

# Draft Grey Squirrel Management Action Plan for Wales

## 1. Introduction

Grey squirrels (*Sciurus carolinensis*) are a significant invasive non-native species (INNS) in Wales, having spread rapidly after their introduction to Britain in the late 1800's. The grey squirrel out-competes red squirrels for food in all forest types including conifer woodlands, and also carries an infection known as 'squirrel pox virus' which is lethal to red squirrels. Grey squirrels can have a considerable impact on biodiversity and woodland ecosystems, as well as causing damage to both broadleaved and conifer woodland. The economic cost of grey squirrel management and damage to the GB forestry sector is estimated to be £6 million per year, and in Wales, £914,500 per year<sup>1</sup>. This rises to an annual cost of £14 million per year to the British economy where costs to other sectors, such as construction, development and infrastructure are included.

There is a range of activity currently underway in Wales, from grey squirrel management to benefit red squirrel conservation areas, to co-funding of research into grey squirrel management methods and the zoonotic risk this species may pose to native mammals. However a more co-ordinated approach to grey squirrel management would enable scarce resources to be maximised and provide a framework for future funding bids. Such an approach would serve to meet the following obligations and commitments:-

- Invasive Alien Species (IAS) regulations
- Welsh Government (WG) Woodlands for Wales strategy
- Conservation plan for Red Squirrels in Wales
- UK Squirrel Accord

*The EU Regulation (EU) No 1143/2014 on the Prevention and Management of the Introduction and Spread of Invasive Alien Species<sup>2</sup> (the IAS Regulation)* entered into force on 1 January 2015. The IAS Regulation requires both a list of invasive alien species of Union concern be drawn up, and Member States to put in place management measures for the eradication, control or containment of listed species. Such management measures must be proportionate to the impact on the environment and appropriate to the specific circumstances of the particular Member State. Grey squirrels are on this list, which came into force on 3 August 2016.

Member States, such as the UK, have 18 months to put in place effective and proportionate management measures for listed species, including grey squirrels. Measures should be based on an analysis of costs and benefits, and prioritised based on the risk evaluation and their cost effectiveness. Monitoring is also required

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<sup>1</sup> CABI - Williams et al (2010) – Economic cost of Invasive Non-native species on Great Britain

<sup>2</sup> The term 'Invasive non-native species' (INNS) is the equivalent of 'alien species' as used by the Convention on Biological Diversity (CBD) and are broadly defined as species whose introduction and/or spread threaten biological diversity or have other unforeseen impacts.

of the effectiveness of the measures put in place. This Grey Squirrel Management Action Plan addresses the requirements of this Regulation in Wales.

*The Welsh Government Woodlands for Wales (WfW) Strategy* sets out a 50-year strategy for woodlands and trees, and is supported by an action plan. The Strategy outlines a number of commitments, which includes creating new native/ mixed woodland; encouraging woodland management and habitat restoration; and improving woodland connectivity. Such action aims to increase the environmental quality, health and resilience of the Welsh woodland resource, and the ecosystem services they provide. However woodlands are vulnerable to damage from grey squirrels which threaten tree survival and timber quality, which can impact on biodiversity and woodland resilience. Many of the objectives of the WfW Strategy will be more difficult to deliver unless the negative impacts of grey squirrel are properly addressed.

Responses to the WfW strategy consultation during its development indicated that management of grey squirrel was essential to the delivery of the various WfW policies. In the WfW strategy, Welsh Government made a commitment to develop a strategic and targeted approach to help tackle threats from non-native invasive species, including grey squirrel. This Grey Squirrel Management Action Plan aims to meet this commitment.

*A Conservation Plan for Red Squirrels in Wales* was drawn up by the Wales Squirrel Forum and is delivered by a range of partners. It provides a foundation for action in Wales to protect and enhance the three red squirrel focal sites – Anglesey, Clocaenog and mid-Wales – and maintain breeding populations of red squirrels. The conservation plan for red squirrels includes elements of grey squirrel management within the focal sites and adjacent buffer areas, owing to the combined impact of competition and disease on red squirrel populations.

This Grey Squirrel Management Action Plan requires a wider remit in recognition of the impact of grey squirrels on woodland as a wider habitat and as a national natural resource, as well meeting WG commitments on IAS as outlined above. Work under this action plan will contribute to the delivery of the Red Squirrel Conservation Plan and vice versa. However the two plans remain separate owing to the wide range of problems caused by grey squirrels.

*The UK Squirrel Accord* was agreed between 32 leading woodland, timber industry and conservation organisations in the UK. The long term vision of the Accord is:-

- Our native red squirrel populations are secure and have expanded beyond their current strongholds
- Our woodlands are flourishing and can continue to deliver multiple benefits for future generations.

The signatories to this Accord, which include Welsh Government and Natural Resources Wales (NRW), recognise the vital importance of this work and agree the following long term aim: Red squirrel populations protected and thriving and greys controlled, through targeted and sustained action. It is also recognised that this must be done through a broad and dynamic partnership between Government, private and

voluntary sectors. This Grey Squirrel Management Action Plan sets out actions in Wales which will contribute to the Accord's aim and recognises the partnership approach necessary for the delivery of management actions.

## Grey Squirrel Management Action Plan for Wales

### Aim

The aim of this action plan is to develop a more integrated, efficient and effective approach to grey squirrel management in Wales, making best use of resources to manage grey squirrel populations, and meet obligations under the IAS Regulation. This document sets out objectives and actions to provide the basis of a Grey Squirrel Management Action Plan for Wales.

### Objectives

It is important to improve the health and resilience of the Welsh woodland resource and the benefits it provides to present and future generations. Grey squirrel is known to have a negative impact on the social, economic and environmental benefits of woodlands and trees.

The objective of this action plan is to control and prevent the geographical spread of grey squirrel populations in order to:-

- Reduce the impact on mainland red squirrel populations
- To prevent, detect and remove grey squirrel incursion onto the island of Anglesey in order to prevent establishment and recolonisation of this grey free landscape.
- Reduce the impact on tree and woodland ecosystems and the services they provide, including timber production.

This grey squirrel management action plan fully supports the Red Squirrel Conservation Plan for Wales, the primary objective of which is to *Maintain breeding populations of red squirrels at all Focal Sites within Wales* – these being Anglesey, Clocaenog and Mid Wales.

