ERADICATION OF GREY SQUIRRELS FROM ABERDEEN: SAVING SCOTLANDS RED SQUIRRELS (SSRS)

Scottish Wildlife Trust

Geographical area of conservation work

North East Scotland

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Key partners

- Scottish Wildlife Trust (lead)
- NatureScot
- Scottish Forestry
- Scottish Land and Estates
- RSPB Scotland
- Forestry and Land Scotland
- Loch Lomond and The Trossachs National Park Authority
- Aberdeen City Council

Resources

Typical Annual Resource available	Number of people	
Paid Contractors (1-6 months)	4	1 Eradication Co-ordinator 1 Eradication Operations Lead 1 Eradication Officer 1 Community Outreach Officer
Paid Contractors (7-12 months)	0	
Volunteers involved with grey control	0	
Volunteers involved with squirrel monitoring	40	This number may fluctuate from time to time
Other Active Volunteers	1-2	Student intern placement to carryout operation surveys

Maps of Project Area

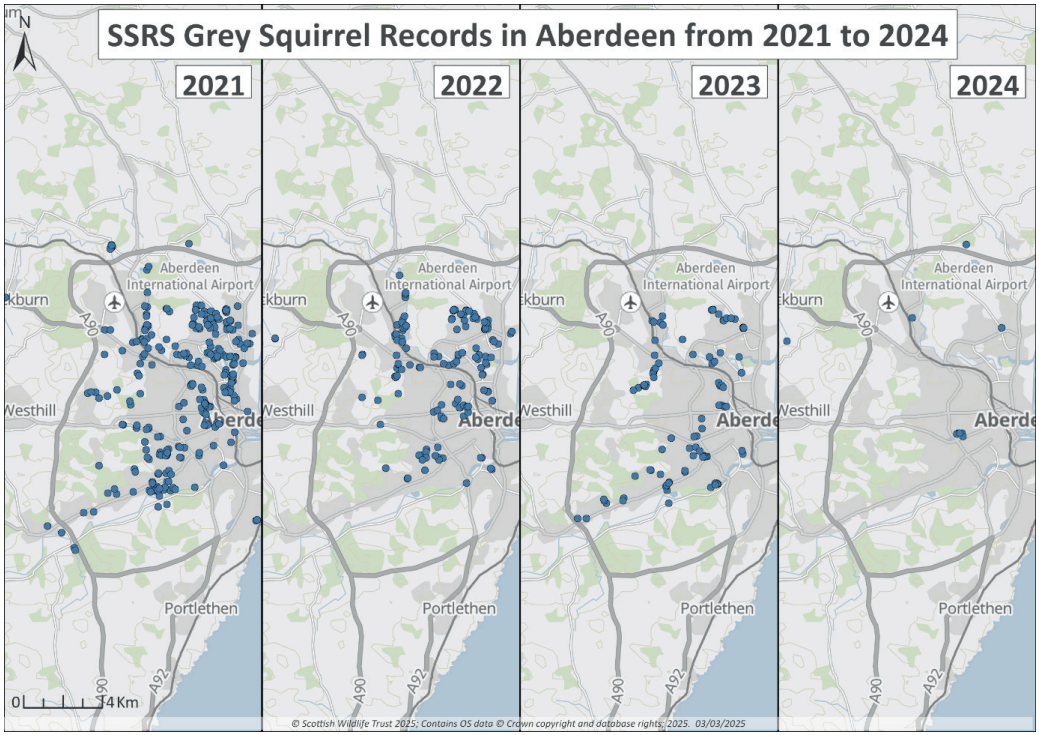

Figure 1. Locations of grey squirrel (*Sciurus carolinensis*) detections (blue dots) across the Aberdeen region including SSRS grey squirrel control records, verified SSRS recorded sightings and a snapshot of detections at feeders from May and June in years 2021 to 2024. There has been a significant reduction in grey squirrel records from 2021-2024.

