



**ERS**  
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**Evaluation and Cost-Benefit Analysis of Red Squirrels United (RSU)**  
**Final Report**



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## EXECUTIVE SUMMARY

- E.1 ERS was commissioned by The Wildlife Trusts in June 2019 to undertake a cost-benefit analysis of Red Squirrels United (RSU). This £2.98m project, funded by EU LIFE and The National Lottery Heritage Fund, aimed to conserve red squirrel populations in nine key locations across England, Wales, and Northern Ireland.
- E.2 The project ran from 2016 to 2020 and was delivered by a partnership of eight organisations managed by The Wildlife Trusts. Partners monitored red squirrels in key areas, controlled grey squirrel populations, established new eradication zones and maintained existing grey squirrel-free habitats. RSU also engaged local communities in conservation activity, through volunteering groups and broader community outreach and education.
- E.3 ERS was commissioned to conduct a cost-benefit analysis of RSU. In order to do so, various socioeconomic and ecological impacts were considered and quantified in monetary values, then combined to produce a final figure to compare against project costs.
- E.4 Following an extensive review of project documentation and data, ERS conducted site visits to Belfast, North Merseyside, Cumbria, Anglesey, Gwynedd and the Tywi Forest in Mid-Wales. Consultations were held in each location with project staff, volunteers, landowners and various other local stakeholders. The aim was to understand the costs and impacts of the project in each local context, taking into account factors unique to each area.
- E.5 The benefit-cost ratio considers three benefits of RSU across multiple project areas, which can be quantified as economic values:
- The benefits to tourism of increased red squirrel presence;
  - The damage to timber prevented by controlling grey squirrel populations; and
  - The equivalence value of the volunteering effort over the lifetime of the programme.
- E.6 In addition, the evaluation explores the ‘willingness-to-pay’ methodology, which aims to provide a monetary figure for the inherent value of the red squirrel; however, these figures are omitted from the final benefit-cost ratio due to a lack of robust data, and suggested primarily as a future area for research.
- E.7 The cost-benefit analysis demonstrated that RSU has had a significant impact on the UK economy, adding millions of pounds of value and creating a considerable number of jobs. The most notable effect is the additional visitor spending in key tourist sites within RSU localities, created and safeguarded by RSU’s conservation work. The headline economic impact figures are as follows:
- Total benefits estimated at **£11.5 million** over the lifetime of the programme, supporting **175.5 FTE** jobs.
  - An estimated **189,000 additional visitors** within RSU localities attributed to presence of red squirrels and programme activity, generating **£10.3 million** in additional visitor spending and directly supporting **165.5 FTE** jobs.

- 
- Over **44,000 volunteer hours** contributed over the programme, with an equivalence value of **£865,000**.
  - An estimated **£283,000** of ecological benefits arising from potential savings to the UK timber sector as a result of reduced bark stripping, supporting **10.0 FTE** jobs.
  - An estimated red squirrel existence value of **£3.2 million** across RSU catchment sites following Willingness-to-Pay (WTP) Analysis.
  - Benefit-cost ratio of **4.53:1** translating to **£4.53 of benefits** for each **£1 of public investment**.

## 1. INTRODUCTION

1.1 In June 2019, ERS was commissioned by The Wildlife Trusts to undertake an ex post cost-benefit analysis of Red Squirrels United (RSU), a £2.98m project funded by EU LIFE and The National Lottery Heritage Fund (NLHF) to conserve red squirrel populations across England, Wales, and Northern Ireland.

### Red Squirrels United

1.2 RSU was a four-year project, running from 2016 to 2020 and delivered by a partnership of eight organisations managed by The Wildlife Trusts. The total project cost was £2,980,597 which supported partners in England, Wales, and Northern Ireland to conserve native red squirrel populations.

1.3 The project sought to counteract the endangerment of UK native Eurasian red squirrels (*Sciurus vulgaris*) caused by the introduction of the invasive non-native Eastern grey squirrel (*Sciurus carolinensis*) in the nineteenth century. RSU supported partners to monitor red squirrels in key areas, control grey squirrels, establish new eradication zones and maintain existing grey squirrel-free habitats.

1.4 RSU had a significant focus on engaging local communities in conservation activity. This was intended to increase public engagement with the issues facing red squirrels and ensure the project's legacy after it came to an end.

### Project locations

1.5 The project operated in nine principal locations.

#### Wales:

- Anglesey and Gwynedd
- Clocaenog Forest
- Tywi Forest

#### England:

- Kielder Forest
- North Merseyside (Formby and surrounding areas)

#### Northern Ireland:

- Glens Antrim
- Mourne Mountains
- Fermanagh
- North West of Northern Ireland

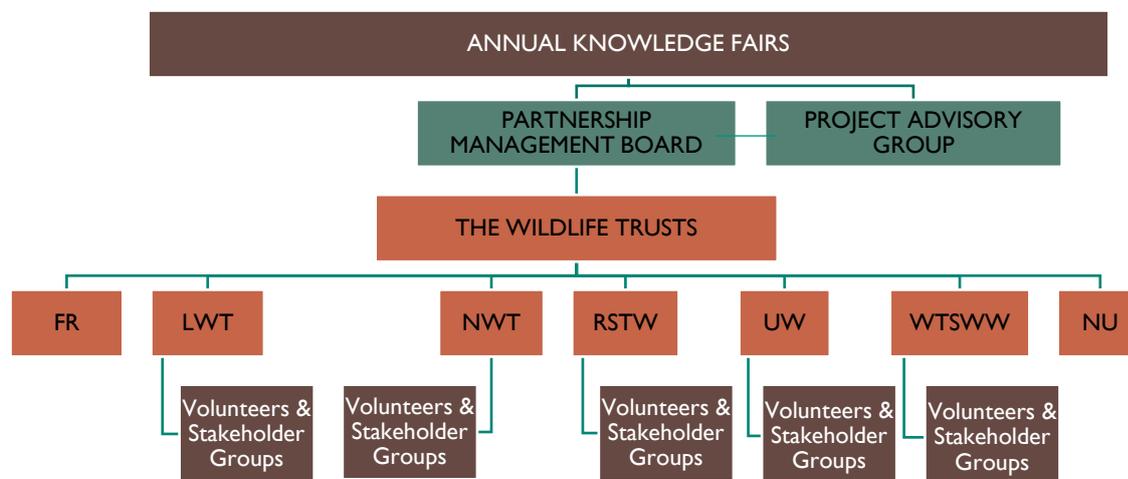
### Delivery model and structure

1.6 RSU was a partnership of eight organisations led by The Wildlife Trusts. The other partners were as follows:

- Northumberland Wildlife Trust
- The Wildlife Trust for Lancashire, Manchester and North Merseyside
- Red Squirrels Trust Wales
- The Wildlife Trust for South and West Wales
- Ulster Wildlife
- Newcastle University
- Forest Research

- 1.7 RSU was the first nationwide network collaborating to tackle threats to red squirrels in the United Kingdom. The project adopted a joined-up approach characterised by the sharing of best practice through shared training, resources, and attendance of annual Knowledge Fairs to which both staff and volunteers were invited.
- 1.8 Working collaboratively allowed RSU partners to adopt a singular and reinforced approach to all aspects of red squirrel conservation. This was particularly beneficial in two areas that red squirrel organisations have historically had difficulty with: monitoring red squirrel populations accurately, and engaging with the public positively and proactively about red squirrel conservation efforts.
- 1.9 Leading the project, The Wildlife Trusts employed a Secretariat team consisting of a Programme Manager, a Project Officer, and a part-time Grants Manager to administer and coordinate the partnership effectively. The Secretariat were also responsible for UK-wide aspects of RSU, namely communications and national campaigning work.
- 1.10 The Wildlife Trusts was supported and given direction by two overarching groups; the first was a Partnership Management Board which was made up of representatives from all eight partners, to proactively share best practice and ensure robust project delivery. In addition, a Project Advisory Group was set up, appointing external partners including (but not limited to) UK Squirrel Accord, European Squirrel Initiative, Saving Scotland’s Red Squirrels, National University Ireland – Galway, Northern Ireland Environment Agency and the Welsh Government.
- 1.11 Finally, a strong relationship was created with Saving Scotland’s Red Squirrels, a similar partnership project led by the Scottish Wildlife Trust which covers red squirrel strongholds in Scotland, outside of the scope of the RSU project. The two projects liaised closely and developed joint messaging on certain key topics. This ensured UK-wide learning and collaboration in the field of red squirrel conservation.
- 1.12 Each of the five partner delivery organisations also worked with numerous volunteer groups and stakeholder organisations of varying sizes, some pre-existing and some newly formed over the course of the project. **Figure 1.1** below provides a visual representation of the project structure, illustrating the various hierarchies and dependencies within RSU.

**Figure 1.1: Red Squirrels United Project Structure**



*Modified from original diagram in Business Plan, Red Squirrels United HG-14-10510, January 2016*

- 1.13 Newcastle University (NU) and Forest Research (FR) were evaluation partners, with Forest Research focusing on volunteering and social impacts, and Newcastle University focusing on ecological monitoring and analysis.