It is **not** the objective of this action plan to *eradicate* grey squirrels from Wales. This is not practical or affordable owing to grey squirrel population levels. The IAS Regulations allow for invasive non-native species to be controlled rather than eradicated where such species are already widely established. This Action Plan seeks to encourage the management of grey squirrel populations where it is feasible to do so and where the benefits are greatest.

## **2. Other Welsh Government strategies and policies relevant to the grey squirrel management action plan**

In addition to the key commitments already outlined, a number of Welsh Government strategies, policies and wider legislation were reviewed in the preparation of this action plan. These include:-

- Wellbeing of Future Generations (Wales) Act 2015
- The Environment (Wales) Act 2016 and Natural Resources Policy
- Climate Change Strategy for Wales (2010)
- Nature Recovery Plan for Wales 2015
- LIFE Natura 2000 project
- GB Invasive Non-Native Species (INNS) Strategy
- Wales Biodiversity Partnership INNS Group

Appendix 1 sets out how this action plan is aligned to and will contribute to the delivery of these.

## **3. Need for Action**

### **Evidence of Impact**

The impact of grey squirrels has been significant both in terms of biodiversity and the forest industry as well as threatening agriculture and the urban environment. There are substantial economic consequences associated with these impacts both as a result of damage and direct revenue loss and through the cost of grey squirrel management.

A risk assessment<sup>3</sup> for grey squirrel highlighted its invasiveness, economic impact and mechanisms by which it replaces the native red squirrel, causing wide-scale extinction of the latter. It also identified that due to the presence of suitable habitat, climate conditions and the invasive nature of grey squirrel, there is a risk that if introduced to further sites, grey squirrel could spread across Europe. For these reasons, grey squirrel features on the list of species of Union Concern.

There are no accurate population estimates for grey squirrel in the UK: in 2010, a number of sources put this at 2-3.3 million<sup>4</sup>. They are widespread in Wales apart from two red squirrel focal areas where they are managed to protect red squirrel populations and on Anglesey where they have been eradicated. Although their

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<sup>3</sup> European Non-native species risk analysis – risk assessment template V1.3.(09.11.11)

<sup>4</sup> CABI - Williams et al (2010) – Economic cost of Invasive Non-native species on Great Britain

presence is related to the decline in red squirrel populations or loss of timber value, their impact on the environment goes far wider in the following areas:-

### Biodiversity

The presence of the grey squirrel has led to the loss of red squirrel populations across large parts of its natural range throughout the UK owing to direct competition for food and the spread of the squirrel pox virus. Within Wales red squirrels are now restricted to three main areas: Anglesey, where red squirrels are now also establishing in adjacent areas of Gwynedd, Clocaenog Forest in NE Wales and in the network of conifer forests in the Tywi area of mid-Wales. In the absence of the efforts of local red squirrel projects to manage grey squirrels, it is likely that the red squirrel would be close to extinction in Wales.<sup>5</sup>

Grey squirrels are known to be a predator of birds' eggs and nestlings, and while there is little evidence of grey squirrels limiting bird populations, there is evidence of a possible link with nest failure for certain species<sup>6</sup>. Grey squirrels have also been implicated in local declines of hazel dormouse populations due to competition for hazelnuts, but insufficient data is currently available to support this view.

Grey squirrels can reach densities four times higher than red squirrels in some broadleaved and mixed woodlands<sup>7</sup>. They are impacting some of Wales' most important woodland sites and have been identified as management problem on eight Sites of Special Scientific Interest (SSSI), including three Special Areas of Conservation<sup>8</sup>. In total 16 SSSI management units have grey squirrels recorded as an issue, affecting for example oak tree recruitment. It is likely that the total may be much higher due to low awareness of grey squirrel damage and confusion with deer browsing by some conservation managers. As such, grey squirrel damage has implications for the wider regeneration and sustainability of woodland habitats, and the flora and fauna associated with it.<sup>9</sup>

### Productive woodlands and tree health

The impact of grey squirrel damage on the growth and subsequent value of productive timber depends on the species affected, and the quantity and location of damage on the tree. Bark stripping can cause callousing around wounds and enable fungal infections to gain entry resulting in tree death, timber staining or rot. However there is very little evidence to suggest any link between grey squirrel damage and *Phytophthora ramorum* (sudden oak death)<sup>10</sup>. Ring barking damage can result in tree

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<sup>5</sup> Haliwell et al 2015

<sup>6</sup> Gurnell J, Lurz PWW, Shuttleworth CM (2016). Ecosystem impacts of an alien invader in Europe, the squirrel *Sciurus carolinensis*. In: *The grey squirrel Ecology & Management of an invasive species in Europe*, 307-326. European Squirrel Initiative.

<sup>7</sup> Gurnell J, Lurz PWW, Shuttleworth CM (2016). Ecosystem impacts of an alien invader in Europe, the squirrel *Sciurus carolinensis*. In: *The grey squirrel Ecology & Management of an invasive species in Europe*. 307-326. European Squirrel Initiative.

<sup>8</sup> Natural Resources Wales Special Sites Actions Database

<sup>9</sup> Mayle et al (2007) Controlling grey squirrel damage in woodlands, FC practice note

<sup>10</sup> Forest Research website – Are grey squirrels implicated in spreading *P. ramorum*? - last updated 2012

death, loss of tree canopy, deformity or stem snap. In addition to whole or partial tree death, damage often results in a downgrading or loss in value of the mature tree e.g. from higher value, versatile timber to wood fuel. A 30% loss of tree canopy through bark stripping can affect tree growth rate, timber and biomass yield.<sup>11</sup>

Susceptible species include oak, sycamore, beech and sweet chestnut, with conifer species including Norway spruce, pine and larch. Birch and sitka spruce have also had reports of damage. Ash, which has been planted as an alternative to susceptible species owing to its relative resistance to squirrel damage, is now no longer planted in Wales due to the Chalara Ash die- back fungus<sup>12</sup>. This further reduces the options available to woodland owners considering broadleaved woodland planting.

In 2000, the cost of grey squirrel damage to the UK Timber Industry was estimated at around £10 million, at the *end* of the then current rotation of standing crops of sycamore, beech and oak at the time. A report by CABI<sup>13</sup> in 2010 estimated the total costs of grey squirrel to the British economy to be £14 million *per year*. This figure included costs of damage and grey squirrel management to the construction, development and infrastructure sectors. The cost to the Welsh forestry sector was estimated at £914,500 *per year*. As this included management costs using warfarin which has since been withdrawn, the cost to the forestry industry is now likely to be higher due to the increased cost of cage trapping.