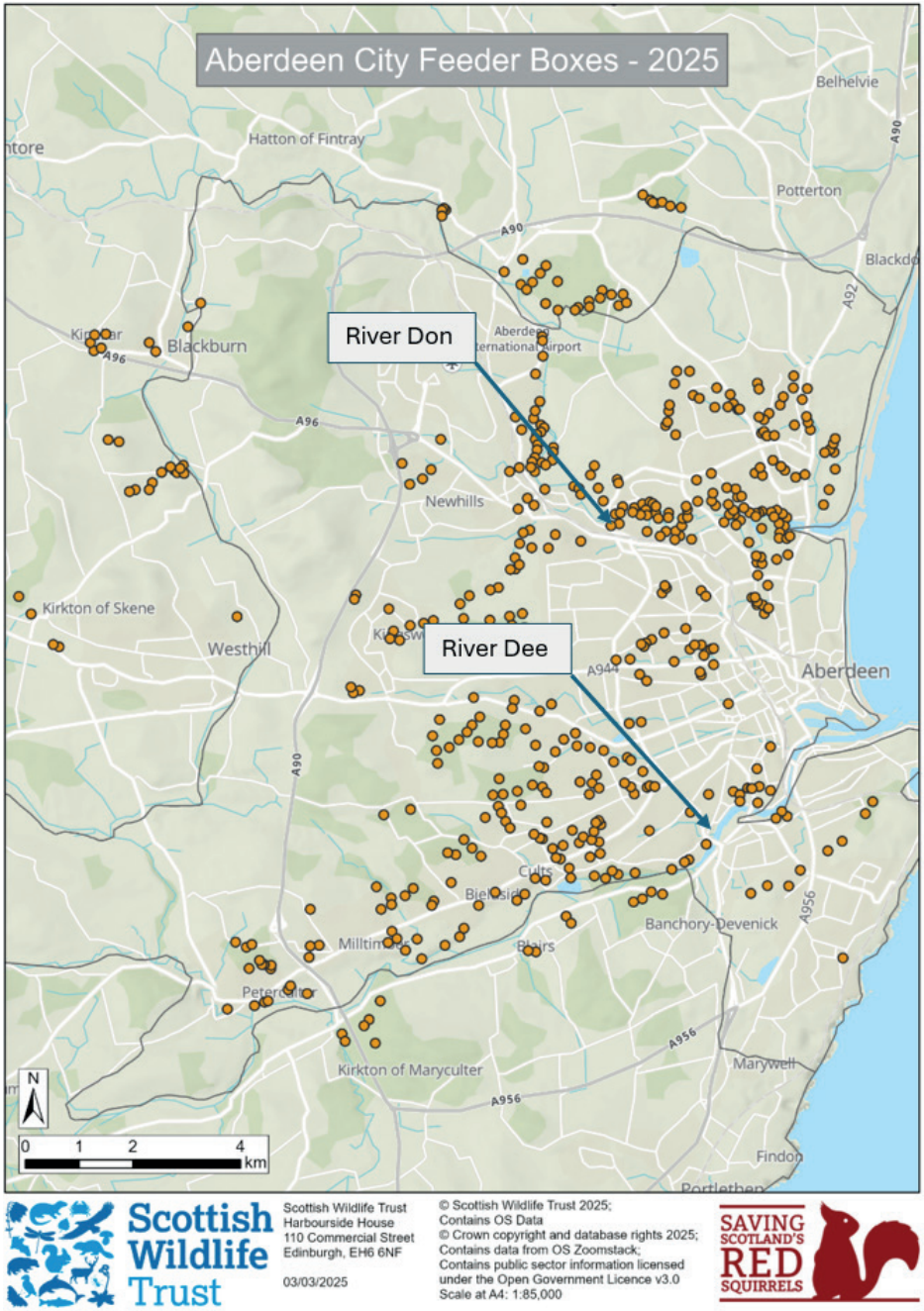

Figure 2. Map of Aberdeen city showing locations of feeder box monitoring stations (yellow dots) which are part of SSRS's Rapid Response Monitoring (RRM) scheme. Most suitable squirrel habitat within Aberdeen City, and key incursion route along the river corridors of the Dee and the Don are covered by the RRM scheme, which aims to detect and remove any remaining grey squirrels.