### **Project Evaluation: Rationale and Methodology**

- 1.14 ERS was commissioned to conduct a cost-benefit analysis of RSU, quantifying the impact of the project in monetary values. The evaluation covers all nine project areas and takes into consideration the four-year duration of the programme.
- 1.15 By quantifying disparate socioeconomic impacts brought about by RSU, and expressing them in monetary values, ERS aims to present a rigorous and wide-ranging assessment of the project's added value in a single format. We follow guidance set out in the HM Treasury Green Book which advises that a cost-benefit analysis should consider as many costs and benefits as possible for a given project, within reasonable bounds, including those for which a monetary measure is not traditionally available.
- 1.16 It is important nevertheless to recognise that many social and environmental benefits of the RSU project cannot simply be reduced to an economic value. While monetary values have been assigned to outcomes in order to fruitfully compare and combine them, this report also contextualises project outcomes and provides a detailed account of RSU's wider impacts on the environment, communities, wildlife, and individuals.
- 1.17 The evaluation began with an extensive review of documentation and data from all project partners, analysing progress to date against targeted outputs as well as financial information and broader project background. Relevant local and national policy documents were also reviewed to further develop an understanding of the context for RSU.
- 1.18 ERS then conducted site visits to Belfast, North Merseyside, Cumbria, Anglesey, Gwynedd and the Tywi Forest in Mid-Wales. Consultations were held in each location with project staff, volunteers,

- landowners and various other local stakeholders. The aim was to understand the costs and impacts of the project in each local context, taking into account factors unique to each area.
- 1.19 Additional understanding was drawn from liaising with Forest Research and Newcastle University and considering the evaluation alongside their work to draw cross-sector conclusions. The evaluation team's understanding of the RSU volunteer experience and the ecological impact of controlling grey squirrel populations were aided by these respective consultations.
- 1.20 The benefit-cost ratio (BCR) considers three benefits of RSU across its project areas.
- 1) The benefits to tourism of increased red squirrel presence;
  - 2) The damage to timber prevented by controlling grey squirrel populations; and
  - 3) The equivalence value of the volunteering effort over the lifetime of the programme.
- 1.21 The 'willingness-to-pay' methodology is also explored in order to propose a monetary figure for the inherent value of red squirrels, although these figures are omitted from the final BCR due to a lack of robust data.
- 1.22 The remainder of the report is structured as follows:
- **Section 2** provides a detailed profile for each RSU area, exploring regional differences in geography, project aims, progress to date and possible economic impacts.
  - **Section 3** calculates the potential benefits associated with RSU and quantifies them in monetary terms. The section considers benefits relating to tourism, ecology, volunteering, and 'willingness-to-pay' measures. A total benefit-cost ratio is then derived.
  - **Section 4** sets out key conclusions from the evaluation and recommendations for project staff, partners, policy-makers and other major stakeholders.

## 2. AREA PROFILES

2.1 This section of the report provides a detailed area profile for each of the constituent RSU projects, divided into the following headings:

- Northern Ireland
- Kielder, Uswayford and Kidland Forests
- North Merseyside
- Anglesey and Gwynedd
- Clocaenog Forest
- Tywi Forest.

2.2 Each profile briefly details the geography of the specified area and notes the rationale for involvement with RSU. The project staff structure is noted, and then the core project activities. Where available, key targets are restated followed by an overview of progress against these outputs.

2.3 In addition, each profile provides a brief account of the status and experience of volunteers on the project, the negative ecological impact of grey squirrels locally, and the levels of tourism in the area. These three aspects form the core of the cost-benefit analysis, but vary considerably between each area, and as such detail is provided here to add context and nuance to the later economic calculations.

2.4 The most notable variation present is between tourism in each area. Whereas Anglesey, North Merseyside, and a number of sites in Northern Ireland successfully market red squirrels as a tourist attraction, more remote areas have reportedly fewer visitors with or without the motivation of seeing red squirrels. As a result, we have omitted Tywi and Clocaenog Forests from the tourism section of the cost-benefit analysis as visitor numbers were either too small or too difficult to quantify.

2.5 The majority of RSU projects were funded by EU LIFE and NLHF, with the exception of Tywi Forest and Clocaenog Forest, which were both funded by NLHF only.

2.6 The subsequent information is drawn primarily from interviews with project staff, volunteers, and local stakeholders conducted during five site visits to project locations from August to October 2019. This was supplemented by data from RSU's Conservation Plan and Business Plan from 2016, and initial funding applications to EU LIFE and NLHF.

### Northern Ireland

2.7 Red squirrel populations across the whole of Ireland are estimated at 40,000, with widespread strongholds covering each of the six counties of Northern Ireland. RSU conservation efforts in Northern Ireland were extensive. Given the large study area, populations and habitats (and subsequently conservation activity needs) differ across the country, and the support of dedicated staff and volunteers has been vital to the success of the project.

2.8 Red Squirrels United: Northern Ireland was led by Ulster Wildlife (UW) in partnership with 12 local red squirrel community groups. The focus in this area was on conserving red squirrel populations across the four main strongholds of: The Mourne, Broughshane and Ballygally, Fermanagh and the North West. The 12 local red squirrel groups included:

- **Ards Red Squirrel group**
- **Ballygally Biodiversity group**
- **Cityside Red Squirrel group**
- **Donegal Red Squirrel group**
- **Fermanagh Red Squirrel group**
- **Glens Red Squirrel group**
- **North Down Pine Marten and Red Squirrel group**
- **North West Red Squirrel group**
- **Ring of Gullion and Cooley Red Squirrel group**
- **Rostrevor Red Squirrel group**
- **Heart of Down Red Squirrel group**
- **Tollymore Red Squirrel group; and**
- **West Tyrone Red Squirrel group**

2.9 Prior to the RSU project there had been an identified need for collaborative activity between the established red squirrel's awareness network in Northern Ireland (Northern Ireland Squirrel Forum) and other established networks throughout England, Scotland and Wales. The RSU programme filled this market failure, by providing a platform and the infrastructure for best practice to be shared by the groups and networks throughout the UK. Over the lifetime of the project, an additional six red squirrel groups were established, further supporting conservation efforts across Northern Ireland.

2.10 The RSU project within Northern Ireland was staffed by a passionate group of experienced conservation experts dedicated to the conservation efforts as well as imparting knowledge to the general public through engagement activities. Total headcount funded by RSU was six staff (3.79 FTEs), which included: a project lead, two community support officers, two squirrel rangers and an education/community engagement assistant.

2.11 Ultimately, the aims of the project in Northern Ireland were to protect red squirrel populations. This was achieved via educating the public through community engagement activities, grey squirrel management activity and population monitoring surveying.

2.12 The project was heavily reliant on volunteers, and the local management team suggest that community engagement and support were vital to the success of the project.

2.13 There were a series of community engagement activities undertaken to increase public awareness of the issues of an unmanaged invasive species and to help with the conservation efforts. These events included:

- Community talks
- Squirrel Safaris
- Survey Workshops
- Feeder building sessions
- Volunteer thank you events
- Talks at external events
- Community outreach events at local schools and youth groups.

2.14 The team also included two rangers who worked alongside volunteers to identify and eradicate grey squirrels. As part of the project 184 volunteers undertook LANTRA training in how to use Kania 2000 traps in conjunction with a live capture trap to safely and humanely manage grey squirrel populations. The use of Kania traps<sup>1</sup> in conjunction with live capture traps was revolutionary and increased the number of volunteers willing to undertake grey squirrel management.

2.15 The final strand of delivery was the monitoring of both red and grey squirrel populations through camera trapping techniques. Volunteers were trained in using the camera traps and collecting the sim card data which was used to monitor populations of red and grey squirrels as well as other species such as the pine marten (*Martes martes*). This data was entered into a spreadsheet to track species movement and was used as part of the annual survey report. **Figure 2.1** is a map from the report which shows the location of red squirrel survey sites and highlights the expansive coverage of RSU activity in Northern Ireland.

**Figure 2.1: RSU Red Squirrel Survey sites: Northern Ireland, 2018**



Source: Presentation to Ulster Wildlife team meeting (15.08.19)

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<sup>1</sup> A Kania 2000 trap is a spring trap used to catch and instantly kill grey squirrels and other small mammals.

- 2.16 The project has been considered a major success within the wider field of invasive non-native species management and control, and has set up processes for a continued national scheme to protect native species. The team noted that these processes can be transferrable to other species and conservation needs. The methods shared have been successful in increasing the effectiveness of grey squirrel management both in terms of rapid response and preventative measures. An example methodology identified through the network included the use of conservation trained dogs to support rangers in finding deceased red squirrels and preventing the spread of squirrelpox virus.
- 2.17 Latest figures from the Northern Ireland Woodland Register<sup>2</sup> indicate that there are almost 113,000 hectares (ha) of woodland and forest across the country, a figure that includes both public and private ownership. Grey squirrels in high densities across broadleaf and coniferous woodland can cause significant damage to plants and trees (as a result of bark stripping) and can disturb nesting birds. In addition to damage to woodland, grey squirrels also pose a threat to agricultural yields and have been known to cause damage to property, specifically roofs. RSU in Northern Ireland worked with a total of 95 landowners covering farms, private estates, wildlife sites and parkland. Landowners themselves as well as RSU rangers worked across these sites to undertake grey squirrel management activity to control population and reduce incidence of damage.
- 2.18 The project was supported by a total of 657 volunteers who engaged with the project to varying degrees and on various tasks.

**Table 2.1: Volunteer engagement in Northern Ireland**

Volunteers	Number of volunteers	Volunteer hours
Working directly on RSU	140	12,600
Recruited for Red Squirrel Group membership	43	5,400
Trained in grey squirrel management activity	184	<i>Unknown</i>
Engaged in practical activities e.g. camera trapping and feeders	290	<i>Unknown</i>
<b>TOTAL</b>	<b>657</b>	<b>18,000</b>

*Source: Local area project monitoring data*

- 2.19 The project has effectively raised the profile of red squirrels and the importance of grey squirrel management in the areas in which it has operated. The team found that working as a national network enabled them to identify best practice processes and adopt them into their own conservation efforts. This was particularly useful for Northern Ireland as it allowed them to avoid some of the pitfalls that other organisations across the UK had experienced before them. In 2019 red squirrels in the Republic of Ireland and Northern Ireland were reduced from *Near Threatened* to *Least Concern* in the

<sup>2</sup> [Northern Ireland Woodland Register \(2018\)](#)

International Union for Conservation of Nature Red List of Threatened Species<sup>3</sup>, a classification system which ranks species based on their extinction risk.

