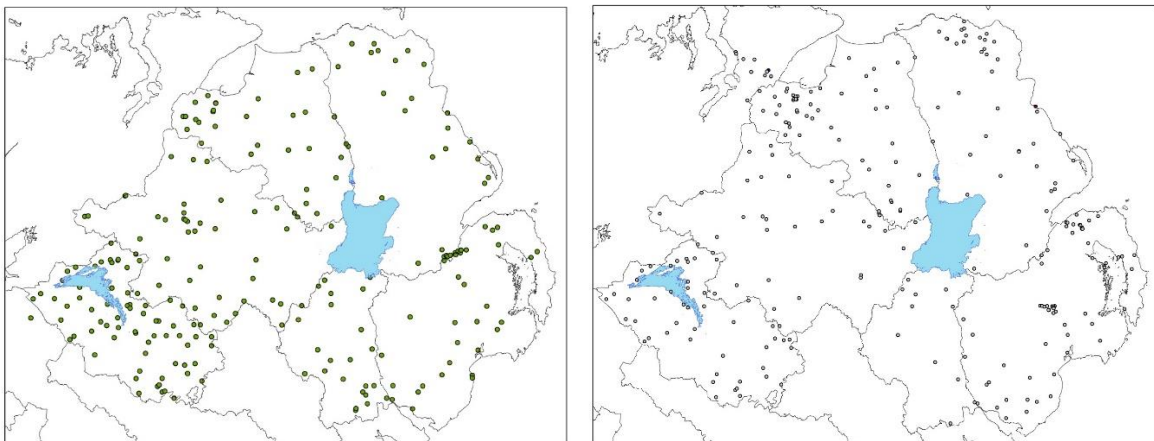


Figure 2. Distribution of possible survey sites taken from 2014/2015 survey on left (n=348), sites surveyed in 2017 on right (n=235).

The aim for this survey was to cover a minimum of 150 woodlands over the 6 counties of Northern Ireland. This number was selected due to the number of sites RSU had a licence agreement for and the equipment available at the start of the survey period. In total 235 woodlands were surveyed in 2017 during the survey period running from March to August 2017, and 204 woodlands surveyed in 2018, distribution of sites shown in figure 3. This increase is due to the large number of volunteers recruited, more equipment being procured during the survey period and more forests being added to licence agreements. A number of

forests in Donegal, Cavan and one in Sligo where also surveyed, due to their proximity to the border and proximity of red squirrel populations.

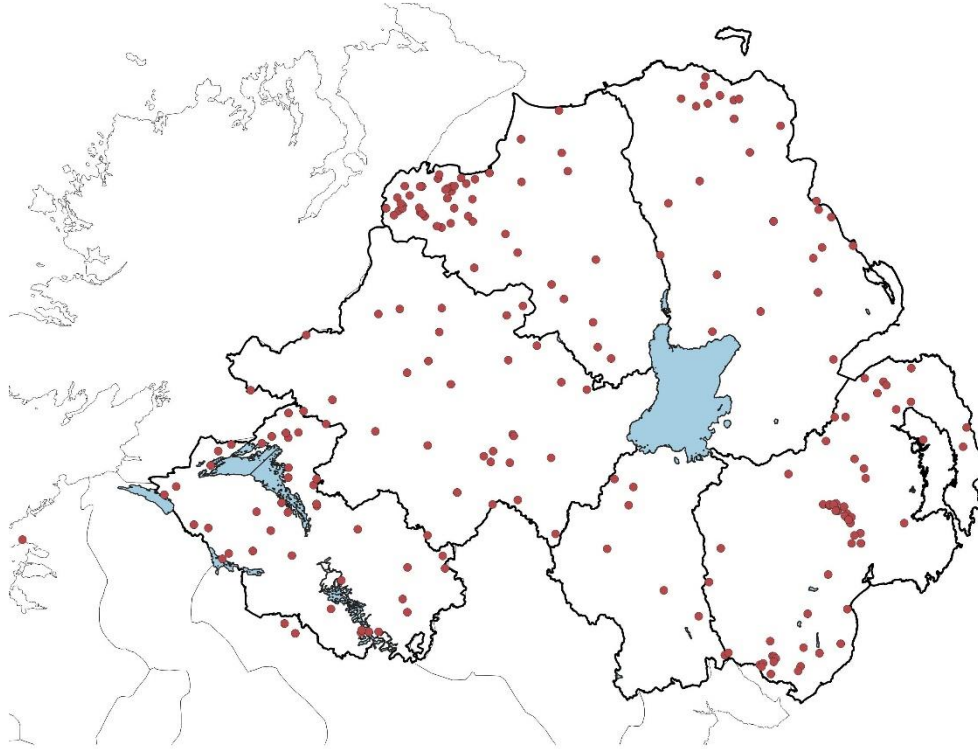


Figure 3. Woodlands surveyed in 2018 (n=204).

During the survey period volunteer fieldworkers were asked to place camera traps and squirrel feeders in forests for 7 to 14 days using the following protocol:

1. Find two trees that are no more than 5m apart (5 to 7 paces)
2. Attach **feeder** to **SOUTH** facing side of tree at head height. The higher a feeder is attached the more it should attract red squirrels.
3. Ensure the feeder contains sunflower seeds and that it is no more than half full.
4. Put sunflower seeds on the ledge of squirrel feeder, on the roof and on the ground around the feeder. This should help attract animals.
5. Attach camera to a tree opposite the feeder also at head height. Ensure that **camera** is **NORTH** facing to stop sunlight from obscuring any images.
6. Attach camera to tree using webbing first. Then attach using cable ties.
7. Ensure feeder can be seen by camera. Do this by either putting a stick where the camera lens is and checking the direction it is pointing OR take a photo from the lens of the camera trap with a camera/phone.
8. Once camera is attached to tree securely switch the camera on.

A 7-14 day survey period window gave volunteers and staff enough leeway that if the weather was unsuitable to collect the camera they could revisit in the following week. In other similar studies it has been found that 7-14 days is a suitable survey period to allow squirrel species to find the feeder. RSNE in 2015 found that 82% of red squirrel populations and 77% of grey squirrel populations found the feeder within the first 5 days of the feeder being put out. This then increases to 93% and 91% for red and grey squirrel populations in the next 5 day period. The previous survey in NI found that 85% of red squirrel populations and 97.5% grey squirrel populations found the camera within the first week. Leaving the camera and feeder out any longer could potentially find smaller populations, but increases the risk of the camera being stolen and reduces the amount of woodlands that could potentially be surveyed.