Introduction

Saving Scotland's Red Squirrels (SSRS) in North East Scotland focuses on removing a geographically isolated population of grey squirrels (*Sciurus carolinensis*) centred on the city of Aberdeen (Figure 1), where they were introduced in the 1970s. When SSRS began in 2009, grey squirrels had spread along the two river catchments of the Dee and the Don into rural Aberdeenshire. Left unmanaged, they threatened the healthy red squirrel (*Sciurus vulgaris*) populations of Grampian and the Scottish Highlands. In the early stages of the project, Grey Squirrel Control Officers (GSCOs, now known as Eradication Officers, EOs), undertook grey squirrel monitoring and control in both the urban city parks and by working inwards from the widest known grey squirrel populations in Aberdeenshire back towards the city.

With the continuation of grey squirrel control efforts since 2009, the refinement of urban grey squirrel trapping techniques in 2015, followed by the introduction of new monitoring and control techniques and the development of a large network of volunteers since 2020, grey squirrel density has dramatically reduced, to what is now only a very small known breeding population. Red squirrel populations in both Aberdeen city and Aberdeenshire have recovered relatively quickly, with red squirrels now regularly being reported throughout Aberdeen city's urban parks, residential gardens, suburban woodlands and further out into Aberdeenshire. The pine marten (*Martes martes*) population in Aberdeenshire has been recovering quite well in recent years, with pine marten regularly being detected through the RRM surveys. However, it is understood that the timing of their recovery did not coincide with the reduction in density and distribution of grey squirrels in Aberdeen city and Aberdeenshire, which can be largely attributed to grey squirrel control efforts. As the NE Team have worked to contain grey squirrels within the limits of Aberdeen City, the population of pine martens has steadily increased in the woods surrounding Aberdeen City, complementing the team's efforts to prevent grey squirrels spreading from the city back into the countryside. Whilst there is no expectation that pine martens would reach densities sufficient to suppress grey squirrels within an urban environment, since 2020, pine martens have been detected repeatedly at numerous urban locations. Crucial partnerships with Forestry and Land Scotland (FLS) and Aberdeen City Council (ACC) supported this work though significant funding contributions and facilitating access for the purpose of grey squirrel monitoring and control on the National Forest Estate (FLS) and in urban woodlands and city parks (ACC).

Project Aims

- The overall project aim is to permanently eradicate grey squirrels from the north east of Scotland. The main project goals include:

- To continue to encourage public support for red squirrel conservation.

- To continue the coordination and delivery of rapid response monitoring, including recruiting and supporting volunteers, and responding to positive detections / sightings with grey squirrel control.

- To prevent immigration of grey squirrels into northeast Scotland from the Mearns and northeast Angus.

- To develop additional methods of detection such as specialist detection dog searches and explore alternative humane methods of removal in addition to trapping to target trap-shy individuals.

- To achieve an eradication milestone of zero detections of grey squirrels, over an extensive confirmation phase, following an eradication plan.

- To establish the infrastructure and institutionalise expertise for long-term, post-eradication monitoring.

Update on major difficulties faced

Control work in public areas: Since 2020 the team have deployed urban trap boxes in areas of increasingly high public footfall, with great success and very few instances of trap tampering. The use of mink police alarms means that traps do not have to be visited twice per day, rather twice per week (to set, and to put on "prebait") and thereafter only when the trap has been triggered.

Access to critical sites: This is an ongoing difficulty but with the success of the SSRS project, including the highly visible recovery of the red squirrel population, there has been a perceived increase in public awareness and support for the project. The Scottish MSP who acts as the red squirrel "species champion" has also advocated with private landowners on behalf of SSRS in critical cases. There are now very few areas that the team do not have access to.

Lack of scientific knowledge: Since 2020, the NE team have adopted a much more scientific approach to achieving the project goals. For example, the team collaborated with a masters student to design and implement the first GPS collar study of grey squirrels in an urban environment, which led to a greater understanding of grey squirrel distribution and movement such as home range sizes, movement across the urban landscape, and additionally, the density of feeders and traps required across the urban landscape to ensure that all individuals are at risk.