2.20 As well as the ecological impacts associated with volunteer support, there were also a number of social impacts that resulted from RSU. An example specific to Northern Ireland is that political and religious divides in some areas still exist and the project has been able to promote social cohesion through shared passions and interests. Observations by the project team as well as volunteer surveys suggest that the project appealed to and engaged with a broad demography.

2.21 Northern Ireland is promoted as “a land of fantastical landscapes, warm welcomes, dramatic history and enduring legend”<sup>4</sup>. It is also home to eight Areas of Outstanding Natural Beauty (AONB), the Giant’s Causeway, a UNESCO World Heritage site and is known for providing the location for various recent film and television productions. Latest tourism visitor figures reported by the Northern Ireland Statistics and Research Agency<sup>5</sup> (2019) identify an estimated 22.1 million visitors to 259 participating attractions, with country parks, parks and forests attracting the largest proportion visitors at 42 per cent (8.9 million visitors). UW and individual red squirrel groups across Northern Ireland engaged with a number of visitor attraction sites including: country parks, estates and hotels to spread awareness and support conservation efforts at these sites. A number of businesses and organisations incorporate red squirrels into their offer, **Figure 2.2** shows a sign pointing to a red squirrel hide at the Mount Stewart estate who have worked closely with the Ards Red Squirrel group and the North Down Red Squirrel and Pine Marten group.

**Figure 2.2 Signpost in the Mount Stewart estate to location of red squirrel hide**



Source: Toby Edwards, Ranger at Mount Stewart estate

<sup>3</sup> Marnell, F., Looney, D. & Lawton, C. (2019) *Ireland Red List No. 12: Terrestrial Mammals*. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland

<sup>4</sup>[www.ireland.com](http://www.ireland.com)

<sup>5</sup> [Northern Ireland Visitor Attraction Survey 2018](#)

- 2.22 One such site was the Montalto Estate, which attracts significant visitors each month (circa 11,000), making it one of the most visited historic properties in Northern Ireland. The case study below showcases how the presence of red squirrels has been incorporated as part of the offer.

#### Case study: Wilson Johnston (Ranger), Montalto Estate (Northern Ireland)

**What do red squirrels mean to the Montalto estate and how are they incorporated into the business offer?**

On a personal level as Ranger here in Montalto it is an absolute joy to see red squirrels on the grounds. As a business and visitor attraction, red squirrels form one part of a much larger offering involving retail, catering and plenty of opportunities to reconnect with nature. We encourage visitors of all ages to enjoy the surroundings and use all their senses whilst exploring the trails and gardens. We offer walks, talks and frequently have school groups on the estate enjoying the benefits of outdoor learning.



Source: Wilson Johnston

**How many visitors do you welcome annually and do red squirrels help to boost numbers or encourage visitors to come back? Do many visitors come specifically to see red squirrels?**

Since Montalto opened to the public in September 2018 we have had footfall per month of around 11,000 visitors. Due to our overall offering then we find people visit Montalto for many different reasons. There is certainly a lot of interest in the red squirrels and any events we run in relation to outdoor experiences are frequently sold out. A lot of our regular visitors and members will come along with their binoculars and cameras to walk the trails in anticipation of spotting some of the red population which reside at Montalto.

**Do you have any comments on the work that is being done to conserve red squirrel populations?**

The Wilson family who own the estate are fully committed to conservation and with the help of the Heart of Down Red Squirrel Group there is a collective effort striving to ensure that the conditions here in Mid Down provide a little haven for reds. It is vitally important that many relevant groups work together to maximise the conservation work being done across Northern Ireland and further afield. One of the most critical elements of this work must be the creation of suitable 'grey-free' corridors of habitat.

**What would it mean for your business if red squirrel populations no longer existed in your area?**

It could certainly mean less footfall at Montalto; however, the red squirrel aspect is only one part of a much larger offering. From a conservation standpoint and general indication of fully functioning parkland, the disappearance of this key member of the tree squirrel family would be a very significant loss. There was a period of 15 to 20 years when the red population at Montalto was non-existent and greys thrived. However, since 2018 the efforts of the Heart of Down RSG has been able to correct that and hopefully we will continue to see the stabilisation of a modest population of reds. Should our small population start to decline then there is no question that we would double our efforts to rectify that.

#### Kielder, Uswayford and Kidland Forests

- 2.23 Northumberland and Cumbria Wildlife Trusts (NWT and CWT) carry out red squirrel conservation work in the Kielder, Uswayford and Kidland Forests in Northumberland. The initial rationale for selecting these forests was that these were the only woodlands identified as free of grey squirrels on the English mainland. These areas are remote, with a low density of people living in small villages of between 10

and 20 houses. The forests have strong red squirrel populations which the Trusts are working to keep free of invasive grey squirrels.

2.24 The RSU team comprised a Project Manager (0.14 FTE), a Data and Monitoring Officer (0.06 FTE) and two full time rangers on fixed term contracts (2 FTE; until April and August 2019 respectively).

2.25 The RSU project in Northumberland mostly consisted of setting up an Early Warning System to monitor incoming grey squirrels. Initially this was led by staff, but more recently the system became 85 per cent volunteer led, with work carried out by a group of around 20 volunteers led by the Data and Monitoring Officer.

2.26 The project was not particularly intended to increase the number of volunteers associated with the Trusts' red squirrel work. Partly this is due to the demographics of the area; communities near the forest are small and those who are invested in red squirrel protection are often elderly and not overly active.

2.27 In addition, this area is notable for having an existing network of red squirrel volunteer groups supported through the Trusts: Red Squirrels Northern England (RSNE) programme. This was set up in 2012 to link a number of local red squirrel conservation groups across the North of England. Some of the RSU funding focused on holding events to increase recruitment, but mostly it was used to support existing volunteers.

2.28 Target outputs of the RSU project in Northumberland included, but were not limited to, the following:

- Successful protection of the woodlands from grey squirrel colonisation
- Prevention of squirrelpox outbreaks in the native red squirrel populations
- A new early warning system set up and maintained by volunteers on the edges of all three woodlands
- Systematic recording of grey squirrel management data to aid the development of more efficient control methods.

2.29 The early warning system was set up and reported to be working effectively. Despite small numbers of volunteers, data was continually collected. Rapid response planning was tested following sightings of grey squirrels reported on the borders of the forests and was felt to have successfully managed the threat.

2.30 Local reports of ecological damage caused by grey squirrels were scarce; project staff reported that while landowners noticed increased number of grey squirrels and fewer red squirrels, they did not report any significant effects of this shift beyond a small number of comments relating to tree bark damage.

2.31 The impact of RSU on volunteers in the area was equally limited, as the majority of red squirrel conservation volunteers within the Kielder, Uswayford and Kidland Forests were already active before

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- the introduction of the RSU funding and activities. The majority of volunteers were retired and have a history of conservation activity prior to their work with red squirrel conservation.
- 2.32 Nevertheless, a small number of new volunteers were recruited through RSU, some of whom were students. One student joined and later helped to run the Brampton and District Red Squirrel Group, which ultimately helped her to get a full-time paid job. The Trust has also recruited students on a temporary basis to complete work placements, although the majority of these interns moved out of the area after graduating.
- 2.33 RSU was not universally well-received by community groups in Northumberland RSU project areas, who found the extra branding and conditions of funding confusing and distracting. Project staff reported that long-term volunteers often saw RSU as a smaller version of RSNE that delivered less. The target areas of the RSU project were also criticised, with questions raised as to why funding was used to safeguard red squirrels in a remote forest rather than in urban areas, where red squirrel conservation could gain more traction with the public.
- 2.34 The disparate nature of the target areas and their distance from major towns and cities has limited the tourism potential of the three forests. The most notable tourist destination is Central Kielder, comprising Kielder Water and Kielder Village. There is a dedicated red squirrel hide in the woods, although the likelihood of a sighting was reported to be low. It was felt that the majority of visitors make day trips to the area or stay at the cabin park, rather than lodging at local accommodation.
- 2.35 NWT and CWT initially believed the forests to be entirely free from grey squirrels, and this was the justification for setting up and testing an early warning system. However, data gathered during the project showed that a number of grey squirrels were present in Kielder and Kidland forests although Uswaysford remains grey squirrel free. This knowledge has been valuable to the Trusts, who are now commencing a new project with Forestry England to address this gap in knowledge.

### North Merseyside

- 2.36 The red squirrel population at North Merseyside is ecologically isolated at 100km<sup>2</sup> away from any other populations and is the southernmost population of red squirrels on the English mainland. The density of red squirrels is highest in the coastal woodlands in and around Formby, but red squirrels are present throughout north Merseyside and west Lancashire.
- 2.37 In 2008, approximately 80 per cent of the area's red squirrels died due to an outbreak of squirrelpox virus.<sup>6</sup> Following intensive conservation work, numbers have recovered to 2007 levels and are continuing to rise.
- 2.38 There are approximately 140 woodlands in the area covered by LWT. The majority of these woodlands are between 0.5 ha and 20 ha (the largest is 300 ha) and are owned by over 40 different landowners.

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<sup>6</sup> Conservation Plan, Red Squirrels United HG-14-10510, February 2016

LWT works closely with them to secure access to woodlands and assess the damage caused by various invasive species.