The bait provided for the feeders was sunflower seeds. This bait was deemed suitable as it attracted both squirrel species and pine marten, it is not an allergen like peanuts, it is relatively cheap, and will limit the attraction to what is in the local area not bringing species in from neighbouring areas. For the 2018 survey, more emphasis was put on using the appropriate bait so there were only a few that had additional foodstuff, this is easy to see in the images provided so can be taken into account in any further work with this data.

The camera settings, for the majority of the cameras, were set to only take still photos at 5M pixel resolution, the capture number of the picture was set to 2 (so that every time the camera was activated the camera would take 2 pictures), the interval between the camera being activated was 20 seconds and the sensor level was set to automatic.

Every volunteer that took a feeder was also provided with Virkon and a spray bottle to disinfect the feeder and their boots. They were also provided with rubber gloves to wear while using Virkon to protect their hands.

3. Results

3.1 2018 results

In 2018 we had 105 volunteers helping with the survey throughout the 6 counties. Unlike 2017 we did not run a marketing campaign to attract in volunteers, these volunteers were

either drawn from the previous year or had heard about the survey through squirrel groups and word of mouth.

The volunteers were asked to leave the camera traps out for 7-14 days. On average, the length of time the camera trap was left in a woodland was 13.5 days during this survey with the longest time being 85 days and the shortest being 2 days. This short length of time was generally by staff who left the camera out until a species was recorded in a well-known site and then the camera was taken down instantly. On average squirrel species and pine marten were recorded in a site after 5 days.

In total 204 woodlands were surveyed during the spring/summer survey period 2018. Figure 4 shows the coverage of the 2018 survey. All six counties in Northern Ireland were included in the survey with some extra sites along the border including in Co. Cavan, Donegal and one site in Sligo, which is not included in the coverage map (Figure 4).

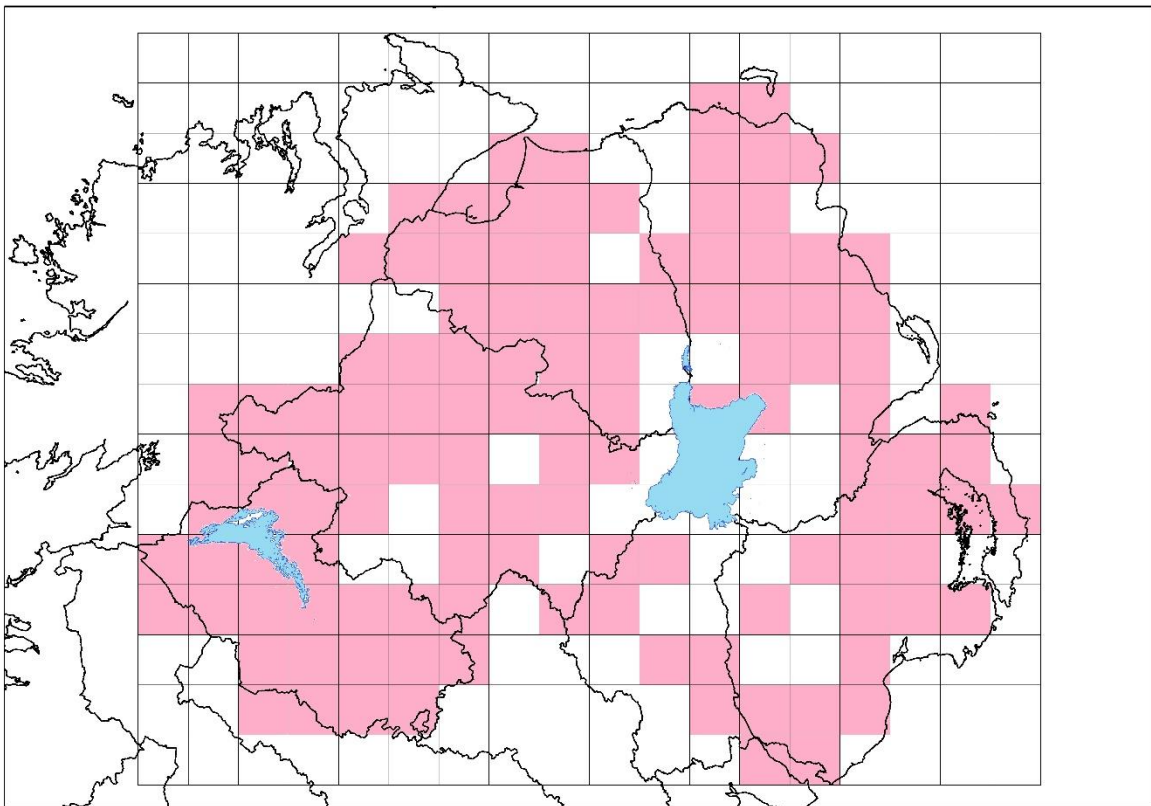


Figure 4. Coverage in 10km² squares of the 2018 survey (pink areas contain at least one survey site).

Focussing on the six counties of Northern Ireland the highest survey effort was in Down, Fermanagh and L/Derry with over 0.2 sites per 10km². The counties with the least effort was Armagh, Antrim and Tyrone with under 0.1 sites per 10km². The average effort this year is very similar to the effort last year with a small decrease from 0.17 to 0.15 sites per 10km².

Table 1. The number of survey sites per 10km² of each County in Northern Ireland and Donegal, and the number of these sites that had a positive record of each of the target species.

County	County area (km ²)	Survey sites per 10km ² (effort)	Number of woodlands surveyed	No. of sites with red squirrel (%)	No. of sites with grey squirrel (%)	No. of sites with pine marten (%)
Antrim	3095.63	0.09	27	15(55)	3(11)	8(30)
Armagh	1325.86	0.05	7	0(0)	4(57)	0(0)
Down	2498.76	0.22	55	12(22)	20(36)	12(22)
Fermanagh	1850.59	0.21	38	23(61)	0(0)	22(58)
L/Derry	2121.13	0.23	48	6(12)	16(33)	2(4)
Tyrone	3264.88	0.1	32	9(28)	2(6)	9(28)

Figure 5 shows the distribution of reds throughout Northern Ireland in the 2018 survey. Red squirrels were recorded in every county apart from Armagh, though the lack of them here is probably due to low survey effort rather than an absence of the species.