Major lessons learned

Need for adaptive approach for low density populations: grey squirrel occupancy can be decreased with the use of a sustained and coordinated control programme, but eradication will require flexibility and adaptive management. During the Developing Community Action (DCA) phase (2017 – 2022) one of the stated project's aims in the NE was for the eradication to be completed by volunteers. This was based on a misconception that as grey squirrel

density reduced, so too would the effort required to remove the remaining individuals. However, the NE team have been working since 2020 to improve both our understanding of how low-density grey squirrels use the urban landscape, and our understanding of the effort that is required for invasive mammal eradications to succeed. In 2021, the NE team developed the Rapid Response Monitoring (RRM) technique, dramatically increasing detection effort which has led to increasingly targeted trapping. The development and refinement of the RRM technique has proven highly successful in ensuring that all squirrel habitat in Aberdeen city is constantly under surveillance, and any grey squirrel detections can be responded to swiftly. In addition, the team have been working to secure the services of specially trained detection dogs, along with the development and refinement of novel removal methods. This novel RRM method which was designed by the NE team was a finalist in the RSPB Nature of Scotland Awards in 2024 (in the Innovation Category).

Possibility for urban recovery: red squirrels can recover and recolonise their former range when grey squirrels are removed (or their densities reduced to low levels) even in urban areas provided habitat and connectivity is suitable. There is a general misconception across the UK that red squirrels do not belong in more urban environments. However, red squirrels are regularly now reported throughout Aberdeen City and will demonstrably use any habitat that grey squirrels have been removed from. This also serves as excellent publicity for the project, as Aberdeen residents are observing red squirrel recovery in real-time, across many urban and suburban parks and gardens.

Importance of community engagement: the appointment of a dedicated Community Co-Ordinator and Outreach Officer (CCOO) since 2022 has been instrumental in recruiting, managing and providing support to a growing network of RRM volunteers, who carry out feeder-box surveys every fortnight. The CCOO is also responsible for the development and implementation of a campaign to identify through mapping, and target through outreach such as flyers, posters and door-knocking, any residential areas that do not yet have sufficient feeder or trap density.

Spatial Ecology: as the spatial ecology study in 2021 illustrated, low-density urban grey squirrels can move large distances, presumably searching for conspecifics. Additionally, some home ranges, mainly those of breeding females, can be comparatively very small. This effectively means that all squirrel habitat in Aberdeen and its surrounding area is at risk of grey squirrels returning to the locality, until the very last grey squirrel has been removed from Aberdeen. Therefore, to meet the requirement that “all individuals must be at risk”, the NE Team have systematically increased coverage of Aberdeen City and its surrounds via RRM monitoring. Due to the success of RRM, grey squirrel detections and captures have decreased annually since 2021 despite an exponential increase in detection effort. For example, there were more than 8,000 feeder checks in 2024 (Figure 2), but only 22 grey squirrel records (note this total includes public sightings and detections at feeders, some of which could be from the same grey squirrel). There was a total of just six grey squirrels captured in 2024.

Description of the project activity

The Scottish Wildlife Trust is the lead project delivery partner, responsible for the practical day-to-day management of all project activities and the finances. The project is delivered in collaboration with eight project partners and with the cooperation of multiple stakeholders. In terms of funding, since the last book was published in 2020, SSRS has moved from the DCA phase, into the Transition phase, and are currently in the two-year Transforming Nature phase, through NatureScot's Nature Restoration Fund. The cyclical and short-term nature of these project phases, and the challenges that come with them reflect the need for long-term sustainable funding.