Recent anecdotal evidence from the private sector<sup>14</sup> has indicated instances of severe damage to young woodland ranging from 20-100% depending on age and species, with broadleaves particularly badly hit. This can bring additional costs of replacing dead trees, or the potential loss of grant aid due to failure of the crop. In extreme cases, complete felling and replanting of woodland copses have been known where damage is such that trees cannot retain or increase in productive value. Higher levels of damage may be more acceptable in broadleaved woodland grown for amenity or biodiversity reasons, where the cost of grey squirrel management cannot be justified.

The reduction of economic value from affected woodland can result in discouraging owners from undertaking woodland management and creation. Evidence indicates that thinning broadleaved trees to reduce competition and enable tree growth can increase the risk of grey squirrel damage to the remaining trees.<sup>15</sup> Hence trees that are grown for quality timber will require a higher commitment to grey squirrel management. Forestry statistics show a 50% decline in hardwood timber production over the last 40 years from 48,000 down to 23,000 green tones in Wales<sup>16</sup>. The increase in demand for firewood may help to stimulate some woodland management, but the trend for managing broadleaves for timber production is clearly downwards.

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<sup>11</sup> Mayle and Broome (2013) Changes in the impact and control of an invasive alien: the grey squirrel in Great Britain, as determined from regional surveys. *Pest Management Science* 69: 414-424.

<sup>12</sup> Chalara response for Wales (2016), Welsh Government/ Natural Resources Wales

<sup>13</sup> CABI - Williams et al (2010) – Economic cost of Invasive Non-native species on Great Britain

<sup>14</sup> Confor – collated member evidence (2016)

<sup>15</sup> Mayle et al (2009) - Influence of tree size and dominance on incidence of bark stripping by grey squirrels to oak and impact on tree growth. *Forestry* Vol 82

<sup>16</sup> FC Statistics – wood production and trade (2016)

Other less obvious costs to the economy attributed to grey squirrel includes damage to loft insulation and wiring. Such damage and associated costs of control was estimated at around £427,000 per year for Wales<sup>17</sup>. Another consideration is the cost associated with arboricultural services to manage damaged trees that represent a health and safety risk.

### Climate change

Producing timber of a quality that can be used in long term products ensures that the carbon removed by the growing trees is stored, often for lengthy periods. Such products are often more suitable for further re-use as recovered timber, extending the storage of carbon further. Good quality hardwood timber can be re-used many times before the timber needs to be disposed of. Damage by squirrels prevents broadleaved trees from growing to a size or quality where the timber is useful for longer term end uses such as construction. Although conifer species are less prone to damage, policies to encourage species diversity through including broadleaves in conifer sites are likely to have made these plantations more attractive to grey squirrel, reflected in increasing reports of conifer damage.<sup>18</sup> Damaged trees are frequently infected with fungal organisms which cause weakening and staining of the timber, reducing their use to mainly wood fuel, and hence reducing carbon storage. This undermines the potential to substitute high energy construction materials with carbon-storing timber. The twin impacts of grey squirrel on tree death and lower tree growth rate also reduces the overall ability of a woodland to lock up carbon and hence contribute to the mitigation of climate change.

Grey squirrel damage has also been found to contribute to a change in the constituent tree species within a woodland through impact on natural regeneration and vulnerable tree species. This can result in a less diverse species mix and age structure, with implications for woodland habitat resilience in response to climate change. The predicted milder winters resulting from climate change are likely to favour grey squirrel survival, and hence a rise in tree damage in future years. When coupled to an increase in pests and diseases also arising from climate change, the pressure on tree health is likely to grow. Thus, the potential for grey squirrel damage acts as a barrier to the 'future proofing' of forests and the use of new potential tree crop species that may be resistant to emerging tree pests and diseases or more suited to predicted climatic change<sup>19</sup>,

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<sup>17</sup> Williams et al (2010) *Economic cost of Invasive Non-native species on Great Britain – Final Report*. Centre for Agriculture and Bioscience International, Wallingford, UK.

<sup>18</sup> Mayle and Broome (2013) – Changes in the impact and control of an invasive alien: the grey squirrel in Great Britain, as determined from regional surveys

<sup>19</sup> Shuttleworth et al. (2012). Integrating red squirrel (*Sciurus vulgaris*) habitat requirements with the management of pathogenic tree disease in commercial forests in the UK. *Forest Ecology and Management* 279: 167-175.

## Implications of Inaction – a summary

Grey squirrel populations are likely to increase in light of milder winters and the expansion of favourable broadleaved habitat.<sup>20</sup> The impacts are listed above, and the implications for inaction are as follows:-

- Red Squirrels – populations of red squirrel are likely to be lost if the current on-going programmes of grey squirrel management are not continued. This is recognised in the Conservation Plan for Red Squirrels in Wales.
- Designated sites –grey squirrel damage will continue to impact on the condition of woodland habitats and associated biodiversity. This could potentially undermine the delivery of the Nature Recovery Plan for Wales, Natura 2000 program and could result in penalties from the European Union.
- Woodlands for Wales strategy – contributes to a number of wider WG strategies and policies, including the WG Natural Resources Policy. Grey squirrels impact on the delivery of a number of outcomes in the following strategic themes of the WfW Strategy, which in turn will affect the contribution of woodlands towards these wider WG policies:-
  - Welsh Woodlands and Trees - Impacts on tree survival, loss of growth, timber quality and end-use can discourage woodland management or new planting. Reduction in the choice of alternative tree species in the face of new pests and diseases, impacting on woodland resilience<sup>21</sup>.
  - Responding to Climate Change – Damage affects the rate of carbon capture in both new and existing woodlands, and the potential for substitution for non-renewable materials e.g. in construction.
  - A competitive and integrated Forest Sector –Damage affects the production of usable, versatile timber for processing and reduces the potential of Wales to capitalise on a demand for home-grown timber with fewer opportunities for timber processing businesses and associated employment.
  - Environmental Quality –The composition and quality of designated sites, ancient woodlands, native woodlands habitats and other plantings can be impacted by grey squirrel. Reduction in the benefits provided by woodland e.g. water and soil protection.