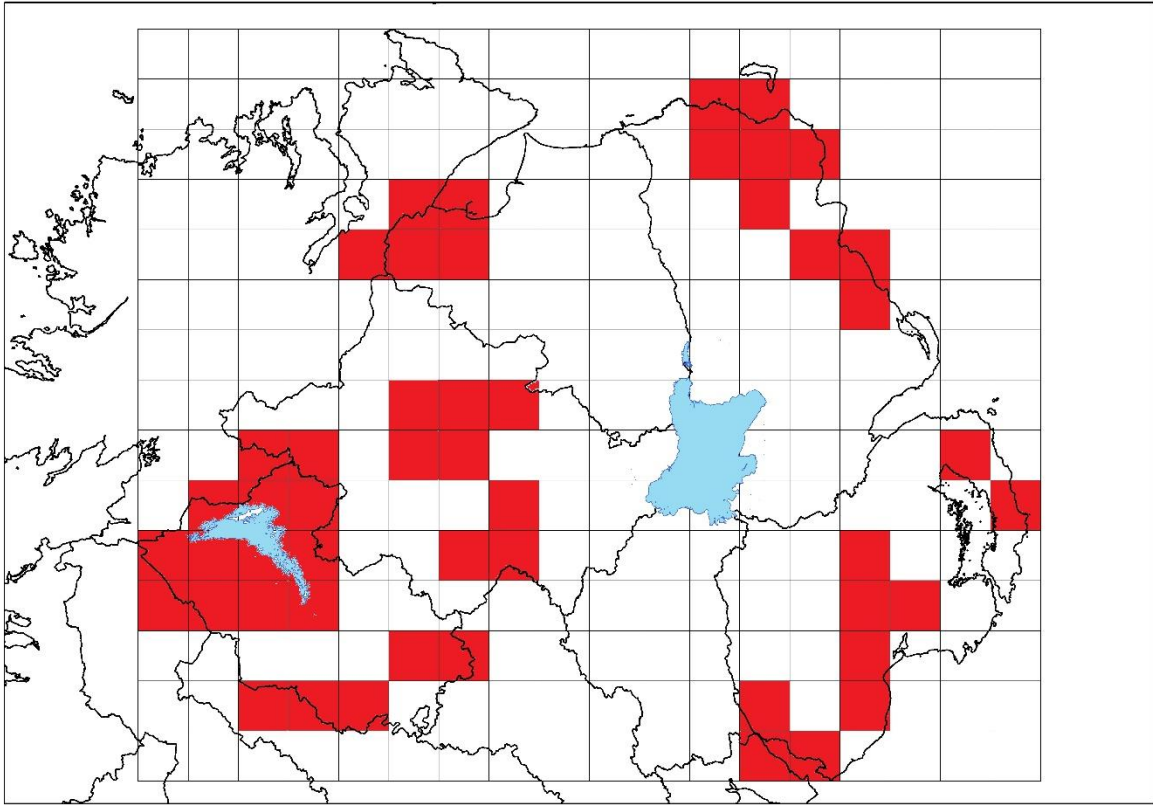


Figure 5. The 10km² squares which contain at least one record of a red squirrel during the 2018 survey period.

The counties with the highest percentage of sites with red squirrel were Fermanagh and Antrim; 66% and 51% respectively. The abundance of red squirrels in Derry/Londonderry have the second lowest percentage of sites containing red squirrel records with only 12% having record of the species. This is an increase from the 2017 survey with a change from 9.5% to 12%, but still a very small percentage. Interestingly, the red squirrels found in this county were all based around the largest population density of people.

In comparison, grey squirrels were found in 33% of the sites in the county, and were much wider spread than red squirrels covering 10 10km² squares in the county, compared to the red squirrels 5 squares. Figure 6 shows that they are spread throughout the west of the county near the Tyrone border.

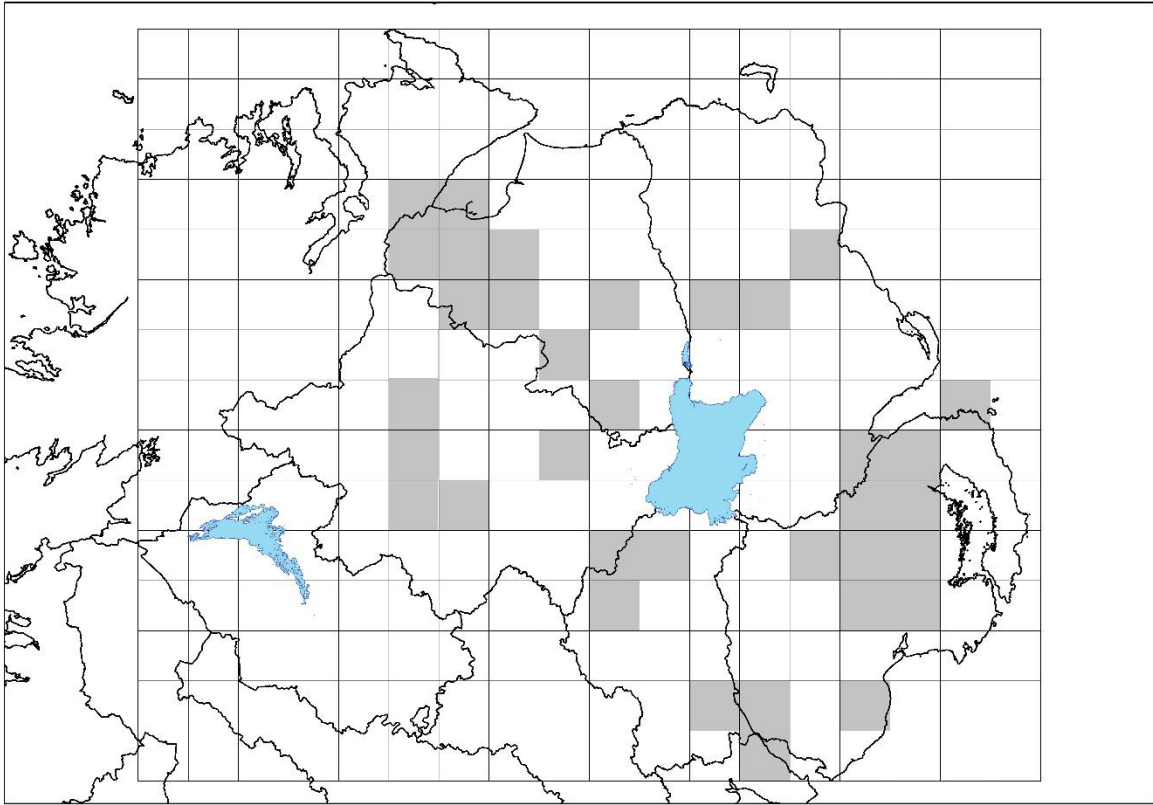


Figure 6. The 10km² squares which contain at least one record of a grey squirrel during the 2018 survey period.