2.39 Target outputs of the RSU project in North Merseyside included, but were not limited to, the following:

- Number of healthy red squirrels in the coastal woodlands remain stable or increase from January 2017 onwards
- Over 200 new members of existing grey squirrel volunteer control networks in Crosby and Southport
- Three entirely new grey squirrel control networks in Scarisbrick, Maghull, and Lydiate
- Multiple training sessions delivered covering monitoring, control, and awareness raising

2.40 The project was successful in gaining new volunteers and raising local awareness. Local red squirrel populations also remained stable, reaching their highest levels in 2017 since 2004.<sup>7</sup>

2.41 Awareness levels among the public varied depending on locality. Formby, Ainsdale, and Blundellsands have historically been aware of the threat presented by grey squirrels and have supported efforts to control and eradicate them in order to preserve the red squirrel. Southport and Crosby have generally been more opposed to these practices and less aware of the specifics of the issue, although public knowledge and engagement has steadily increased in Crosby over the course of RSU.

2.42 RSU employed a full time Red Squirrel Officer and a full time Ranger at LWT (2 FTE). RSU funded three strands of conservation activity in North Merseyside: control, monitoring, and community engagement.

2.43 Control activities were largely delivered by staff in local woodlands. One of the officers undertook all trapping himself, and a group of six volunteers had permission and the requisite insurance to shoot grey squirrels. In addition, LWT ran an urban trap loan scheme; residents reported sightings of grey squirrels in their gardens to community representatives, who installed live capture traps. Once a grey squirrel was caught, volunteers collected the traps and dispatched the grey squirrels.

2.44 90 per cent of monitoring activities were delivered by local volunteers, who walked a set transect, install cameras, monitored sightings and reported their data back to LWT staff, who compiled and analysed it.

2.45 Community engagement covered several activities, including guided walks, fairs, stalls and talks to community groups and schools. This was particularly successful at raising awareness of red squirrel endangerment in Crosby, where public engagement levels had previously been low. LWT staff noted that volunteers believed they could add the most value to this strand.

2.46 The area has a number of broadleaf woodlands which are threatened by grey squirrels, but in general North Merseyside does not have a significant amount of timber, and as such there were few reports

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<sup>7</sup> EC LIFE Progress Report, Covering the project activities from 01/09/2017 to 31/08/2018

of bark stripping. The most significant negative economic impact of grey squirrels in the area results from the damage they cause to pheasant shoots, which has been widely reported by local landowners. Grey squirrels destroy pheasant feeders, incurring an economic cost for landowners.

- 2.47 LWT worked with one large volunteer group which undertakes red squirrel conservation activities throughout the region, known as *Red Alert*. The group has existed under various names and in various forms for 20 years, but during the RSU funding period was supported by LWT to become constituted and to appoint a committee for the first time in over a decade. The group has a very strong relationship with LWT, and the relationship is seen as an equal partnership by both volunteers and staff.
- 2.48 Volunteers were usually retired, particularly those who undertook long-term work with the project; the group has a balanced mix of genders, although control activities were almost exclusively performed by retired men. Despite the average age of participants tending towards older age groups, a number of students from various Liverpool universities attended the group as well, all of whom studied a degree relating to conservation or the environment. In addition, LWT took on temporary interns from Edge Hill and Liverpool John Moore Universities.
- 2.49 Project staff were enthusiastic about the impacts of environmental volunteering on personal wellbeing; LWT runs a social prescribing project called MyPlace with Lancashire NHS Trust, providing ecotherapy to those suffering from mental health conditions.
- 2.50 The economic benefits related to red squirrel tourism in North Merseyside are significant in comparison to other RSU areas. Formby Point woods, owned by the National Trust, is well-known regionally and nationally as one of the best places to see red squirrels in the United Kingdom. A decade ago, an outbreak of squirrel pox wiped out around 80 per cent of the red squirrel population at Formby, but numbers have steadily increased since then, and the area's popularity has not wavered.
- 2.51 Visitor numbers are high, particularly on public holidays, and often tourists travel long distances to visit the woods. Formby Point woods also provide access to a popular beach; as such, visitor numbers cannot be attributed entirely to the presence of red squirrels.
- 2.52 In addition, a number of local businesses use red squirrels in their marketing and publicity to attract customers, capitalising on the area's renown as a hotspot for red squirrel sightings.

### Anglesey and Gwynedd

- 2.53 Anglesey is an island situated off the coast of North West Wales, around 720km<sup>2</sup> in size. It is separated from the mainland by the Menai Straits and two bridges which cross them: the Menai Suspension Bridge and the Britannia Bridge. Anglesey holds 60 per cent of Wales' red squirrel population, and is the only Welsh County which has eradicated grey squirrels. Due to the island's geographical isolation, red squirrels have become prolific enough to be seen outside of conifer woodland, instead spotted in gardens, parks and on doorsteps.
- 2.54 On the other side of the Menai Straits is the county of Gwynedd, comprising a few settlements (of which the largest is the City of Bangor) surrounded by a heavily wooded landscape. Although grey

squirrels proliferate in this area, a small red squirrel population has formed since 2008, when the creatures migrated from the island to the mainland via the bridges and the sea.

2.55 The team at Red Squirrels Trust Wales (RSTW) consisted of a full time Project Lead, a full time Red Squirrel Ranger, one full time and two seasonal trappers equating to 4 FTE. RSTW also employed a part time ranger in Clocaenog, an area discussed in a subsequent section.

2.56 Target outputs of the RSU project in Anglesey and Gwynedd included, but were not limited to, the following:

- The prevention of epidemic viral infections in Anglesey due to grey colonisation
- A joint Welsh and Irish approach to reducing the likelihood of grey squirrels crossing from the mainland to Anglesey via sea ferry traffic
- The eradication of grey squirrels from 1500 ha of woodland in Gwynedd;
  - if successful, an early warning system set up to prevent reinvasion, based on community awareness and education. If unsuccessful, a quantified assessment of the level of resources required to eradicate grey squirrels from a geographically isolated landscape in Gwynedd containing a small re-establishing red squirrel population.

2.57 Anglesey was felt to have been successful in keeping the island free from grey squirrels; in addition, migration of red squirrels to the mainland reportedly continued, and in 2018 a red squirrel was sighted in Snowdonia National Park for the first time in 50 years.

2.58 However, the project was not able to eradicate all grey squirrels from the designated area of Gwynedd. Nevertheless, a successful community early warning system was set up, with Gwynedd volunteers alerting the team to the discovery of a dead red squirrel which was later found to be carrying the squirrelpox virus in 2017. The outbreak was contained due to quick action and community education initiatives. The Island Colonisation Prevention Plan, set up at the programme's inception, also supported efforts to prevent the virus from spreading to Anglesey.

2.59 Preventing grey squirrels from entering Anglesey, and removing them from Gwynedd, was thought to have reduced ecological and economic damage on several fronts; grey squirrels damage hardwood timber crops, attack young birds and eat their eggs, and chew through machine wiring causing fire hazards. Forestry impacts are largely hypothetical in Anglesey as woodland is scarce, although future efforts to increase this are reportedly under discussion. There is, however, anecdotal evidence of increased biodiversity and crop success in Gwynedd following the reduction of grey squirrel populations in the area.

2.60 In total, over 3,800 volunteer hours were recorded on the project between September 2016 and September 2019. Approximately 46 per cent of hours were spent on events and learning experiences, while 38 per cent were linked with red squirrel monitoring. The remaining hours were associated with

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grey squirrel control, Welsh translation and website/social media activities. A considerable number of volunteers had been involved to some extent in conservation or wildlife work beforehand.

- 2.61 Volunteers and project staff were in agreement that volunteers gained increased levels of wellbeing after participating in red squirrel conservation; the result of meeting new people, learning new skills, and gaining a sense of purpose and drive. Project staff relayed accounts of individuals suffering from depression, or dealing with grief, who had felt better following time spent monitoring squirrels. A local partner also stated that she “can think of two people who have literally turned their lives on the head because of [the project]”.
- 2.62 Volunteers cited improved skills in IT, natural history and biology, governance and the law, and practical tracking and identifying. Project staff also suggested that younger volunteers gained important employability skills and specific conservation knowledge.
- 2.63 Views of volunteer demographics varied slightly according to different accounts; some felt that there was a 50/50 split between retirees and younger volunteers (often graduates), whereas others perceived a higher frequency of relatively affluent retired people and only a small number of younger people. Project staff also noted that while training sessions were well attended by conservation students and graduates, this did not always result in active volunteering on the project.
- 2.64 The economic impacts of tourism related to red squirrel sightings were felt to be considerable in Anglesey and Gwynedd; many described the impact of red squirrels on local tourism as “massive”. Visitors to North Wales during holiday seasons to Anglesey were felt to frequently visit expressly to see red squirrels. Tourists were thought to commonly come from the North, particularly Manchester or Liverpool, although staff spoke of visitors from as far away as New Zealand.
- 2.65 The Dingle Nature Reserve was highlighted as a key site for tourism, especially following an appearance on BBC’s *Countryfile*<sup>8</sup> in January 2019, which was said to have noticeably boosted visitor numbers. **Figure 2.3** shows a signpost for a red squirrel feeding area in the Dingle. In addition, Plas Newydd, a country house on Anglesey, charges visitors for entry to their grounds where red squirrels can be spotted. The house itself is currently under renovation so squirrels were thought to make up a considerable part of Plas Newydd’s appeal to tourists.

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<sup>8</sup> <https://www.bbc.co.uk/programmes/b09r87j5>

Figure 2.3 Signpost in the Dingle alerting to location of red squirrel feeding area



Source: ERS Ltd

2.66 Several businesses capitalise on the presence of red squirrels on the island; many actively feed them in order to maximise the chance of sightings. Project staff spoke of local shops and breweries that used red squirrels in their marketing materials, some of whom work directly with the Trust and donate money to them. Likewise, it was reported that some wildlife tour guides and photographers make a considerable part of their living working with red squirrels and would be significantly affected by any future reduction in numbers.