## Cost-benefit of control

*Timber production* - There is little data to identify the point at which grey squirrel management becomes cost-effective in relation to the end market value of the timber. This is difficult to determine, as the estimate of the final tree crop is made

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<sup>20</sup> Press Release March 16 – Grey squirrel numbers to increase – European Squirrel Imitative

<sup>21</sup> Shuttleworth et al. (2012). Integrating red squirrel (*Sciurus vulgaris*) habitat requirements with the management of pathogenic tree disease in commercial forests in the UK. *Forest Ecology and Management* 279: 167-175.



during the damage-vulnerable period, at least 50 years before harvest.<sup>22</sup> There are many variables that affect this, including the owners' objectives, tree species, site conditions, growth rate, end market, the level of grey squirrel populations and subsequent damage. The potential economic impact of squirrel damage on woodlands can influence the choice of species planted.

Since the withdrawal of warfarin poison, humane trapping and dispatch is the main method of management. However the labour costs of maintaining such traps over the main active period from late April to the end of July mean that costs have increased significantly. Anecdotal evidence from the private sector indicated that the costs range from £21 - £71 per hectare per year, depending on the method chosen, distances travelled and accessibility of the woodland.

Well planned and sustained grey squirrel management can make a difference. The Forestry Commission annual assessments of squirrel damage to woodlands in southern England showed that damage levels reduced from 50% to 8% following 11 years of annual control<sup>23</sup>. However, as many broadleaved tree species are vulnerable between the ages of 10-40 years, managing grey squirrel for quality timber objectives is a substantial commitment for the owner. This investment can also be undermined where populations resurge or management fails in a particular year. Given the geographical spread and mobility of grey squirrel, many landowners cannot justify the costs.

*Biodiversity* - The cost-benefit of grey squirrel management for biodiversity reasons such as protecting red squirrels or reducing damage to designated woodland habitats, is also difficult to gauge. The eradication of grey squirrels from Anglesey between 1998 and 2015 is estimated to have cost just over £1million<sup>24</sup>. The Mid Wales Red Squirrel Partnership estimated around £14,000 was spent on grey squirrel management in 2015-16, most being volunteer time, estimated at around half of the labour cost/hour on private estates.

Natural Resources Wales (NRW) spends between £20 – 30,000 per annum on grey squirrel management for the successful protection of red squirrels on the Welsh Government Woodland Estate (WGWE). This varies depending on the availability of funding and compliments other active projects such as Red Squirrels United and BASC Green Shoot projects. Whenever possible, NRW also incorporates sensitive conservation management within the three red squirrel focal areas (Mid Wales, Clocaenog and Anglesey) to benefit their habitat. Longer term actions such as retaining harvestable trees, maintaining connectivity and restocking with less productive tree species to diversity habitat, can add to costs.

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<sup>22</sup> Mayle and Broome (2013) – Changes in the impact and control of an invasive alien: the grey squirrel in Great Britain, as determined from regional surveys.

<sup>23</sup> Derbridge JJ, Pepper HW, Koprowski JL (2016). Economic damage by invasive grey squirrels in Europe. (2016). In: *The grey squirrel Ecology & Management of an invasive species in Europe*, 393-405. European Squirrel Initiative.

<sup>24</sup> Derbridge JJ, Pepper HW, Koprowski JL (2016). Economic damage by invasive grey squirrels in Europe. (2016). In: *The grey squirrel Ecology & Management of an invasive species in Europe*, 393-405. European Squirrel Initiative.

It should be noted that the extent of grey squirrel management, whether undertaken by volunteer groups, or private or public landowners, is dependent on funding and available resources. This can often limit the amount that can be achieved, whether for red squirrel conservation, habitat restoration or the protection of timber crops.

## 4. A strategic Approach to Management

Sect 14 of the Wildlife and Countryside Act (1981) makes it illegal to release or allow to escape into the wild any animal which is not ordinarily resident in Great Britain and is not a regular visitor to Great Britain in a wild state, or is listed in Schedule 9 to the Act. The grey squirrel is included in Schedule 9 meaning that it is illegal to release a grey squirrel into the wild, or allow one to escape, even if it was taken into captivity for welfare reasons. The Animal Welfare Act 2006 places a responsibility on a person to ensure that the welfare needs of all animals under their control, including those caught in a trap, are met. In this context any grey squirrel caught in a trap is protected from pain and suffering.

### Targeting Resources

Owing to the widespread and prevalent nature of the grey squirrel population in Wales, any type of grey squirrel management needs to be long-term and collaborative if it is to be effective<sup>25</sup>. Grey squirrel management for the protection of red squirrel populations is effective when carried out as a continuous programme of strategic trapping, both within the core focal areas and in surrounding buffer areas. If this action were to stop, grey squirrels would recolonize these areas.<sup>26</sup>

The same applies where management is undertaken for other reasons – whether to protect a young timber crop or alleviate pressure on a woodland habitat. The decision by a landowner to control squirrels is an on-going commitment of resources and finance during the 30 years or more that the timber crop is vulnerable. The level of management needs to be relevant to the objectives of the woodlands.

At a time of reducing resources, the following priorities for targeting grey squirrel management should be applied :-

- Red squirrel focal areas and buffer zones
- Ancient Semi-natural woodlands/ SSSIs and Special Areas of Conservation (SACs) / Plantation on Ancient Woodland Sites (PAWS) under restoration
- Broadleaved woodland where timber production is the objective, and a landscape scale approach to grey squirrel management is proposed

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<sup>25</sup> Mayle et al (2007)

<sup>26</sup> Shuttleworth et al (2016) Identifying incursion pathways, early detection responses and management actions to prevent grey squirrel range expansion; an island case study in Wales. The Grey squirrel: ecology and management of an invasive species in Europe

- Conifer connected or in close proximity to badly damaged vulnerable broadleaved trees.

It is likely that the nature and availability of public funding will mean that the main focus is the protection of red squirrel populations. However there is scope for landowners to co-operate to achieve their own objectives, given adequate support through access to training, trap loan schemes and best practice. A collaborative approach at a landscape scale is recommended to maximise effectiveness, as recognised in the Wales Red Squirrel Conservation Plan.

Mapping of vulnerable wooded areas and examining likely dispersal routes will also serve to identify areas where a collaborative and targeted approach could be successful. A project officer approach to assist in co-ordination is also likely to contribute to success, as demonstrated in red squirrel focal areas.

