

Scottish Environment LINK

## **Invasive Non-native Species in Scotland** A Plan for Effective Action



#### Acknowledgements

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Harlequin Ladybirds Photo: Mike Majerus/GBNNSS

# Summary

- Invasive non-native species (INNS) constitute one of the five principal direct drivers of biodiversity loss globally. They are among the most significant pressures on Scottish biodiversity, and economic impacts are also significant.
- > The problem is intensifying at national and international scales:
  - Established INNS are spreading across marine, terrestrial and freshwater habitats in Scotland
  - > New INNS are arriving every year
  - > Non-native species established but previously benign will become invasive in future
- Whereas there are examples of action of INNS prevention, surveillance, eradication and control to date in Scotland, success is patchy and best practice, based on experience here and internationally, is not always followed.
- The National INNS Plan signalled in the Scottish Biodiversity Strategy to 2045 represents a unique opportunity to improve effectiveness, efficiency, coordination and impact across Scotland.
- Scottish Environment LINK collates thinking across the environmental non-governmental organisations (NGO) network in Scotland to propose **Ten INNS Response Principles** that should be applied in all INNS initiatives, and which indicate how best practice can be defined, adopted and applied.
- We signal specific High Priority INNS issues of national importance that should be targeted for action as an essential and urgent element of the collective effort to halt and reverse biodiversity loss.
- We outline Case Studies that highlight some of the issues and successes that can deliver lessons for future improvements in tackling INNS.

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Scotland has suffered a high historic level of nature loss, losses are ongoing and we face further risks and pressures in future

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## Introduction

We are in a nature and climate emergency. Scotland has suffered a high historic level of nature loss, losses are ongoing and we face further risks and pressures in future. The intactness of our biodiversity is lower than most other countries worldwide, and today average species abundance continues to decline, with 1 in 9 species at risk of national extinction.

The UN Intergovernmental Science-Policy Panel on Biodiversity and Ecosystem Services (IPBES), and the UN Convention on Biological Diversity (CBD) identify the impact of Invasive Non-Native Species (INNS) as one of the five principal direct drivers of global biodiversity loss.<sup>1</sup> It is also one of the top drivers of loss overall in Scotland.<sup>2, 3</sup>

The pressure of INNS on biodiversity is intensifying across terrestrial, marine and freshwater environments,<sup>4</sup> and this is likely to worsen as new species arrive, climate change proceeds and conditions for establishment and spread of species introduced by people become increasingly favourable.<sup>5</sup>

In Scotland, INNS have had major impacts on native biodiversity and are a major challenge for biodiversity looking forwards. The condition of protected areas, our most important spaces for nature, has not significantly improved over the past 15 years, and invasive non-native and invasive native species together constitute the single biggest pressure affecting these sites.<sup>6, 3</sup> Our native woodlands, including Scotland's globally significant temperate rainforest, are under immense pressure from the spread of the garden escapee *Rhododendron ponticum*.<sup>7</sup> Recent research across Britain and Ireland has found that non-native plants now outnumber native plants, with half of all native plant species having declined since the 1950s.<sup>8</sup> Although a relatively small proportion of non-native terrestrial plants are currently invasive – aquatic plant species are much more frequently invasive – those that are pose a huge environmental threat. The financial impact of INNS in Scotland is estimated to be at least £200 million per year.<sup>9</sup> Invasive species have cost the UK economy over £5 billion over the past 40–50 years, one of the highest totals in Europe.<sup>10</sup>

Rhododendron management Photo: WTML

## **A Growing Threat**

...it is evident that past attempts to control the spread of established invasive non native species have overall been inadequate to slow or halt spread across the island of Britain.

The Scottish Biodiversity Strategy (SBS) notes that the JNCC UK Biodiversity Indicator B6<sup>11</sup> shows "an increasing spread of 190 [actually 195] established invasive non-native species (INNS) across Great Britain's terrestrial, freshwater and marine environments during the last six decades". By this metric, it is evident that past attempts to control the spread of established INNS have overall been inadequate to slow or halt spread across the island of Britain – the most appropriate biogeographic unit with regard to INNS. In addition, an estimated 10–12 new non-native species continue to establish in Britain each year.<sup>12</sup>

INNS and climate change operate in synergy as drivers of biodiversity loss. The likelihood of non-native species establishment and of invasion both increase as a warmer climate favours a wider range of species, and niches become vacant through climate-driven species and habitat disruption.<sup>13</sup> We are already seeing range expansion and a rise in species numbers thriving outside their native environments. INNS established in the south of the island of Britain are and will move northwards as temperatures rise<sup>14</sup> and are likely to establish and become future invasives in Scotland.