The only county in Northern Ireland with no grey squirrel sightings in the 2018 survey is Fermanagh. The highest percentage of sites within Northern Ireland of red squirrels is in Fermanagh with 61% of the sites having positive sightings. Fermanagh, as shown in figure 7, also has the highest occurrences of pine marten with 58% of the sites surveyed containing pine marten in 2018.

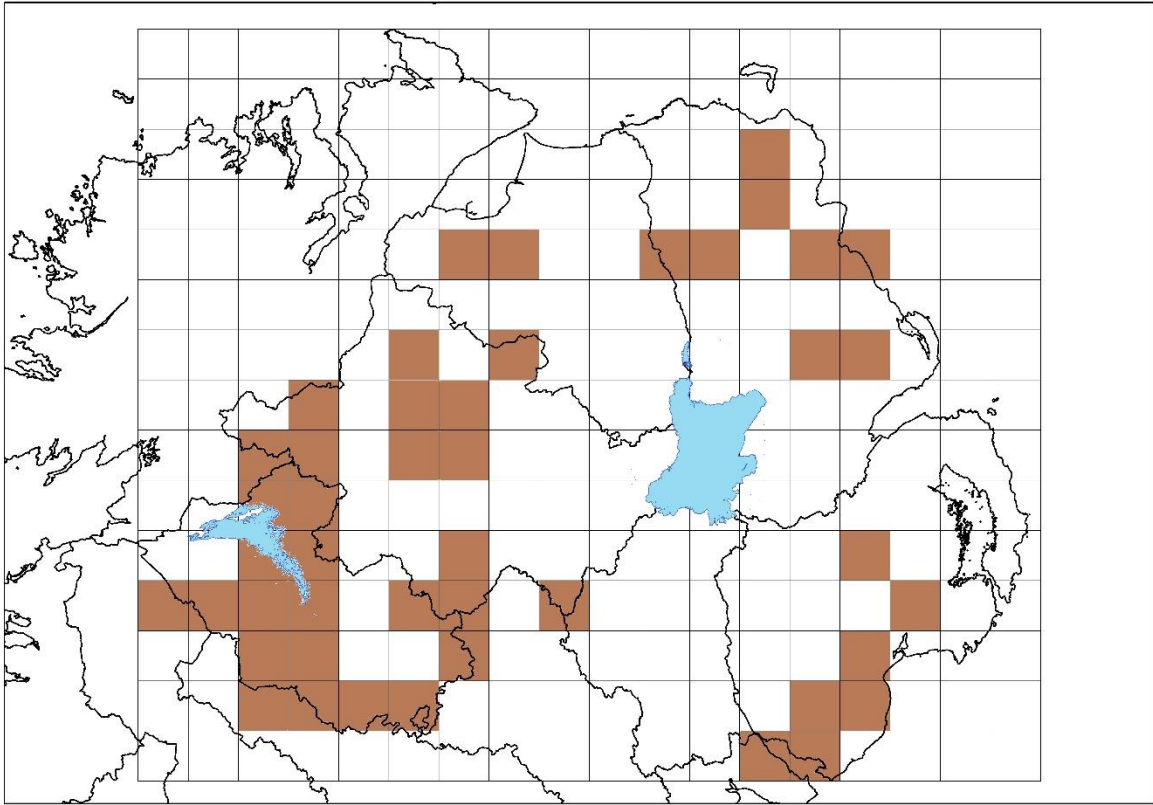


Figure 7. The 10km² squares which contain at least one record of pine marten during the 2018 survey period.

Like red squirrels, pine marten were found in every county apart from Armagh, although this is probably due to lack of survey effort. Last year no pine marten were found in Londonderry/Derry, but this year were found in two sites in the north west as shown in figure 7. They had been recorded in this area anecdotally, but had not been recorded in any previous surveys using this survey method, this alludes to them having a low population density in the north west.

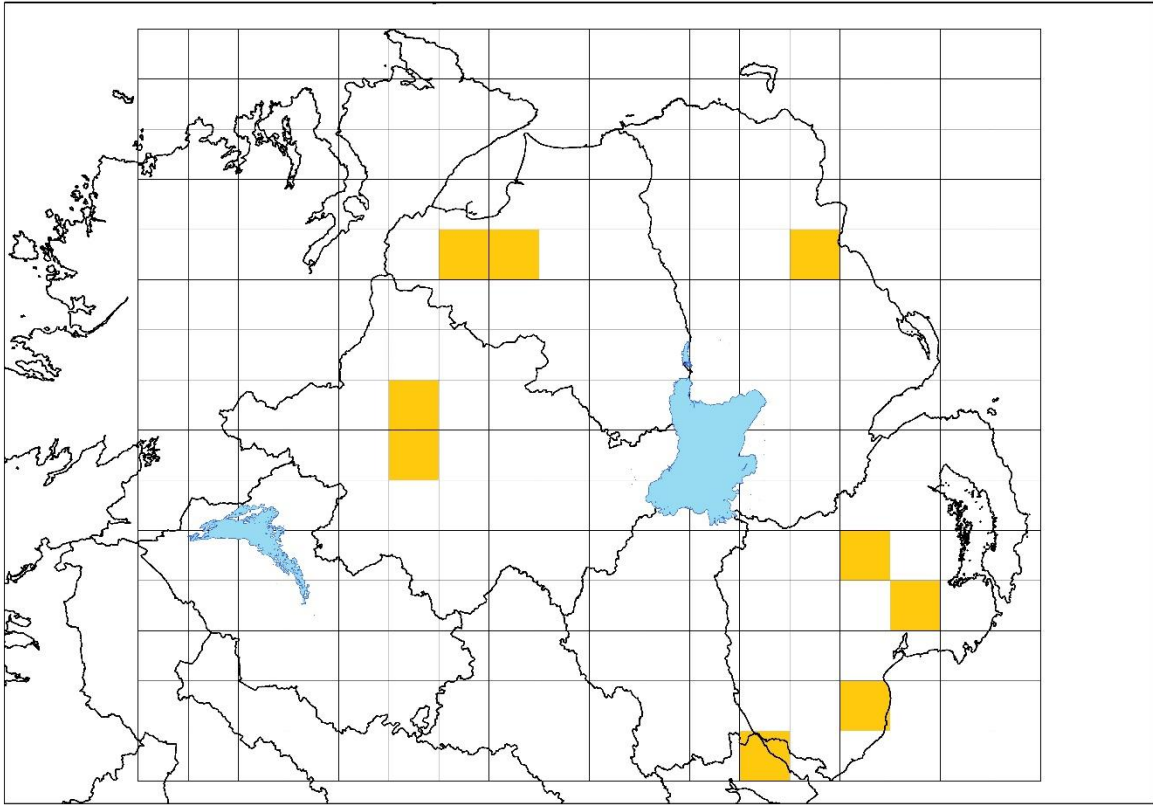


Figure 8. The 10km² squares which contain at least one record of pine marten and grey squirrel during the 2018 survey period.