Although individual landowners taking action on their own to control grey squirrels may not be as successful as a collaborative landscape scale approach, this should not prevent access to grant aid if this becomes available.

### **Limitations of grey squirrel management**

*Public opinion* - Grey squirrels are firmly in the public eye as being part of British wildlife. The general public perception of the grey squirrel is one of endearment; they are engaging animals and are often fed in gardens and parks. Negative public reaction to grey squirrel control can be emotive, which has acted as a disincentive to control numbers by some bodies and charities.

*Population* - The grey squirrel is a frequent breeder, having two litters per year, with a typical litter size of three young. Estimated survival is around 50% per litter<sup>27</sup>. Young are ready to leave the drey at seven weeks of age. Population levels can vary according to availability of food, particularly in winter months.<sup>28</sup>

*Spread and Dispersal* - It is accepted that grey squirrels are prevalent in all parts of mainland Wales<sup>29</sup>, apart from red squirrel focal areas where control is undertaken to reduce their numbers. Dispersal routes favour woodland and river corridors, field and habitat edges, grass verges and tracks.<sup>30</sup> Knowledge of these routes can be used to target management. Habitat and food availability has been expanded as more broadleaved species have been planted. Policies that encourage diversification of conifer woodlands through broadleaved plantings, are likely to have encouraged grey squirrel encroachment.<sup>31</sup> The average rate of colonisation in GB is considered to be 18km<sup>2</sup> yr<sup>-1</sup> (range 1.1 -250 km<sup>2</sup>).

<sup>27</sup> Hayssen, V – Reproduction in grey squirrels: from anatomy to conservation. *The Grey Squirrel – Ecology and Management of an Invasive Species in Europe* (2016)

<sup>28</sup> Gurnell, J. (1996) The effects of food availability and winter weather on the dynamics of a grey squirrel population in southern England. *Journal of Applied Ecology* 33: 325-338.

<sup>29</sup> Dutton, C (2016) – *The Grey Squirrel Management Handbook*, European Squirrel Initiative

<sup>30</sup> Stevenson et al (2013) - Modelling ecological networks and dispersal in grey squirrel.

<sup>31</sup> Mayle and Broome (2013) Changes in the impact and control of an invasive alien: the grey squirrel in Great Britain, as determined from regional surveys. *Pest Management Science* 69: 414-424.

*Isolated action* - Grant assistance for grey squirrel management has been on an individual basis in the past. Efforts to manage grey squirrels can be undermined where neighbours fail to control squirrels in adjacent woods. Evidence indicates that grey squirrels will recolonize a cleared area within 6-8 weeks if adjacent uncontrolled populations are present.<sup>32</sup> Hence the lack of co-operation between woodland owners is a disincentive to manage grey squirrels, and has discouraged the planting of broadleaved woodlands for quality timber.<sup>33</sup>

*Costs of Management* – The main cost of grey squirrel management is labour – to set, check and reset traps. This is particularly relevant with the withdrawal of warfarin. The long timescale over which management is needed, coupled to uncertainty about the end value of the timber produced, acts as a disincentive to owners.

*Alternative food sources* - Where woodlands are adjacent to residential areas, efforts to trap grey squirrel are undermined by local residents providing alternative feed in gardens. The feeding of pheasants for shoots also provides a food source, which can reduce the efficiency of trapping.

*Costs of Eradication* - A report by CABI examined the potential for eradication of grey squirrel in the UK estimated late stage eradication costs for the UK to be £850 million over 8 years, which was considered to be conservative. The equivalent cost in Wales would be £76 million over the same period. The report acknowledged that, given the practicalities of eradication, lessons from attempts to eradicate early invasion in Italy, and the failure of previous attempts to do so in mainland UK, it may no longer be possible to eradicate grey squirrels in Britain. Despite the successful Anglesey eradication programme, the high dispersal ability, established population numbers, extended geographic border with England and the potential costs mean that **the complete eradication from Wales is currently not possible.**

*Red squirrels* - Controlling and preventing the re-establishment of grey squirrel populations within red squirrel focal sites aims to avoid competition for food and the spread of the squirrel pox virus. Although a squirrel pox vaccine is in development, such populations are likely to remain vulnerable, requiring the on-going management of grey squirrels around these areas.

## Management options and best practice

The level of grey squirrel management will depend on the objectives for a particular area. The recommended method<sup>34</sup> of reducing grey squirrel damage to woodlands requires an assessment of the likely level of damage<sup>35</sup>, followed by targeted management to reduce population levels to below damaging levels. This is likely to

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<sup>32</sup> Mayle and Broome (2013) Changes in the impact and control of an invasive alien: the grey squirrel in Great Britain, as determined from regional surveys. *Pest Management Science* 69: 414-424.

<sup>33</sup> Confor – member's comments

<sup>34</sup> Mayle et al (2007) Controlling Grey squirrel damage to woodlands. FC Practice Note.

<sup>35</sup> Pepper (1998) Nearest Neighbour Method for Quantifying Wildlife Damage to Trees in Woodland. FC Practice Note

require repeated or on-going management over a number of years while the trees are vulnerable to damage. Best practice on assessing squirrel damage is available through Forest Research - [https://www.forestry.gov.uk/PDF/fcpn1.pdf/\\$FILE/fcpn1.pdf](https://www.forestry.gov.uk/PDF/fcpn1.pdf/$FILE/fcpn1.pdf)

Woodlands managed for conservation or amenity may not require or justify the costs of grey squirrel management. In contrast, the protection of red squirrel habitat is likely to necessitate the complete removal as far as possible, of grey squirrel on a long term basis. Therefore different objectives will influence the choice of management options and to what extent. Other influencing factors include the resources available, skills, knowledge, costs and the timescale in which the objective needs to be achieved.

There are a number of sources of advice, training and best practice on the methods of grey squirrel management. These are at Appendix 2.

### Alternative management methods

*Pine marten* – This is a native woodland carnivore with a varied diet, which can include squirrels. Although pine martens are scarce in Wales, the Vincent Wildlife Trust project has involved the licenced release in 2015 and 2016 of a small number of pine martens to mid-Wales to reinforce remnant populations. Evidence from Ireland suggests that the recovery of red squirrel populations in some areas is linked to return of pine martens and the subsequent decline of grey squirrel populations. However, there is currently poor understanding of how this effect operates. Hence pine martens cannot be relied upon as an effective grey squirrel management measure.