Recommendations from the DCA phase included the continuation of a professional team in Aberdeen, to implement project activities, (as opposed to earlier proposals for a volunteer-led eradication), along with the requirement of dedicated staff-led grey squirrel control and volunteer-delivered monitoring in the Mearns and South Aberdeenshire. This critical area was identified in 2020 by the NE Team as the northernmost frontier of the Central Lowlands grey squirrel population. By 2020, the Mearns was host to a breeding population of grey squirrels, as well as habitat corridors which could connect them to the Aberdeen population if not addressed, violating the principal of eradication that immigration must effectively be zero. To address this in 2022, a new role of Monitoring and Control Officer for the Mearns was created, which now sits within the Highland Line Team's remit.

Project staff in the North East consist of an Eradication Co-ordinator, Eradication Operations Lead, Eradication Officer, and Community Co-ordinator and Outreach Officer. The current project phase is a partnership project supported by the Scottish Government's Nature Restoration Fund managed by NatureScot, along with project partners including Forestry Land Scotland (FLS) and Aberdeen City Council (ACC).

In 2021, an opportunity arose to collaborate on FLS funded research with the University of the Highlands and Islands, using GPS collars and radio-tracking to learn about the movements of grey squirrels in Aberdeen's urban environment. The field element of the research took place in 2021 when grey squirrel density was considered medium-low at the time. Overall, 371 Grey squirrels were trapped in 2021 (compared to 153 in 2022, 95 in 2023, and 6 in 2024). Although the work is yet unpublished, this Master of Research work, has helped to inform the NE team on the spatial ecology of this low-density urban population of grey squirrels in Aberdeen. As the study illustrated, low-density urban grey squirrels have much larger home ranges than previously published for the species, and move large distances, presumably searching for conspecifics. In comparison, some home ranges - mainly those of breeding females - can be much smaller than the team expected. The study also looked at optimum trap-spacing in various habitat types, informing the NE team the considerations needed to ensure that every grey squirrel is at risk of being trapped. The work highlighted the need for the RRM scheme to increase both the density of feeders in existing areas and increase coverage in woodland areas not previously covered by RRM or trapping.

Some 8,073 feeder box checks were carried out in 2024, supported by 40 volunteers, resulting in one grey squirrel, 4,219 red squirrel and 216 pine marten detections. Fortnightly surveys are carried out, and samples dropped off by volunteers at dedicated "drop-off" points around the city. Staff collect samples and use microscopes to identify to species level every sample as it comes in. When a grey squirrel is detected, staff respond immediately with traps. Every grey squirrel detection is responded to as soon as practically possible, with discreet urban trap boxes utilised alongside a mink police trap alarm to increase trapping efficiency.

At the start of the current project phase in 2024, RZSS Wild Genes Lab carried out genetic sexing tests and ddRAD library construction to determine individual grey squirrel identification with a view to estimating population size to inform eradication efforts. The work was undertaken using 85 grey squirrel tissue samples representing populations from Aberdeen City, Aberdeenshire and the closest neighbouring population in Tayside. This was supplemented with an additional sample sourced in Edinburgh. The genetic sexing test was successfully performed. The study found the Aberdeen population to be genetically distinct from the Tayside populations, with no evidence of genetic connectivity. This further supports earlier work by Signorile *et al*, and anecdotal evidence that all grey squirrels in Aberdeen have originated from a single introduction event.

Major Difficulties Faced

- Potential trap/feeder shy grey squirrels and the need for innovative methods of detection and removal within the urban environment.

- The need for a long-term and sustainable funding model required to see through the entire eradication process and confirmation phase.

Major Lessons Learned

- The combination of full-time, long-term staff working in conjunction with a network of managed volunteers is needed to achieve consistency and efficacy (i.e. volunteer delivery of project objectives), are crucial, but they must be staff led, and staff supported to succeed.

- The ability to trap squirrels in high visibility/high footfall areas such as the urban and suburban environments, including school grounds, universities, offices, residential estates, and essentially anywhere there are trees, has been a result of work to increase public education and awareness combined with the development of the urban trap box by the NE Team.

- To achieve eradication, the NE Team need to be aware of grey squirrel distribution

across the region at any point in time. Implementing RRM in all available squirrel habitat requires the support of dedicated and reliable volunteers to achieve this level of survey effort.