This year there were four counties and 9 10km² squares that had both grey squirrels and pine marten present. There were only two woodlands in the entire survey that had both grey squirrels and pine marten recorded coming to the same feeder, these were Cleggan wood, Co. Antrim, and Oaks Wood, Co. Derry.

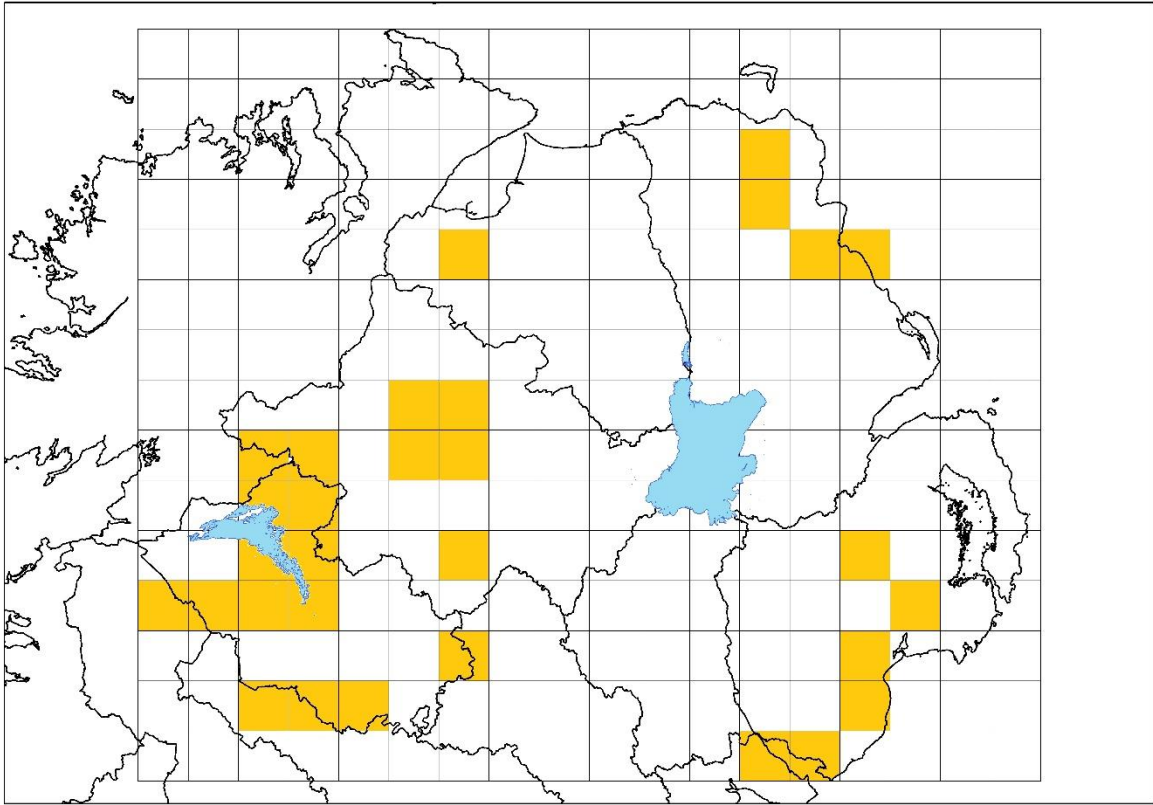


Figure 9. The 10km² squares which contain at least one record of red squirrel and pine marten during the 2018 survey period.

In comparison, there were 30 squares that contained both red squirrels and pine marten, and 31 woodlands that have records of these species coming to the same feeder during the survey.

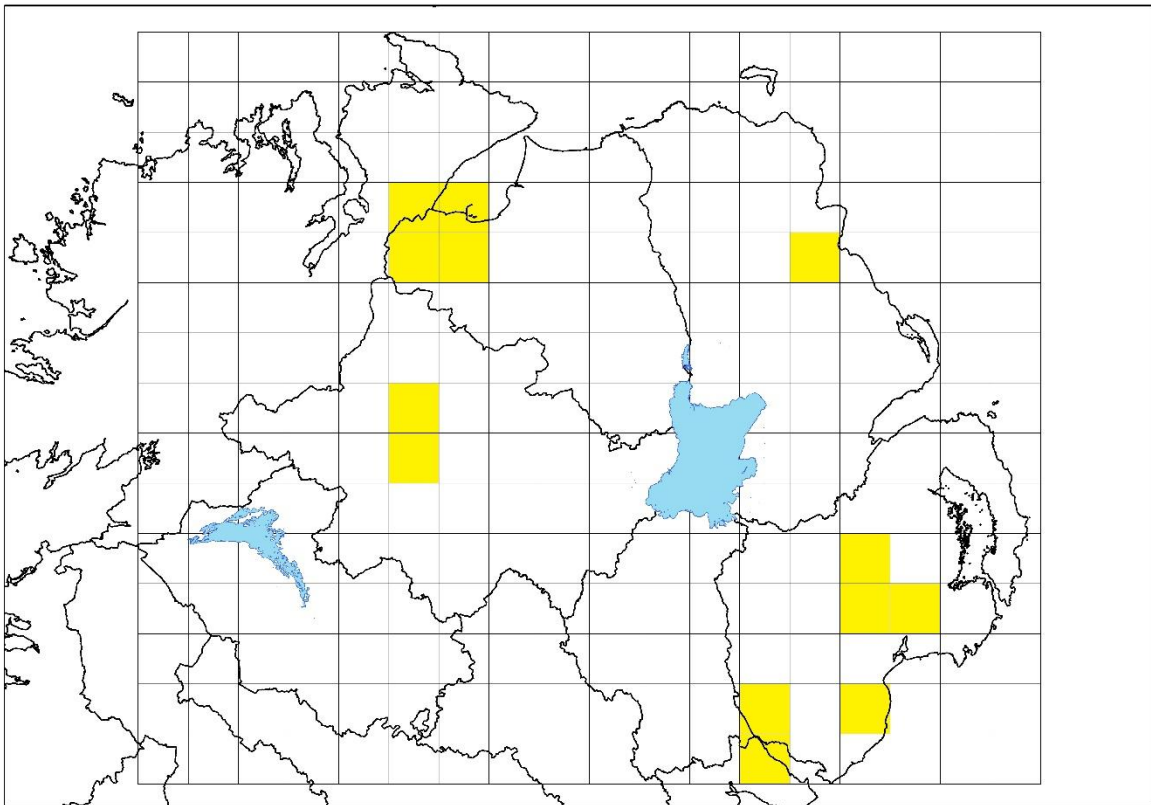


Figure 10. The 10km² squares which contain at least one record of red squirrel and grey squirrel during the 2018 survey period.