*Forest design* - Grey squirrels are able to exploit particular woodland habitats and species mixes better than others. When managing existing woodlands or planting new areas, consideration should be given to avoiding certain tree species which are attractive to grey squirrels. This has to be balanced with the objectives of the woodland i.e. timber production or biodiversity value. Forest design can have a part to play in the management of grey squirrels at the individual forest scale but also potentially at the larger, landscape scale.

*Immuno-contraception* – This novel method of population management is still being researched. Work is focused on the oral delivery to grey squirrel of an existing effective injectable contraceptive to reduce the population size in a given area. Further work is required to confirm its effectiveness and target uptake, as well as captive and field trials. This could provide a potentially cost-effective management method which will sit alongside existing methods of grey squirrel management. Research is on-going.

### Lethal management methods

The overarching requirements of lethal control management options are that they are humane and specific to grey squirrel. Lethal control can only be undertaken by

where a landowner or occupier has given consent.<sup>36</sup> Those undertaking lethal methods of control should be properly trained in operating traps and humane dispatch.

*Poisoning using Warfarin* - Warfarin, (Grey Squirrel bait) is **no longer authorised** for grey squirrel management such as in woodlands (authorised use expired on 30<sup>th</sup> September 2015). Use as an indoor biocide has also been withdrawn with authorisation for marketing expiring on 31<sup>st</sup> July 2017 and use expiring on 27<sup>th</sup> January 2018.

*Live trapping* - This involves the capture of live animals, followed by dispatch when the trap is checked, which should occur at least once per day. This method **must** be used where red squirrels may be captured, as they can be then be released. Grey squirrels caught in the traps must be dispatched as it is illegal to release these once caught.

*Spring trapping* - These trap designs kill the animal as it moves through and triggers the trap. The traps authorised for use have been approved through the Spring Trap Approval Order (Wales) 2012<sup>37</sup> for their humaneness and effectiveness. Measures must be taken to restrict access by non-target species. Spring traps must be checked at least once per day.

*Shooting* - Shooting grey squirrels can be undertaken legally and humanely. Opportunistic shooting of grey squirrels has not been regarded as an effective method of grey squirrel management in the past. However pilot schemes using baiting stations and coordinated shooting efforts are being tested to maximise the efficiency.

New traps and methods of grey squirrel management are continually under development. It is important that owners ensure that their methods of management are legal and humane. Where there is a risk that red squirrels may be caught, advice should be sought from local red squirrel groups.

## Research

There continues to be a range of research into the ecology and behaviour of grey squirrels, and how this knowledge can be used to provide more effective methods of management.

Forest Research, DEFRA, Bangor University, Animal and Plant Health Agency and others continue to engage in research on grey squirrels, including:-

- Investigating the impact of grey squirrels on woodlands and the reasons for bark stripping behaviour
- Identifying efficient control strategies, including new trapping methods, immuno-contraception and natural predation

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<sup>36</sup> 1981 Wildlife and Countryside Act. 27 (1) Interpretation of part 1

<sup>37</sup> <http://www.legislation.gov.uk/wsi/2012/2941/introduction/made>)

- Investigating the range of infections carried by grey squirrels and the risk these pose to native wildlife and domestic animals.

Forest Research provides advice on the management of grey squirrels and tree protection issues, and lists published research.

<http://www.forestry.gov.uk/fr/greysquirrels>

## 5. Table of actions and lead bodies

The management of grey squirrels requires a collaborative partnership approach between all stakeholders. Welsh Government and NRW can contribute through raising awareness of best practice, research and training; supporting co-operation and partnership; and taking appropriate action on the WGWE. However success depends on landowners and managers taking responsibility for managing grey squirrel on their own land and working with other landowners and groups in a co-ordinated, landscape approach.

The UK Forest Standard sets out the principles of sustainable forest management and best practice. It states that woodland owners should 'Monitor forest damage, and intervene to protect vulnerable trees from browsing and grazing mammals, including voles, deer, rabbits, hares, grey squirrels and livestock'. As such, all woodland owners should monitor damage and consider whether grey squirrel management is necessary.

The following actions set out what will be done to support a more strategic and collaborative approach to grey squirrel management in Wales.

The Action Plan is in the form of a table which shows:-

- Actions that will contribute towards delivering the objectives
- Lead Bodies involved in delivering the action who have a funding and/or co-ordinating role, and thus are active in driving forward the delivery of the actions.
- Delivery agents are the groups and organisations working in partnership to deliver the actions.

<b>Action</b>	<b>Lead Body</b>	<b>Delivery Agent</b>
<b>Sustainable Management of Natural Resources.</b>		
1) Ensure Area Statements consider the impact of grey squirrel on the woodland resource and	NRW	

<p>biodiversity.</p> <p>2) Encourage the establishment and support of landscape-scale collaborative grey squirrel management partnerships.</p> <p>3) Investigate the development of a Vulnerability Analysis of Wales' woodland resource to provide a focus for a co-ordinated approach to grey squirrel management by local partnerships and landowners.</p> <p>4) Where it is feasible and beneficial to do so, undertake grey squirrel management activity on the WGWE as part of a co-ordinated landscape scale partnership approach.</p> <p>5) Continue to provide support on grey squirrel management for red squirrel conservation on private land through provision of advice, research and loan of equipment</p> <p>6) Continue to manage grey squirrel for red squirrel conservation on the WGWE in line with the Wales Red Squirrel Conservation Plan through a partnership approach.</p> <p>7) Work with squirrel partnerships/ initiatives to improve the dissemination of information, and the co-ordination of red squirrel conservation and grey squirrel management efforts.</p> <p>8) Participate in the Wales Squirrel Forum and contribute to the delivery of both the Wales Red Squirrel Conservation Plan and the Wales Grey Squirrel Management Action Plan.</p> <p>9) Examine the feasibility of incentives for a strategic and collaborative approach to grey squirrel management in the design of future natural resource management schemes.</p>	<p>WG/NRW</p> <p>WG/NRW</p> <p>NRW</p> <p>NRW</p> <p>NRW</p> <p>All partners</p> <p>All partners</p> <p>WG/NRW</p>	
<p><b>Guidance</b></p>		
<p>10) Raise awareness of the impacts of grey squirrel on woodland and wider biodiversity, and the need to assess the risk of damage and implement a plan of management.</p>	<p>All partners</p>	



<p><b>11)</b> Promote best practice, ensuring these are up to date, and encourage the continuation of grey squirrel management training through a range of partners.</p>	<p>All partners</p>	
<p><b>Research and monitoring</b></p>		
<p>12) Continue to support research into improvements in control methods through the Defra England and Wales wildlife and biodiversity research and development budget.</p> <p>13) Maintain an overview of grey squirrel management research in the UK and identify research gaps that would better inform grey squirrel management. Flag to research organisations.</p> <p>14) Monitor the impact of grey squirrel management measures minimising the impact on biodiversity, non-targeted species, related ecosystem services and economy.</p>	<p>WG</p> <p>Wales Squirrel Forum</p> <p>WG/NRW</p>	

## 6. Governance and Monitoring

The delivery of this action plan is dependent on a partnership approach between the public, private and voluntary sectors. Delivery of the action plan will be overseen by the Wales Squirrel Forum (to be confirmed). Progress on action will be reported annually to a wider stakeholder forum.