#### Case study: Debbie Cavanagh, Gwynfair Caravan Park (Anglesey)

Debbie Cavanagh runs Gwynfair Caravan Park on the west coast of the Isle of Anglesey. She has taken a keen interest in red squirrels since moving to the Island 10 years ago and is frequently asked about them by customers. Although she doesn't see them much close to the Caravan Park, she often sees them elsewhere on the island and also tells her customers where they can go to catch a sighting. Debbie joined a local Facebook group dedicated to red squirrels and through that, got to know about the work Holly was doing for RSU. Debbie interacts with others on the site and has also been involved as a volunteer, donating towards and building squirrel boxes and signs for Penrhos Nature Reserve.



Source: Joyce Grieves

She thinks that the work Holly has been doing has been particularly important in engaging younger volunteers through school visits and many of the current volunteers are older and retired. Debbie would like to see the Red Squirrels Trust work continue. While she can't always get out to see the squirrels herself, she enjoys seeing others post pictures online and comments on a couple of individuals who's mental health has benefitted through taking up photography of the squirrels.

Debbie believes that the red squirrels are a big attraction for visitors to Anglesey and often receives visitors to the campsite from over the border in England, particularly Liverpool and Manchester.

*“I think that the squirrels are a big draw for our caravan park, people often ask me about them and were to go I show people on maps the best areas to spot them, I also bring the squirrels up when selling caravans and people always stop conversation to ask about them and ask further questions and I feel people are really pleased that they are doing well on the island.”*

Although any future decline in red squirrels may not have a direct impact on the caravan park itself, Debbie believes that it could have an impact on the island as a whole and therefore believes that funding for conservation efforts is vital.

- 2.67 Preventing grey squirrels from colonising Anglesey was widely agreed to be considerably cheaper than control measures should colonisation happen. Research undertaken by Dr Craig Shuttleworth<sup>9</sup> in 2016 suggests that removing a single grey squirrel from Anglesey costs £5,000.

### Clocaenog Forest

- 2.68 Clocaenog Forest is an upland conifer woodland in the counties of Conwy and Denbighshire, managed by Natural Resources Wales since the late 1990s. A trend of declining red squirrel numbers had been a cause for local concern, but recent surveys have been positive with a number of sightings. RSU intended to build on this and sustainably revitalise the population.
- 2.69 Alongside their work in Anglesey and Gwynedd, RSTW funded a part-time Red Squirrel Ranger post in Clocaenog. The project aimed to develop previously lacking community involvement in conservation effort, by creating a new community group and a trap loan scheme. A citizen engagement programme, where volunteers were managed and trained by RSTW, was successful in recruiting over 100 local residents to help control grey squirrels and monitor native wildlife.
- 2.70 Through the project, a community group was established and constituted in 2019. The Clocaenog Red Squirrels Trust will continue the work initiated by RSU.

### Tywi Forest

- 2.71 The 17,000 hectare Tywi Forest in mid-Wales is a refuge for a small number of red squirrels, particularly in the densely wooded area surrounding the Cambrian Mountains. In recent years numbers have diminished and the population was estimated to consist of between 100 and 500 red squirrels at the programme’s inception. The Mid Wales Red Squirrel Partnership (MWRSP) aimed to protect and expand this population.
- 2.72 MWRSP consists of The Wildlife Trust of South and West Wales (WTSWW) alongside local councils, Forestry Commission Wales, other environmental trusts and interested individuals. Red squirrel

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<sup>9</sup> Shuttleworth, Craig, Peter Lurz, and John Gurnell. *The Grey Squirrel: Ecology & Management of an Invasive Species in Europe*. The European Squirrel Initiative, 2016.

conservation activity in the forests was launched in 2014 by WTSWW, with one full-time Red Squirrel Officer initially funded by Environment Wales.

- 2.73 RSU funded a three-year part-time post for a Grey Squirrel Control Officer to take over grey squirrel control activities. This enabled the Red Squirrel Officer to focus on managing and assessing the local habitat, building partnerships with forestry management companies, and producing an integrated five-year management plan in conjunction with these companies. The part time Red Squirrel Officer was also funded through RSU.
- 2.74 Funding was also used to buy equipment for both control and monitoring, such as traps and cameras, and to recruit more volunteers. Of the nearly 120 volunteers currently involved with the Trust's red squirrel conservation work, 50 per cent were recruited during the period funded by RSU. **Figure 2.3** shows a volunteer finding evidence of red squirrel activity in the Tywi Forest. Volunteers were particularly instrumental in implementing and running a local trap loan scheme, which trapped over 3,500 grey squirrels over the project lifespan. They also helped to raise awareness of red squirrels in the area, leading to increased reports of sightings. In total, over 7,000 hours of volunteering were recorded by the project team between September 2016 and July 2019, although this was felt to be an underestimate due to gaps in records for some volunteers.

**Figure 2.3 Photograph of RSU volunteer holding a gnawed pine cone: evidence of red squirrels in Tywi forest**



*Source: ERS Ltd*

- 2.75 Project staff reported a range of ecological damage caused by grey squirrels which their project aimed to prevent; grey squirrels chew through wires on farm machinery, strip bark off trees, and alter timber growth. Stripping the bark from young trees in broadleaf woodland prevents them from growing straight, making the resulting timber less economically valuable.

- 2.76 As Tywi Forest is not a broadleaf woodland, impacts on forestry are less pronounced, but project staff believed that intensive grey squirrel control had a positive economic impact on the local forestry industry, although quantitative evidence was difficult to source.
- 2.77 Of the project's nearly 120 volunteers, staff regarded 20 to 25 of these as forming a core group. Initially this core comprised local area coordinators, who set up the trap loan scheme in different localities. Afterwards it grew to encompass regular monitoring volunteers, and those who regularly attended training and outreach events.
- 2.78 The majority of volunteers on the Trust's database had little face-to-face contact with project staff. After being trained by staff or local coordinators to control and monitor squirrels on their property, they were left to do so individually, feeding quarterly data back to local area coordinators.
- 2.79 Project volunteers spanned a range of different demographics. There was a large proportion of retired people, who took on the majority of the project's control activities alongside monitoring work, and a significant number of farmers and their partners, with a long-standing relationship with the local environment. Another key group was professionals in their late 20s to early 40s, who were often self-employed and tended to be keen photographers; they carried out a lot of the monitoring work but were less enthused about control activities.
- 2.80 Project volunteers spoke about the benefits of the project in helping them to meet like-minded people, rejuvenating their energy levels, and giving them a sense of worth and purpose.
- 2.81 Economic impacts related to red squirrel tourism are scarce in this area due to the low density of red squirrels locally. The Cambrian Mountains Initiative is a small organisation that seeks to promote the Cambrian Mountains as tourist destinations due to their heritage, geography and culture; they worked with the Trust to produce a series of themed maps of the area, although red squirrels themselves are not a major selling point.
- 2.82 In addition, a select few businesses use the possibility of red squirrel sightings as part of their marketing – a local pub, for example, has a board outside tallying recent sightings. However, this practice is not particularly widespread as sightings were felt to be few and far between and not to be relied upon as a hook for tourists.
- 2.83 The new post created by RSU funding gave the Red Squirrel Officer increased capacity to plan for the future of the Trust and its red squirrel conservation activities, and put together comprehensive bids for new funding opportunities. As a result of the extra time afforded to the Officer, the Trust successfully bid for another three years of funding from the NLHF.

### 3. COST-BENEFIT ANALYSIS

3.1 This section of the report explores and identifies the potential benefits associated with the activities of the Red Squirrels United programme, covering the case study sites over the project's lifetime. The costs and benefits covered are outlined in **Table 3.1** below. A final calculation considers the total economic benefits divided by the programme costs to derive a benefit-cost ratio (BCR) which expresses the return (in monetary benefits) on the input costs of the programme.

**Table 3.1: Areas covered within the cost-benefit analysis**

Costs	Benefits
Input costs of RSU programme	Tourism benefits
	Ecological benefits
	Volunteer benefits
	Willingness to Pay (WTP) benefits*

#### Programme expenditure

3.2 In this section of the report programme costs are identified, a vital component as the denominator in the benefit-cost ratio (BCR). The total amount of public funding which supported the RSU programme was **£2,530,529** with funding provided by NLHF and EU LIFE.

#### Tourism benefits

3.3 This section of the report aims to quantify the economic benefits associated with tourism and recreational visits attributed to red squirrels across the RSU sites. Such visits generate monetary benefits to local economies through visitor spending, either directly at the site or within local businesses.

#### Methodology

3.4 In order to quantify the visitor impacts, an estimated number of additional visitors must be derived, taking into account the attribution of red squirrel presence for the reason of their visit. This is an important process given that a large proportion of visitors are likely to still visit each area regardless of the presence of red squirrels. This section also excludes local visitors to each site, with the underlying assumption that non-locals bring in money to the locality whereas local visitors are likely to have spent that money in the region anyway.

3.5 The process of deriving the visitor attribution involved synthesising primary data, collected via research undertaken on behalf of the RSU programme, with relevant secondary data.

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\* WTP figures are omitted from the final benefit-cost ratio (BCR) calculation due to lack of robust data.

- 3.6 A 2015 survey by Forest Research<sup>10</sup> on behalf of the RSU programme explored public attitudes towards red and grey squirrels. Cross-tabular analysis on respondent data is applied to derive the proportion of visitors who undertake visits for the purpose of observing wildlife. The UK-wide survey had a response sample of 3,758, of which 27 per cent of respondents indicated that seeing wild animals or plants was their main reason for visiting woodlands.
- 3.7 The same survey questioned participants to express their desire to see squirrels in different settings. We consider responses including *I would like to see red squirrels in my local park* and *I would like to see red squirrels in the countryside* but not *I would like to see red squirrels in my garden* as this does not constitute as a visit. Across the sample interviewed, 58 per cent of participants strongly agreed that they would like to see red squirrels either in their local park or in the countryside, indicating that they would be willing to make a visit to see a red squirrel.
- 3.8 **Table 3.2** below highlights a number of previous UK-based studies which identify the number and proportion of wildlife visitors primarily visiting to observe a specific species. The average proportion amongst this group is that 16.9 per cent of visitors visit a site with the primary purpose of observing a specific animal.