The most squares that contain both red and grey squirrels are in Co Down, closely followed by Co. Derry.

3.2 Combining 2017 and 2018 results

With only two years' (2017 and 2018) worth of data using this conservative surveying method, it is not possible to say definitively if red squirrel populations are increasing between years, but some trends can be shown in the below figures.

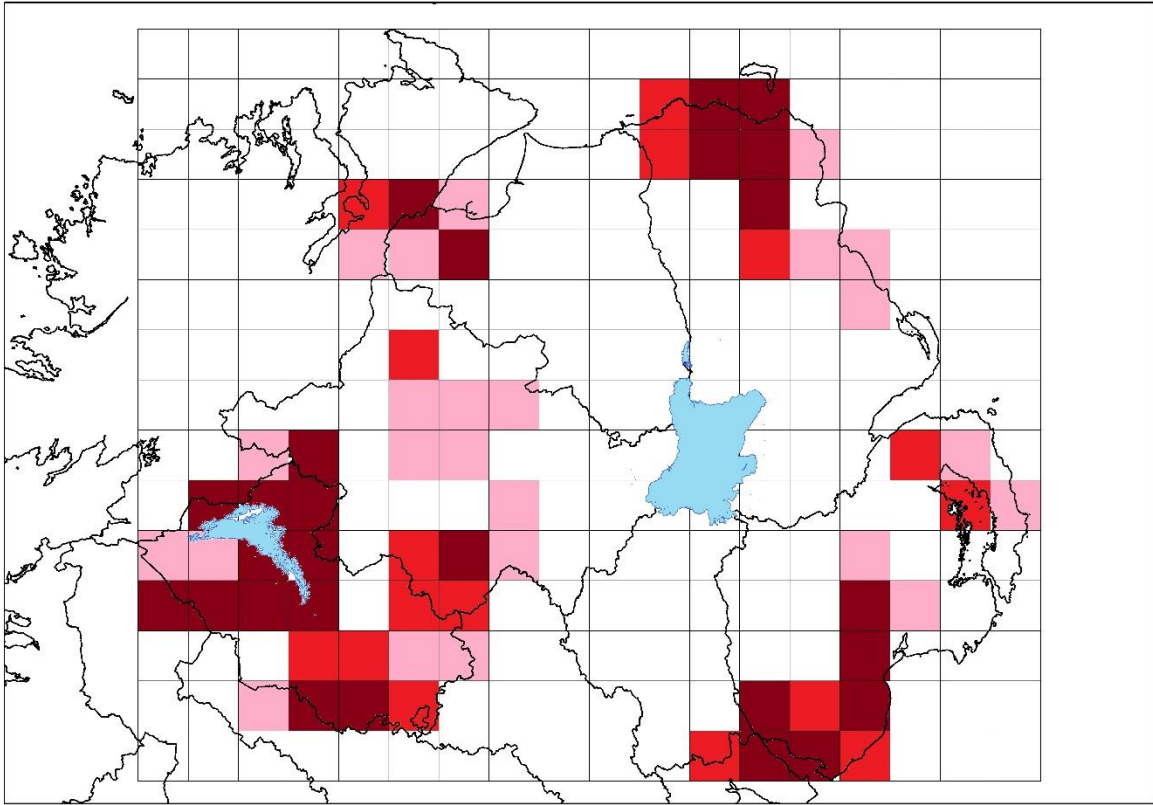


Figure 11. Showing the 10km² squares that have red squirrels present in the 2017 and 2018 survey period (Pink = 2018, red = 2017, dark red = 2017 and 2018)

The dark red in figure 11 areas show where red squirrels have been recorded in both survey years. The consistency of these records give the impression that these areas are established populations and possible red squirrel strongholds.

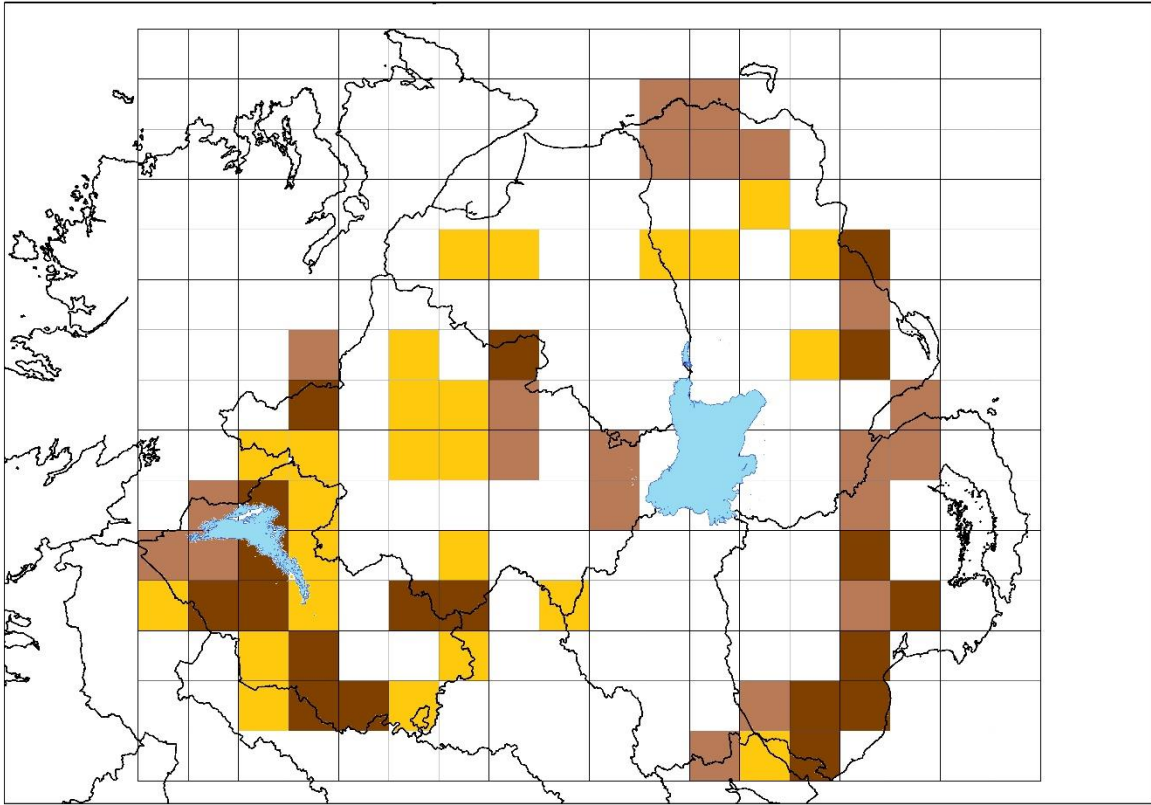


Figure 12. Showing the 10km² squares that have pine marten present in the 2017 and 2018 survey period (Yellow = 2018, brown = 2017, dark brown = both 2017 and 2018)