This action plan will be monitored against the following indicators to show what impact actions are having:-

- Report on action plan activity progress – on an annual basis
- National Forest Inventory (NFI) – analysis of bark stripping data
- Link to Integrated natural Resource Monitoring Framework (GMEP 2)

- Red squirrel population data – as undertaken to report on the Red Squirrel Conservation Plan for Wales
- To be developed, subject to IAS Regulation requirements at Member State level.

## Appendix 1

### **Other Welsh Government strategies and policies relevant to the grey squirrel management action plan**

In addition to the obligations and commitments which necessitate this action plan – IAS Regulations, Woodlands for Wales Strategy, Conservation Plan for Red Squirrels and the UK Squirrel Accord - the Grey Squirrel Management Action Plan will also contribute to a number of wider legislation, strategies and policies. These are:-

#### **Wellbeing of Future Generations (Wales) Act 2015**

The Well-being of Future Generations (Wales) Act is about improving the social, economic, environmental and cultural well-being of Wales.

To make sure we are all working towards the same vision, the Act puts in place seven well-being goals.

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A Wales of vibrant culture and thriving Welsh language
- A globally responsible Wales

The Act places a Well-being Duty on public bodies to carry out sustainable development in achieving these goals. It also sets out five ways of working for public bodies to demonstrate they have applied the sustainable development principle.

The Grey Squirrel Action Plan meets the sustainable development principle in that it has been developed through the involvement of stakeholders and partners with the aim of taking collaborative action to reduce the impact of grey squirrels, and improve the resilience of woodlands and the red squirrel population in the longer term. The actions will be delivered collaboratively by partners and will help deliver outcomes in other policies and strategies.

The Action Plan will directly contribute to the goal of creating “a resilient Wales” and is also relevant to the goals of “a prosperous Wales” and “a globally responsible Wales”. The aim is to establish the action plan as a joined up and integrated approach with partnership working at its heart.

## **The Environment (Wales) Act 2016 and Natural Resources Policy**

The Environment Act introduces an approach to natural resource management that is about managing our natural environment in a joined up sustainable way that delivers real outcomes for the environment, people, the economy and our communities. The aim is to make the most of the opportunities that Wales' natural resources present while safeguarding and building the resilience of natural systems to continue to provide these benefits in the long term. The Act introduces a biodiversity duty which will help to reverse the decline and secure the long-term resilience of biodiversity in Wales. It also introduces 9 principles of sustainable management of natural resources.

The Grey Squirrel Management Action Plan is well aligned to the ambitions of the Environment Act. It is of direct relevance to the three key features introduced by the Act: - the State of Natural Resources Report; the National Natural Resources Policy and Area Statements. The objectives and actions proposed to establish a joined up approach to grey squirrel management should be a strong contributor to the delivery of the Act and the principles of sustainable management of natural resources. This action plan will help deliver the Natural Resources Policy through managing grey squirrel as a pressure that impact on the resilience of natural resources such as woodlands and other habitats, and the services they can provide. The introduction of Area Statements provides an important opportunity to reflect and build upon the work that is already being undertaken around red squirrel focal areas and to consider how this can be extended.

## **Climate Change Strategy for Wales 2010**

The Climate Change Strategy for Wales and associated delivery plan set targets to reduce greenhouse gas emissions in Wales by 3% every year and achieve at least a 40% reduction by 2020 compared to figures from 1990. They confirm where action should be focused and the policies and programmes that will help meet the targets. The Strategy also recognises how actions taken by people, communities and organisations across Wales will help reach the target.

The Climate Change Strategy delivery plan details that new woodland creation for carbon capture and management of the existing woodland carbon sink will contribute towards reducing greenhouse gas emissions from the agriculture and land use sector in Wales. A key part of this policy is to ensure that timber grown is of a quality that can be used in long lived products, such as construction timber, which effectively stores carbon captured during tree growth. Grey squirrel damage can curtail tree growth which reduces carbon capture, as well as affecting the end use of the timber, which is often fuel wood and hence carbon release back into the atmosphere. The Grey Squirrel Management Action Plan has the potential to reduce damage to woodlands through targeted and collaborative grey squirrel management.

## Nature Recovery Plan for Wales 2015

The Nature Recovery Plan for Wales is comprised of a Strategy for Nature, its associated action plan and a Nature Recovery Framework which sets out the governance structure to deliver action in Wales.

The ambition to be addressed through the Nature Recovery Plan is:

*‘To reverse the decline in biodiversity, for its intrinsic value, and to ensure lasting benefits to society’*

The Nature Recovery Plan defines the objectives and key actions needed in Wales to achieve our ambition and meet both the Resilient Wales goal and the global and European commitments to halting the loss of biodiversity. This Grey Squirrel Management Action Plan has the potential to contribute to Objectives 2, 3 and 4 by:-

- *Objective 2: Safeguard species and habitats of principal importance and improve their management.* Red squirrel is currently listed as a species of principle importance. Targeted control of grey squirrel in and around red squirrel focal areas will help to safeguard these populations.
- *Objective 3: Increase the resilience of our natural environment by restoring degraded habitats and habitat creation.* If the problem of grey squirrels can be addressed, landowners will be able to plan for future economic returns from semi-natural woodlands and may be encouraged to undertake longer term woodland management as a result.
- *Objective 4: Tackle key pressures on species and habitats.* Squirrel pox virus is a clear pressure on red squirrel populations and represents a direct threat to their survival. Woodland habitats can be gradually altered as grey squirrel impact on vulnerable species, affecting their composition and longer term resilience.