- Due to the eradication progressing faster than anticipated in Aberdeen, and the time involved for the initial development of genetic markers for individual identification and genetic sexing tests, we learnt that the potential for genetic insights to aid the eradication in real-time should have been conducted at an earlier stage of the eradication process (estimate: before annual captures fell below 500 in 2021).

Success indicators

- Number of feeder checks (per quarter, per year etc)
- Record low grey squirrel detections
- Control rate of any grey squirrels detected
- Disruption to grey squirrel breeding cycle
- Red squirrel recovery (location and number of detections)
- Long-term commitment of volunteers
- High level of support and engagement of community

Project Success

Success or failure		Confidence
Highly Successful	✘	High
Successful		
Partially Successful		
Failure		

High confidence means that the assessor feels they have approximately 80% chance of the given selected score (Failure, partially successful, successful or highly successful) being correct. Medium confidence is defined as 51-79% chance of the assessor score being correct and Low confidence only 50% chance of being correct

Reasons for success/failure

- The adoption of the scientific method of eradication.
- The development and expansion of the RRM networks, including the extension of RRM to all available squirrel habitat has led to the current exceptionally low grey squirrel density.
- The support of the CCOO, along with the visible recovery of red squirrel populations has helped build and maintain a committed network of volunteers.
- Communicating the successes of the project, the fast reaction, communication and action of grey squirrel sightings, as well as visible recovery of red squirrel populations has helped contribute to the support and engagement of community.
- North East Scotland's grey squirrel population are a geographically isolated population, and the NE team work closely with the Highland Line team to prevent incursions of grey squirrels moving north from Angus into Aberdeenshire.
- A partnership approach has enabled continuity of funding, national and local cooperation between a range of Government agencies, NGOs, academics, local authorities and land managers and a momentum that sustains the work on the ground.
- The grey squirrel population in the north east of Scotland do not carry squirrelpox virus.

Future project development

- The aim of SSRS in the North East is confirmation of the complete elimination of Aberdeen's grey squirrels. This will be achieved through the careful development and implementation of a robust eradication plan and confirmation phase.
- The plan incorporates the use of a trained drey detection dog to enable the detection of remnant grey squirrel individuals, particularly any potential trap-shy or feeder-shy grey squirrels.

Opinion on methods of grey squirrel control

Approaches	Importance in your project currently	Future importance in developing this aspect of grey squirrel management in your project area
Shooting		
Live traps	★★★	★★★
Kill traps		
Pine marten (as natural grey predator)	★	★
Immuno-contraception (oral bait delivered via hoppers)		
Gene Drive (Selected inheritance manipulated so only male young are born)		
Habitat management (reducing availability of tree seed crops favoured by grey squirrels).		
Squirrelpox vaccine		

★★★ High; ★★ Medium; ★ Low, blank = None.

References

I. Scottish Strategy for Red Squirrel Conservation (2015) https://www.nature.scot/scottish-strategy-red-squirrel-conservation-june-2015 https://scottishsquirrels.org.uk/wp-content/uploads/2024/03/Scottish-Strategy-for-Red-Squirrel-Conservation-June-2015.pdf

II. Tonkin M, Hatcher G, Tipple N (2023) Saving an icon: Final report from the Developing Community Action phase of Saving Scotland's Red Squirrels. Published by Saving Scotland's Red Squirrels, Edinburgh, UK

III. Sheehy E, Sutherland C, O'Reilly C, Lambin X (2018) The enemy of my enemy is my friend: native pine marten recovery reverses the decline of the red squirrel by suppressing grey squirrel populations. Proceedings of Royal Society B 285: 20172603

IV. Cromarty PL, Broome K, Cox A, Empson RA, Hutchinson WM, McFadden I (2002) Eradication planning for invasive alien animal species on islands–the approach developed by the New Zealand Department of Conservation

V. Signorile AL, Reuman DC, Lurz PWW, Bertolino S, Carbone C, Wang J (2016) Using DNA profiling to investigate human-mediated translocations of an invasive species. Biological Conservation 195: 97-105