**Table 3.2: Proportion of visitors primarily to see a specific species, UK-based studies**

Species	Region	Wildlife visits	Primary reason for visit	Proportion
Whales <sup>11</sup>	West Scotland	241,591	54,439	22.5%
Dolphins <sup>12</sup>	Moray Firth, Scotland	63,000	17,100	27.1%
General Wildlife <sup>13</sup>	East Yorkshire, England	266,385	45,670	17.1%
Sea Eagles <sup>14</sup>	Mull, Scotland	70,085	4,305	6.1%
Sea Birds <sup>15</sup>	Orkney	81,000	5,850	7.2%
Chough <sup>16</sup>	Cornwall, England	18,000	5,400	30.0%
<b>UK Total</b>		<b>785,170</b>	<b>132,764</b>	<b>16.9%</b>

- 3.9 Applying each of these assumptions allows us to derive an estimate for the proportion of visitors who visit primarily to see red squirrels.

<sup>10</sup> Dunn, M. & Marzano, M. (2015). Red Squirrels United Public Attitudes Survey – Social acceptability of methods used to manage squirrels in the UK.

<sup>11</sup> Warburton, C.A., Parsons, E.C.M., Woods-Ballard, A., Huges, A. & Johnston, P. (2001) Whale-watching in West Scotland: Report for the Department of Environment, Food and Rural Affairs.

<sup>12</sup> Davies et al. (2010), 'The Value of Tourism Expenditure related to the East of Scotland Bottlenose Dolphin Population'.

<sup>13</sup> ICRT Leeds. (2010), 'The Economic Potential of Nature Tourism in Eastern Yorkshire'.

<sup>14</sup> Dickie et al. (2005), 'Watched Like Never Before... the local economic benefits of spectacular bird species'.

<sup>15</sup> Molloy, D. (2011). Wildlife at work. The economic impact of white-tailed eagles on the Isle of Mull. The RSPB, Sandy.

<sup>16</sup> Moran, D. & Lewis, A.R. (2014). The Scottish Beaver Trial: Socio-economic monitoring, final report. Scottish Natural Heritage Commissioned Report No. 799.

3.10 The calculation involves multiplying those who visit with the main reason of seeing wildlife (26 per cent), with the proxy value of seeing a specific wildlife species (16.9 per cent) by the proportion of respondents who indicated that they would travel outside of their home to see a red squirrel (58 per cent). Doing so results in an estimated 2.6 per cent of visitors being directly influenced by the presence of squirrels.

$$\text{Primary Red Squirrel Visitor ratio} = (26\% * 16.9\% * 58\%) = 2.6\%$$

3.11 As highlighted in the opening methodological statement it is important to discount local resident visitors from any impact calculations due to the likelihood that they would have spent in the area regardless of visiting the site. Lack of visitor survey data across the RSU sites means that proxy estimates are used in our analysis. The closest resembling study is the Brecon Beacons National Park Visitor Survey<sup>17</sup> which is similar in profile to the RSU sites in that it is a nature reserve and home to significant wildlife.

3.12 The results of this survey identify that 19 per cent of visitors are local residents, compared with 36 per cent domestic day visitors and 45 per cent visitors as part of an overnight trip.

**Table 3.3: Proportion of visits by visitor profile**

Visitor profile	Proportion of visits
Resident / live locally	19%
Day visitor	36%
Staying overnight	45%

3.13 Great British Day Tourism Survey<sup>18</sup> data identifies the number of day visits and expenditure broken down by primary reason for undertaking such a visit. One of the indicators included was to *Watch wildlife (e.g. bird watching)*. A total of 29 million day visits were undertaken with a total spend amounting to £1.24 billion. This results in an average spend of £42.62 per day visitor (£46.86 in 2019 prices).

3.14 The GB Tourist Survey also breaks down visits and expenditure using this indicator. In total 3.71 million visits were undertaken to *Watch wildlife* totalling 17.8 million nights<sup>19</sup>. Total expenditure was £982 million, representing an average spend of £264.69 per trip or £55.16 per day for overnight visitors (£60.64 in 2019 prices). We take a conservative estimate that all overnight visitors will spend just one day for the purpose of observing squirrels.

<sup>17</sup> [Brecon Beacons National Park Visitor Survey 2016-17](#)

<sup>18</sup> [The GB Day Visitor Statistics 2015](#)

<sup>19</sup> [The GB Tourist Statistics 2015](#)

## Northern Ireland

- 3.15 Red Squirrels United and Ulster Wildlife worked alongside a number of recreational visitor site partners to promote the conservation of red squirrels for tourism purposes. Ulster Wildlife devised a list of visitor attraction sites for seeing red squirrels across Northern Ireland. The total visitor numbers for the attractions listed was estimated at almost 5.8 million across the lifetime of the programme (four years).
- 3.16 Applying the earlier ratio of visitors attributable to red squirrel presence results in over 123,000 additional (non-local) visitors over the four years.

**Table 3.4: Visitor profiles and spending – Northern Ireland**

Type of visitor	Visitor numbers	Value of visitor spending (£)
<b>Total visitors</b>	5,800,000	-
<b>Primary Red Squirrel visitors</b>		
<b>Day visits</b>	54,800	£2,555,000
<b>Overnight stays</b>	68,500	£4,154,000
<b>Total</b>	<b>123,300</b>	<b>£6,709,000</b>

## Kielder, Uswayford and Kidland Forests

- 3.17 The total number of visitors to Kielder, Uswayford and Kidland forests over the duration of RSU was estimated at 1.6 million. The estimated number of visitors primarily attracted as a result of red squirrel presence is over 43,000. Omitting local residents from the impact analysis results in 34,900 additional visitors, including over 15,500 day visitors and 19,400 overnight visitors as part of an overnight stay. These visitors generated almost £1.9 million to the local economy as a result of their spending.

**Table 3.5: Visitor profiles and spending – Kielder, Uswayford and Kidland Forests**

Type of visitor	Visitor numbers	Value of visitor spending (£)
<b>Total visitors</b>	1,628,000	-
<b>Primary Red Squirrel visitors</b>		
<b>Day visits</b>	15,500	£727,000
<b>Overnight stays</b>	19,400	£1,176,000
<b>Total</b>	<b>34,900</b>	<b>£1,903,000</b>

## North Merseyside

- 3.18 Total visitor numbers to Formby Point over the lifetime of the programme are estimated to be just over 1.2 million. Adopting the attributable red squirrels visitors figure results in almost 32,000 visitors primarily to see red squirrels. Discounting local residents from the impact analyses results in 25,900

economically additional visitors, of which, around 11,500 are day visits and 14,400 are as part of an overnight stay. These visitors generate spend of over £1.4 million.

**Table 3.6 Visitor profile and spending – North Merseyside**

Type of visitor	Visitor numbers	Value of visitor spending (£)
<b>Total visitors</b>	1,200,000	-
<b>Primary Red Squirrel visitors</b>		
<b>Day visits</b>	11,500	£539,000
<b>Overnight stays</b>	13,580	£872,000
<b>Total</b>	<b>25,900</b>	<b>£1,332,000</b>

### Isle of Anglesey and Gwynedd

- 3.19 Total visitor numbers across Anglesey and Gwynedd were significant. Across the two areas, wildlife visits were estimated at almost 9.1 million.

**Table 3.7: Visitor profile and spending – Anglesey and Gwynedd**

Type of visitor	Visitor numbers	Value of visitor spending (£)
<b>Total visitors</b>	9,080,000	-
<b>Primary Red Squirrel visitors</b>		
<b>Day visits</b>	84,200	£3,924,000
<b>Overnight stays</b>	105,200	£6,379,000
<b>Total</b>	<b>189,400</b>	<b>£10,303,000</b>

### Tywi and Clocaenog Forests

- 3.20 Due to the isolated nature of Tywi and Clocaenog Forests, visitor benefits are estimated to be minimal as forests are difficult to access and have no major tourism centres that measure visitor numbers. As such, we have not taken either forest into account as part of the tourism analysis.

### Results & Sensitivity Analysis

- 3.21 A final step must also be applied which estimates the proportion of these visits which are directly related to the activities of the RSU programme. **Table 3.8** below displays sensitivity analysis of the attribution of red squirrel visitors directly related to the activities of the RSU programme. The worst-case example assumes that none of these visitors can be attributed to the programme, the middle case assumes that 50% of these visitors were influenced by activities undertaken via the programme and the best case assumes that all visitors are additional as a result of the programme.

3.22 The middle case is adopted for the purpose of this report, which identifies that 189,400 additional visitors can be attributed to RSU over the programme lifetime, and that visitor spending generated by these visits totalled over **£10.3 million**.

3.23 A 2013 study by Deloitte and Oxford Economics on behalf of VisitBritain<sup>20</sup> identified that the marginal tourism revenue required to support an additional job was £54,000 (£62,351 in 2019 prices). This results in a total of **165.5 FTE jobs** supported as a result of tourism activity under middle case conditions.

**Table 3.8: Sensitivity analysis for visitor impacts**

	Worst case (0%)	Middle case (50%)	Best case (100%)
<b>RSU Additional visitors</b>	-	189,400	378,800
<b>Additional visitor spending</b>	£-	£10,317,000	£20,634,000
<b>Visitor spend FTEs</b>	-	165.5	330.9

### Case Study

3.24 Certain tourist destinations rely on red squirrels in particular to attract their core visitors. The following case study details the importance of red squirrels, and by extension RSU, to the Mount Stewart Estate in Northern Ireland. Toby Edwards, a ranger at Mount Stewart, demonstrates how the conservation work carried out by RSU has a direct economic impact on the site, by safeguarding and increasing visitor numbers.