## LIFE Natura 2000 Project

There are 123 designated habitat and species features on the 92 Special Areas of Conservation (SACs) and 20 Special Protection Areas (SPAs) in Wales. Together these comprise the Natura 2000 network.

The purpose of the LIFE Natura 2000 Programme for Wales, led by NRW is to enable Wales to make significant progress towards bringing Natura 2000 species and habitats into favourable condition and help meet its commitments under the European Habitats and Birds Directives.

The LIFE Natura 2000 Programme has created 11 Thematic Action Plans, each of which detail priority strategic actions to address major issues and risks which have been identified as having an adverse impact on Natura 2000 features across the network. The Thematic Action Plan on Invasive Species and Pathogens recognises the importance of having a strategic approach to grey squirrel management and this is listed in a table of Strategic actions to improve the condition N2K sites.

## **GB Invasive Non-Native Species (INNS) Strategy**

The overarching aim of the GB Strategy is to minimise the risk posed by INNS<sup>38</sup> and reduce their negative impacts. It follows the Convention on Biological Diversity (CBD) hierarchical approach stressing prevention, followed by early detection and rapid response and finally long-term management and control. Although the main emphasis of the Strategy is directed towards prevention and rapid response, the strategy also recognises there is still a need to manage in a cost effective and strategic manner the impacts of the large number of INNS that are already established in GB.

The GB INNS Strategy vision is to better protect biodiversity, quality of life and economic interests against the adverse impacts of INNS. Through:

- Widespread awareness and understanding of the risks and adverse impacts associated with INNS, and greater vigilance against these;
- Integration of INNS within the broader biosecurity agenda.
- A strong sense of shared responsibility across government, key stakeholder organisations, land managers and the general public for action and behaviour that will reduce the threats posed by INNS;
- A guiding framework for national, regional and local mitigation, control or eradication initiatives helping to reduce the detrimental impact of INNS;
- Improved co-ordination and co-operation on INNS issues at a European and international level.

This Grey Squirrel Management Action Plan aims to contribute towards this vision.

## **Wales Biodiversity Partnership INNS Group**

Grey Squirrel is currently listed as a 'Strategic Control Priority' on the Wales Biodiversity Partnership INNS Group's Welsh INNS Priorities list. Strategic control priorities are for species that are established, and where a strategy may include protecting key areas, containment, control or mitigation. Although this is currently under review, this Grey Squirrel Management Action Plan contributes towards this aim.

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<sup>38</sup> The term 'Invasive non-native species' (INNS) is the equivalent of 'alien species' as used by the Convention on Biological Diversity (CBD) and are broadly defined as species whose introduction and/or spread threaten biological diversity or have other unforeseen impacts.

## Appendix 2

### Grey Squirrel Management - Support in Wales

The following table summarises sources of support in the management of grey squirrel in Wales.

Name of organisation	Main support areas	Location	Contact / website
Farming Connect	<ul style="list-style-type: none"> <li>• Individual and group advice on a range of subjects including woodland management/ creation.</li> <li>• Demonstration events</li> <li>• Training, including grey squirrel management</li> <li>• Technical news bulletins</li> </ul>	Pan Wales	<a href="http://www.gov.wales/farmingconnect">www.gov.wales/farmingconnect</a> Service Centre 08456 000813
Welsh Government	Advisory leaflet- Urban grey squirrels Available on request		Wildlife@wales.gov.uk
Mid Wales Red Squirrel Partnership (MWRSP)	<ul style="list-style-type: none"> <li>• Trap Loan Scheme for landowners and residents situated within the mid Wales red squirrel focal site and buffer.</li> <li>• Training in grey squirrel management</li> </ul>	Mid Wales, within the focal site and buffer.	<a href="http://midwalesredsquirrels.org/">midwalesredsquirrels.org/</a> 07972 201202
British Association for Shooting and Conservation (BASC)	<ul style="list-style-type: none"> <li>• Training courses on grey squirrel management</li> <li>• Best practice advice on grey squirrel management</li> <li>• General information on grey squirrel management</li> <li>• BASC grey squirrel management project</li> </ul>	Pan Wales  Targeted to Red Squirrel Focal sites	<a href="https://basc.org.uk/basc-wales/">https://basc.org.uk/basc-wales/</a> <a href="https://basc.org.uk/game-and-gamekeeping/advice-and-factsheets/basc-grey-squirrel-control/#">https://basc.org.uk/game-and-gamekeeping/advice-and-factsheets/basc-grey-squirrel-control/#</a> <a href="https://basc.org.uk/conservation/green-shoots/green-shoots-in-wales/grey-squirrel-control/">https://basc.org.uk/conservation/green-shoots/green-shoots-in-wales/grey-squirrel-control/</a>
Natural Resources Wales	Clocaenog?	Clocaenog	www.redsquirrels.info
Red Squirrels Trust Wales	<ul style="list-style-type: none"> <li>• Contingency plans to prevent, detect and respond to grey squirrel incursion.</li> <li>• Training courses on grey squirrel management</li> <li>• Research into grey squirrel viral infections</li> </ul>	Anglesey/ Gwynedd	www.redsquirrels.info 07966150847

Red Squirrels United	<ul style="list-style-type: none"> <li>• Support grey squirrel management across mainland Wales red squirrel focal sites</li> <li>• Evolve UK grey squirrel management best practice through a scientific Evidence Review Group</li> <li>• Publish research into new methods and approaches to grey squirrel management</li> <li>• Recruitment of 5000 volunteers to support red squirrel conservation including grey squirrel management</li> <li>• Provision of advice</li> </ul>	Pan Wales	<a href="http://dev-squirrel.pantheonsite.io/about/">http://dev-squirrel.pantheonsite.io/about/</a>
Forest Research	<ul style="list-style-type: none"> <li>• Best practice on grey squirrel management, assessing damage to woodland and other.</li> <li>• Lists published research on grey squirrels</li> <li>• Provision of advice</li> </ul>	UK wide	<a href="http://www.forestry.gov.uk/fr/greysquirrels">http://www.forestry.gov.uk/fr/greysquirrels</a> <a href="https://www.forestry.gov.uk/PDF/fcpn1.pdf/\$FILE/fcpn1.pdf">https://www.forestry.gov.uk/PDF/fcpn1.pdf/\$FILE/fcpn1.pdf</a>