The combined map of pine marten records in figure 12 shows that pine marten are widespread throughout Northern Ireland. The areas where they have been found in multiple years include south and mid Down, Fermanagh, east Antrim and a couple of squares in Tyrone. These are areas where pine marten have been recorded consistently, and possible areas where population densities are higher.

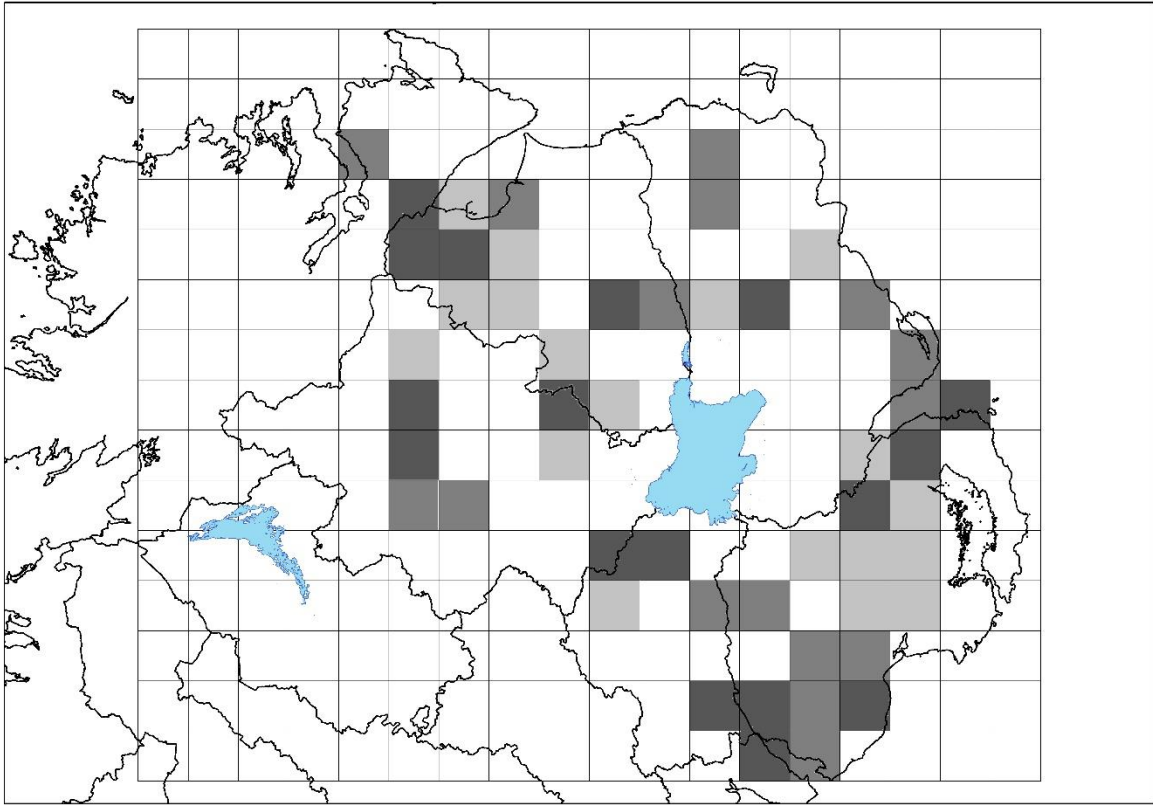


Figure 13. Showing the 10km² squares that have grey squirrel present in the 2017 and 2018 survey period (Light grey = 2017, med grey = 2018, dark grey = 2017 and 2018)

Thankfully, as shown in figure 13, greys have not been recorded in Fermanagh in any of the surveys completed, but there are populations that have been recorded every year in other areas. These include Newry, north Armagh, Omagh, Belfast, Derry, Bangor and mid Ulster.

Table 2 shows the number of 10km² squares that contain each species in each of the surveying periods. There has been an increase in the range of red squirrels from 40 squares in 2014/2015, to 43 in 2017, to 50 in 2018. This could possibly hint at an increase in established range of the red squirrel, but future surveys are needed to confirm this trend.

Table 2. Comparing the 2017, 2018 survey to the 2014/2015 survey.

	2014/2015 survey	2017 survey (not including Inishowen peninsula squares)	2018 survey (only including NI)
Coverage	41 squares not surveyed	36 squares not surveyed (3 additional squares in Donegal)	47 squares not surveyed
Number of squares with grey	55	31	35
Number of squares with red	40	43	50
Number of squares with pine marten	46	40	45
Number of squares with grey and red	10	10	13
Number of squares with grey and pine marten	9	10	9

Overall 68 sightings of red squirrels were recorded, with 33.5% of forests containing this species, this is an increase of 8.2% from 2017. The percentage number of woodland containing pine marten also increased from 21.2% in 2017 to 26.1% in 2018. The percentage number of greys did increase slightly from 21.1% in 2017 to 22.7% in 2018. In the west Fermanagh still shows no evidence of populations of grey squirrel, and is showing evidence of supporting the largest area habited by red squirrels and pine marten.

3.3 Volunteer experience

During the thank you events, in August, volunteers were asked to fill in an evaluation sheet. This sheet asked the volunteers to rank their experiences of the survey, and fill in demographic information. They could select strongly agree, agree, neither agree nor disagree, disagree, strongly disagree or not applicable, to 5 statements. The statements are as follows; I learned new things about red and grey squirrels, I learned new skills, the event was done

well, I enjoyed the event, and I would recommend it to others. They were also given the opportunity to leave extra comments about the survey experience.

Table 3. The percentage of respondents that answered strongly agree to strongly disagree for various statements on event evaluation sheets, after the 2018 survey period.