#### Case study: Toby Edwards (Ranger), Mount Stewart Estate (Northern Ireland)

##### **What do red squirrels mean to the Mount Stewart estate and how are they incorporated into the business offer?**

Red Squirrels are a big part of our overall outdoor visitor offer at Mount Stewart. They are written into our conservation management plan for the obvious reasons. But they are also in our business plan as a key offer to both first time and regular visitors to the demesne. This has steered not only our core conservation work but also the overall outdoor offer comprising of self-led and guided program of trails, our purpose-built viewing hide and associated interpretation + engagement.

**How many visitors do you achieve annually and do red squirrels help to boost visitor numbers or encourage visitors to come back? Do many visitors come specifically to see red squirrels?**



Source: Toby Edwards

<sup>20</sup> [Deloitte & Oxford Economics on behalf of VisitBritain \(2013\). Tourism: jobs and growth – The economic contribution of the tourism economy in the UK](#)

Annual visitors to Mount Stewart are circa 245k. Most certainly Reds do boost our overall offer. Not a month goes by without there being comment to one of our team or via our visitor survey returns that a motivating reason for visit (to the outdoors) was because of the red squirrels (or that they had seen one for the first time and was 'magical' etc.) This has been interesting for us as we do not have a habituated red squirrel population like those at Formby or Brownsea Island etc. They are very much in their natural form and behaviours and we want to keep it that way. So visitors do really get an authentic wild experience that is very much not guaranteed which makes it that much more rewarding.

***What has been your experience of working with the Red Squirrels United team?***

Without a doubt the RSU:NI (and RSU) project has been a catalyst for forward momentum and joined up landscape scale approach. The co-ordination of faltering groups as well as establishing new groups has been fantastic. Really shows what having a dedicated resource with people on the ground can do you 'rally the efforts' and target resources showing that it can be done. I really think that with this having happened in NI, as long as there is some severance of resource (that should be supported at a governmental level) NI and even island of Ireland can be recovered.

***What would it mean for the Mount Stewart estate as a business if red squirrel populations no longer existed in your area?***

We would probably see a slowdown in visitor growth. We are not talking big numbers as it is hard to predict what this would be. We have such a broad and ever-changing offer for our visitors. We do know for sure that it would be a great loss and certainly seen so by our regular visitors who come specifically for the Red Squirrels and have come with us on that journey of recovery. I can see it having a far bigger impact on other smaller outdoor visitor offers.

We would need to majorly rethink and change our outdoor visitor framework and infrastructure. If we are also talking the en masse rise in grey squirrels (unchecked) then our forestry and woodland management conservation and business would be majorly impacted alongside needed to completely re-plan our medium and long term biodiversity management.

## Volunteer impacts

- 3.25 Another area where economic value can be identified is via volunteering activity. A significant amount of volunteering was undertaken throughout the RSU programme, and was unanimously cited by members of the programme team as being vital to the success of the programme. In total almost 44,000 hours of volunteering effort was contributed over the lifetime of the programme.

### Methodology

- 3.26 The methodological approach adopted is the equivalent job value, which assigns a monetary value based on what could be expected for a paid employee undertaking the same work. Essentially, this quantifies in monetary terms what it would cost to undertake such activity with paid staff.
- 3.27 NLHF guidance provides estimate monetary value based on the level of skill required to undertake the volunteering activity, outlined in [Table 3.9](#).

**Table 3.9: Monetary value of volunteering activity (NLHF guidance)**

Skill level of role (and description)	Value in £ (per day)	Value in £ (per hour)
Professional labour (for example – accountancy or teaching)	£350	£46.67
Skilled labour (for example – administrative work or leading a guided walk)	£150	£20
Unskilled labour (for example – clearing a site or working as a steward at an event)	£50	£6.67

3.28 Consultation with programme leads from across the RSU sites was undertaken to estimate a breakdown of volunteer activity and the corresponding skill level required, adopting the HLF guidance. Weighted averages were calculated based on the total number of volunteer hours contributed and the proportion at each skill level classification. The results (**Table 3.10**) found that approximately 12.5% of volunteering was considered to be *Unskilled labour*, the vast majority (82.9%) was considered to be *Skilled labour* and the final 4.6% to be *Professional labour*.

**Table 3.10: Average skill level of RSU volunteer**

Skill level of role	Weighted proportion
<b>Professional labour</b>	<b>4.6%</b>
<b>Skilled labour</b>	<b>82.9%</b>
<b>Unskilled labour</b>	<b>12.5%</b>

### Results

3.29 The total number of volunteer hours contributed over the lifetime of the RSU project was almost 44,000. Applying the above proportions results in 5,500 volunteer hours of unskilled labour, with an equivalent value of £36,500; 36,400 volunteer hours of skilled labour with an equivalent value of £727,600; and 2,000 hours of professional labour at an equivalent value of £94,200. The total monetary value associated with volunteering activity was significant at almost **£860,000** over the duration of the programme.

**Table 3.11: Value of RSU volunteering activity**

Skill level	Volunteer hours	Value (£)
<b>Unskilled labour</b>	5,500	£36,500
<b>Skilled labour</b>	36,400	£727,600
<b>Professional labour</b>	2,000	£94,200
<b>Total</b>	<b>43,900</b>	<b>£858,300</b>

## Ecological impacts

3.30 As well as impacts resulting from visitor spending there are also ecological benefits associated with managing grey squirrel populations. Existing literature identifies that the primary ecological threat caused by an unmanaged grey squirrel population is the damage caused to woodland as a result of bark stripping. The economic effect of this is losses to the value of timber and the forestry sector. Other ecological impacts not covered in this study include damage to nesting songbirds and agricultural yields.

## Methodology

3.31 It is firstly important to identify the total area of woodland that is covered by the programme. Individual Wildlife Trust teams identified this as just over 87,000 ha. In order to determine possible savings an estimation of how much of this land is used for commercial timber production must be calculated.

3.32 Market analysis by Savills (2018)<sup>21</sup> on the forestry sector identified that the typical total market area of woodland used for commercial activity annually is 18,000 ha. In order to identify the total land that could conceivably be involved in timber production across the RSU sites a ratio of marketed woodland over the total UK woodland is derived. Total UK woodland was estimated at 3.19 million hectares in 2017 therefore around 0.56% of UK woodland is used in the annual production of timber.

3.33 Given that the total area covered by the programme was 87,100 ha, the conceivable area that could be expected for use in timber production based on the national ratio is around 492 ha.

3.34 A study by Derbridge, Pepper and Koprowski (2016)<sup>22</sup> identify the value of 1 ha of woodland suitable for silviculture to be £15,000 (£16,469 in 2019 prices). This study also found that significant grey squirrel damage reduces timber value to just 30% of that value at £4,500 (£4,941 in 2019 prices). If the total area were susceptible to bark stripping then the potential damage (assuming 25% of trees are affected) would be over £1.4 million.

**Table 3.12: Total area covered by RSU (ha) and potential area of timber production/timber damage**

Site	Total area (ha)	Timber estimate (ha)	Potential damage (annual)
Northern Ireland	15,000	85	£244,000
Kielder, Uswayford and Kidland Forests	41,279	233	£671,000
North Merseyside	3,677	22	£60,000
Isle of Anglesey and Gwynedd	4,650	26	£76,000

<sup>21</sup> [UK Forestry Market: Spotlight 2018. Savills Research.](#)

<sup>22</sup> Derbridge, J.J., Pepper, H.W., and Koprowski, J.L. (2016) *Economic Damage by Invasive Grey Squirrels in Europe*

<b>Tywi and Clocaenog Forests</b>	22,500	127	£366,000
<b>Total</b>	<b>87,106</b>	<b>491</b>	<b>£1,420,000</b>

### Results and Sensitivity Analysis

3.35 The table below considers the potential damage if the entire RSU project area (491 ha) was damaged by the typical level of bark stripping damage (25% of trees). It is unrealistic to assume that the entire area of potential timber woodland would be affected by bark stripping. Sensitivity analysis for 0% as the lower bound estimate, 5% as the middle-case and 10% as an upper bound estimate are applied. The table below highlights the expected benefits under these different assumptions over the lifetime of the programme.

**Table 3.13: Potential savings to the timber sector under different conditions**

	Lower bound (0%)	Middle case (5%)	Upper bound (10%)
<b>Potential cost savings to the timber sector (SIC 21 and SIC 22)</b>	£-	£283,000	£566,000
<b>FTEs safeguarded/supported</b>	-	10.0	18.2

3.36 Taking into account middle-case estimate proportions of trees susceptible to bark stripping (5%) and assuming a conservative estimate of 25% the total costs associated with bark stripping are estimated to be £70,800 annually.

3.37 Given that the programme ran for four years this is considered an annual cost saving to the timber sector resulting in a total cost saving of **£283,000**.

3.38 Analysis of latest Annual Business Survey (ABS) data<sup>23</sup> suggests that the average employment costs to support one FTE position in the forestry sector (SIC 21 and SIC 22) is £28,333. Therefore, the potential estimated savings to the timber industry from potential grey squirrel damage would have supported or safeguarded **10.0 FTE jobs** over the lifetime of the programme.

### Existence Value of Red Squirrels

3.39 Willingness to Pay (WTP) surveying and analysis identifies a monetary value based on public attitudes towards species and how much individuals would be willing to pay to ensure that conservation efforts are undertaken. Due to a lack of recent and robust data this value will be omitted from the final benefit-cost ratio but it provides useful context into the public perception of conservation activity and is an area for consideration for future studies.