	I learned new things about red and grey squirrels (% of respondents)	I learned new skills (% of respondents)	The event was done well (% of respondents)	I enjoyed the event (% of respondents)	I would recommend it to others (% of respondents)
Strongly agree	86	72.34	72.34	80.85	82.98
Agree	23.3	31.91	27.66	19.15	17.02
Neither agree nor disagree	7	12.77	0	0	0
Disagree	2.33	2.13	0	0	0
Strongly disagree	0	0	0	0	0
N/A	4.65	6.38	0	0	0

Table 3 shows that 100% of the respondents enjoyed the event and would recommend it to others. The only statements that recorded disagree/strongly disagree responses were I learned new things and I learned new skills. These negative responses were only recorded when running the survey with squirrel groups, and be accounted for by the fact they have been doing similar surveys for many years.

4. Conclusions and recommendations

This survey was designed to replicate the previous survey conducted by Dr. Dave Tosh, and the 2017 survey conducted by Ulster Wildlife. Although the survey this year covered less woodlands and squares, the woods surveyed were completed at a better standard and still above the 150 woodland target.

4.1 Conclusions from 2018 results

There was a surprising number of squares with grey squirrel populations recorded in mid Down. This could be due to the new group Heart of Down Red Squirrel Group and their increased amount of survey effort in this area. This could also account for the increase of red squirrels in Tyrone, due to the West Tyrone Red Squirrel Group surveying in that area. These groups are new for this year.

To reiterate, with only 2 years' worth of data using this conservative surveying method, it is impossible to highlight specific trends in the data, however the results from this year do show that red squirrels are not losing habitat range and have possible stronghold areas in Fermanagh, Tyrone, south Down and the Glens of Antrim. Although there is also a possibility of a stronghold in the north west with them being recorded consistently here each year, the proximity to large numbers of grey squirrel put these populations at risk.

The widespread evidence of pine marten this year shows that this once elusive creature is now possibly on the increase. Due to the proclivity of pine marten to predate game birds, chickens, pheasants and generally become a nuisance when they move into an area in high densities it is advised the new areas they are now being recorded are targeted with an education scheme to help reduce any human-wildlife conflict in these areas e.g. showing how to create appropriate chicken coops to reduce the chances of pine marten getting in, and what to do if you find a pine marten in your attic.

Although the sightings from 2017 to 2018 do not show a reduction in grey squirrels, the number of squares they are recorded has reduced greatly from 55 to 35. There is a possibility that this could be explained by the conservative nature of the surveying methods now used compared to 2014/2015 survey i.e. only using sunflower seeds and being strict on the time feeders are put out in woodlands, but this is a trend that will need to be scrutinised again in future years. It is likely, however, that the work of the red squirrel groups have reduced grey squirrel populations to the point where they are not being picked up by these conservative surveying methods.

4.2 Improvements since last year and specific areas of concern for future work

Compared with the survey undertaken in 2017 there has been a marked increase in the quality and consistency in the surveying this year. More of the sites were surveyed only using sunflower seeds and, the cameras and feeders were predominately left out for only 7-14days.

A possible area of concern currently is around Omagh, where grey squirrels have been recorded consistently, with reds now found both east and west of the Strule/Mourne river corridor. Thankfully, there has been a red squirrel group set up in this area and it is hoped that the results of their work will be reflected in the survey next year. It is also advised that further north towards Strabane could be another area where a red squirrel group could be set up to stop grey squirrels moving further up that catchment to exacerbate the issues in Derry and to protect the small pockets of red squirrels currently in that area. Clearing the west of Tyrone of grey squirrels will help the efforts in the north west, but also prevent them threatening red squirrels in Donegal through the Finn river valley.

Last year and this year one square in the Glens of Antrim was shown to contain both red and grey squirrels, and it was one of the areas that reds and greys were recorded coming to the same feeder during the 2018 survey. This is worrying as this has been an area of squirrel pox outbreak in the past. It is possible that this area is susceptible from greys moving from the areas outside of the red squirrel range. Strategic education and volunteer recruitment in these bordering regions could make a difference in preventing grey squirrel incursion. Possible areas for this would be Coleraine in the north, Broughshane in the west and Larne in the south.

4.3 Red squirrel reintroductions

There have been multiple red squirrel releases in Northern Ireland, mostly in Co. Antrim and Co. Down. This can be reflected in the survey with new squares showing presence of red squirrels. For this survey it is important to note which squares are likely to be red squirrels increasing range naturally and which are red squirrels being translocated into areas, so that

any future trends that could possibly be identified by this survey are not biased by artificial increases from translocations, but also the success of these reintroductions can be assessed by future surveys i.e. are these populations viable, do they stay in the area they are released into. It is advised that further reintroductions take into account the IUCN guidelines on translocations and genetic monitoring is increased. This will be especially important in counties Down and Antrim as they have had previous squirrel pox outbreaks, and possible introductions of squirrels from outside this area could outbreed any genes that decrease the red squirrels susceptibility of this disease by not being from areas challenged by it.

It will also be important to create a checklist that is specific to Northern Ireland on habitat and environment suitability for red squirrel reintroductions. Unlike other areas of the UK where red squirrels have been released we have a very low percentage of forest cover and a relatively high density of pine marten in certain areas. It is not known yet if there is a level of pine marten population density where it would be unwise to release red squirrels, as it is known they will predate on their dreys during the breeding season. More research on this topic could ensure that any red squirrel releases are done in the most efficient and ethical manner.

4.4 Recommendations for organisations

Organisations that own land within any of the areas with grey squirrels in either the 2017 survey or the 2018 survey should take measures against this invasive species. Either by training staff on grey squirrel control measures or by allowing trained volunteer groups to control the species on their behalf. Grey squirrels are associated with tree damage, which can lead to an estimated cost of £10 million in Britain and €4.5 million on the island of Ireland (Kelly *et al.* 2013), so it would be financially beneficial for the organisation to control grey squirrels.

It is important that organisations working in the same area join together to create a comprehensive control strategy for the area. Working independently without a strategy for grey squirrel eradication will allow the surrounding areas to act as a reservoir for grey squirrels from which they can repopulate.

Organisations which are in areas with a population of red squirrels that are currently not threatened by grey squirrels should implement rapid response networks in their area to monitor for greys coming into the area.

5. Acknowledgements

Thanks are given to our funders EU Life and Heritage Lottery fund. We would like to thank all the red squirrel groups, biodiversity groups and individuals that took part in the 2017 survey. Without volunteers giving up so much of their spare time we would never have been able to cover such a vast area and get a comprehensive view of the species in Northern Ireland. We would also like to thank the private landowners and organisations that allowed staff and volunteers onto their land to survey for squirrels and pine marten. We hope that all the organisations involved use the information collected to inform their own strategies for the removal of grey squirrels and conservation of red squirrels.

6. References

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