3.40 Existing literature on WTP explores public perception values within the context of UK mammal conservation. The results in **Table 3.14** highlight the median WTP values across a range of UK mammal

<sup>23</sup> Office for National Statistics. (2020). *Annual Business Survey*.

species covered by several studies. These figures have been converted to reflect the value of British sterling in 2019 and are expressed both as a one-off WTP and an annual rate, using the accepted discount factor methodology adopted within the studies.

**Table 3.14: One-off and Annual WTP Values for UK Mammal Species**

Species	One-off WTP £2019	Annual WTP £2019
Red Squirrels <sup>24</sup>	£4.48	£0.67
Pine Marten <sup>25</sup>	£16.11	£2.40
Water Vole <sup>26</sup>	£13.64	£2.03
Otter <sup>26</sup>	£21.84	£3.25

3.41 In order to identify the total potential existence value across the RSU sites, population boundaries must be established. A case could be made that suggests conservation of a native species is of importance to the entire UK population. However, a conservative approach has been adopted using county and unitary authority populations for the individual sites with the exception of Northern Ireland given the coverage of the RSU project activities. A further conservative approach is also applied, covering just the population aged 16 and above who are more likely to have earnings and disposable income to fund such initiatives.

3.42 **Table 3.15** below highlights the resident population estimates across the surrounding area of each RSU site.

**Table 3.15: Resident population estimates by RSU site**

Population boundary	Total population	16+ population
Northern Ireland	1,881,641	1,488,131
Northumberland (Kielder)	320,274	267,919
Sefton (North Merseyside)	275,396	227,487
Anglesey & Gwynedd	194,139	161,233
Ceredigion (Tywi forest)	72,992	62,042
Conwy (Clocaenog forest)	117,181	98,172
<b>Total</b>	<b>2,861,6230</b>	<b>2,304,984</b>

Source: ERS analysis on ONS Population estimates

<sup>24</sup> White, P.C.L., Bennett, A.C. & Hayes, E.J.V. (2001). The use of willingness-to-pay approaches in mammal conservation. *Mammal Review*, Volume 31, No. 2, 151-167.

<sup>25</sup> The Vincent Wildlife Trust. (2013). *People & Pine Marten in Wales: Public Opinion Survey*.

<sup>26</sup> White, P.C.L., Gregory, K.W., Lindley, P.J. & Richards, G. (1997). Economic values of threatened mammals in Britain: A case study of the Otter (*Lutra lutra*) and Water Vole (*Arvicola terrestris*). *Biological Conservation*, Volume 82, 345-354.

3.43 A final treatment is applied to the population estimates to identify the proportion of which who would be willing to fund red squirrel conservation initiatives. This is informed by the 2015 Forest Research survey<sup>10</sup> on behalf of RSU which asked respondents to identify to what extent they agree with the following statement: *Red squirrels are endangered and efforts should be made to conserve them.*

3.44 52% of respondents either strongly agreed or agreed with this statement, with the remaining 48% either having a neutral or negative stance. Using this assumption, a final population across the RSU programme sites of almost 1.2 million is estimated.

**Table 3.16: Resident population estimated to financially support red squirrel conservation efforts**

Population boundary	Total population	16+ population
Northern Ireland	978,453	773,828
Northumberland (Kielder)	166,542	139,318
Sefton (North Merseyside)	143,206	118,293
Anglesey & Gwynedd	109,952	83,841
Ceredigion (Tywi forest)	37,956	32,262
Conwy (Clocaenog forest)	60,934	51,049
<b>Total</b>	<b>1,497,043</b>	<b>1,198,591</b>

3.45 Applying the annual Red Squirrel WTP figure over the four-year duration of the programme for these populations leads to an estimated existence value of red squirrels of **£3.2 million**.

**Table 3.17: Existence value of red squirrels**

Population boundary	16+ population	Existence value £2019 (4 years)
Northern Ireland	773,828	£2,073,859
Northumberland (Kielder)	139,318	£373,372
Sefton (North Merseyside)	118,293	£317,026
Anglesey & Gwynedd	83,841	£224,694
Ceredigion (Tywi forest)	32,262	£86,462
Conwy (Clocaenog forest)	51,049	£136,812
<b>Total</b>	<b>1,198,591</b>	<b>£3,212,226</b>

3.46 There are also further potential spill-over impacts in terms of existence value as grey squirrel management efforts have also had a positive impact on pine marten populations, notably in areas across Northern Ireland.

### Total benefits and overall value for money

- 3.47 The total benefits came to almost **£11.5 million** over the lifetime of the programme. This is also estimated to have supported **175.5 FTE jobs** across the sites.
- 3.48 Cost-benefit analysis was undertaken, which considers the total economic benefits associated with the programme as the numerator and the total programme costs as the denominator. The final benefit-cost ratio is 4.53:1 which means that for every £1 of public investment, benefits of £4.53 are achieved.

**Table 3.18: Final cost-benefit analysis**

Costs	Benefits	Benefit-cost Ratio
<b>£2.53 million</b>	<b>Tourism benefits – £10.3 million</b>	<b>4.53:1</b>
	<b>Ecological benefits – £283,000</b>	
	<b>Volunteer benefits - £858,000</b>	
	<b>Total: £11.5 million</b>	

## 4. CONCLUSIONS AND REFLECTIONS

4.1 This section of the report reviews the findings of the cost-benefit analysis of RSU, and provides recommendations for programme leads, partners, and other decision-makers, identifying key points of learning for future conservation projects.

### Headline economic impacts

4.2 RSU has had a significant impact on the UK economy, adding millions of pounds of value and creating considerable numbers of jobs. The most notable effect is the additional visitor spending in key tourist sites within RSU localities, created and safeguarded by RSU's conservation work. The headline economic impact figures are as follows:

- Total benefits estimated at **£11.5 million** over the lifetime of the programme, supporting **175.5 FTE** jobs.
- An estimated **189,000 additional visitors** within RSU localities attributed to presence of red squirrels and programme activity, generating **£10.3 million** in additional visitor spending and directly supporting **165.5 FTE** jobs.
- Over **44,000 volunteer hours** contributed over the programme, with an equivalence value of **£865,000**.
- An estimated **£283,000** of ecological benefits arising from potential savings to the UK timber sector as a result of reduced bark stripping, supporting **10.0 FTE** jobs.
- An estimated red squirrel existence value of **£3.2 million<sup>27</sup>** across RSU catchment sites following Willingness-to-Pay (WTP) Analysis.
- Benefit-cost ratio of **4.53:1** translating to **£4.53 of benefits** for each **£1 of public investment**.

### Dissemination and key messages

4.3 In light of these findings, RSU should increase discussion of its socioeconomic impacts alongside its ecological impacts in marketing literature and campaigning on both a local and national level. This could help to bring an increased number of stakeholders and policy makers outside of the field of conservation on board with the project and its aims.

4.4 In particular, there is convincing evidence to suggest that red squirrels have a significant cultural value and motivate the decisions made by some tourists of where to go and what activities to undertake. This aligns the RSU project with a number of regional agendas.

4.5 Likewise, the effectiveness of the project in recruiting, mobilising, and training volunteers to undertake core project activities make it a success story for volunteer management organisations.

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<sup>27</sup> Not included in cost-benefit analysis

- 4.6 However, the cost-benefit analysis only draws attention to that fact that there are a number of valuable impacts produced by RSU which cannot be quantified in economic terms using currently available methodologies. Consultations with project staff have revealed a shared belief that red squirrels have an inherent ecological and cultural value which cannot be monetised; further analysis of this idea and communications centring the notion may be effective where economic impact assessments are not.

### Management and delivery

- 4.7 Amongst the wider discussion of impacts, there were some references to the management and delivery of the programme and partnership. While there were felt to be some initial challenges and weaknesses in communication, this was widely considered to have improved significantly by the end of the programme. Meanwhile, there were mixed opinions on the programme level events which brought programme partners together. Some individuals found the links established with other partner areas really useful and a valuable part of the programme. In some areas there was however a feeling that not all partners were as committed to sharing and collaboration as others and this was a source of disappointment after what was initially hoped to be a valuable partnership.

### Data collection and analysis

- 4.8 As primary data was not readily available for many of the output indicators used in the cost-benefit analysis, proxy figures from a variety of academic and industry sources were used in their place. In order to ensure similar evaluations are more rigorous and nuanced in future, we recommend that partners collect data proactively and consistently from the project inception with economic impact measures in mind; key indicators include visitor numbers for local tourist sites, volunteer hours and types of role/activity, and the proportion of woodland in each area used for timber production.
- 4.9 Our analysis of tourism impacts is partly based on findings from the baseline Public Attitudes Survey carried out by Forest Research for RSU in 2015. We understand that Forest Research is in the process of publishing an updated Public Attitudes Survey to chart the programme's impact on public perceptions of red and grey squirrels. We welcome these new findings and recommend that the economic analysis be updated with these new figures, as levels of willingness to travel to see red squirrels may well have increased due to RSU's campaigning and communications.
- 4.10 While Forest Research have carried out extensive surveys of volunteers on RSU activities, their focus has been on volunteer experiences of the RSU system. The specific health and skills related benefits experienced by volunteers as a result of their participation in the programme are outside of their stated remit. As such, a dedicated survey of volunteers to ascertain the key benefits of volunteering would provide unique and useful data by which to measure project impacts.
- 4.11 We recommend that annual damage assessments of woodland be undertaken to identify and enable more accurate estimation of levels of bark stripping and its economic impact on the timber sector.

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4.12 In addition, we recommend that the ‘willingness-to-pay’ methodology is explored in more depth during future evaluations, once more robust data sets have been made available to researchers.