International trade and the movement of people, goods and equipment are at global and national scale the most important broad vectors of non-native species across borders. Political change and a changing natural environment will both result in changes to global trading patterns over the 21st century, and in turn this will lead to fresh threats of INNS. As new trading relationships develop, new arrays of species will arrive.

Changes in trade partners could increase risk of marine invertebrates from "new" seas. Ship ballast water is a significant medium of transporting non-native species.<sup>15</sup> Ships carrying ballast water must comply with the IMO's 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' and implement Ballast Water Management Plans. The rate of terrestrial invertebrate invasion may increase significantly if trade deals are made with new countries and markets. As new trade routes are proposed an assessment across various taxa should be undertaken to determine the greatest risks, and resources should be directed accordingly.

Political interventions such as Freeports, which cause the easing or delaying of checks and monitoring of goods, pose a particular risk of spreading INNS.

## Prevention action must target the relevant pathways of introduction, both national and local.

## **Action to Date**

...best practice is not always followed.

Progress has been made in recent years with horizon scanning,<sup>16</sup> awareness raising<sup>17, 18</sup> and central information hubs, such as provided by the GB Non-native Species Secretariat (GBNNSS).<sup>19</sup>

A number of past and current projects have tackled or attempted to tackle specific INNS issues in Scotland. The Saving Scotland's Red Squirrels project is an internationally leading example of partnership working preventing the spread of the non-native grey squirrel into areas of Scotland where they are yet to establish.<sup>20</sup> The eradication of mammal predators introduced by human actions has secured safe breeding opportunities for threatened seabirds on the Shiants,<sup>21</sup> Canna and Ailsa Craig and the Biosecurity for LIFE project has established advanced biosecurity measures to prevent INNS incursions onto all of our most important island seabird colonies.<sup>22</sup> The Scottish Invasive Species Initiative is working to tackle INNS along rivers and watercourses in northern Scotland, supported by the Scottish Government's Nature Restoration Fund.<sup>23</sup>

However, Scottish INNS projects have not always been successful. The intensifying spread and impacts of INNS in Scotland<sup>24</sup> demonstrate that the sum value of past and current projects is insufficient. Eradications are not always seen to completion; success is not always assessed at the right ecological scale and best practice is not always followed. Greater priority must be given to effectively tackling INNS as a prerequisite to successful nature restoration in Scotland.

This report lays out LINK's view on how the INNS challenge should be understood, what comprises best practice, and how Scotland can best respond to the growing threat.



## The Nature of the Problem

Geographic barriers such as oceans, mountains, deserts and currents restrict the mixing of wildlife from different regions. Evolution proceeds independently in different parts of the world, and this generates and maintains a high proportion of global biodiversity. Non-native species introductions, in effect, break down these barriers and so erode and homogenise biodiversity. They constitute one of the five principal direct drivers of biodiversity loss. Impacts are increasing nationally and globally, and the homogenisation of the world's biodiversity is increasing as a result.

People directly moving any organism or propagule (i.e. seeds, spores, eggs, plant fragments capable of growth) beyond its native range and, deliberately or accidentally, introducing it into the wild, is a potential threat to the natural environment.

Any species known to cause environmental or socio-economic damage when introduced beyond its native range is an invasive non-native species, and the development of its impact is known as a biological invasion.

Not all non-native species establish and when they do not all have immediate or detectable environmental impacts – but many do.

LINK proposes that the following scenarios constitute separate issues, and species concerned **should not** be considered as invasive non-native species: Native species that have become extinct through human agency ('former natives' as defined in the Code of Practice on Non-native Species<sup>25</sup>), which are deliberately reintroduced under licence to their native range;

 Species that change their range independently of direct human assistance – unassisted range expansion because of climate change or habitat changes, for instance;

- Species that are under severe threat and are strategically translocated to new, suitable areas beyond native range as a deliberate last-resort conservation response – e.g. assisted colonisation of threatened species as a targeted climate change response.
- Species that have been introduced as non-natives to mainland Europe and subsequently spread to Scotland without further direct human assistance should be considered as invasive non-native species.

There is a lag period between species establishment in the wild, and impacts becoming evident. Sometimes this lag extends to decades or centuries. Some of the currently benign non-native species that are established in Scotland will become invasive in future.

We cannot accurately predict which species will, when introduced as non-natives, become invasive. Ecological characteristics such as reproductive rate are not reliable indicators of invasive potential. Owing to founder effects and genetic drift, the invasive form may evolve in situ and come to differ considerably from the original donor stock in unpredictable ways.

There are broad taxonomic, ecological, and geographic patterns that should guide and prioritise action:

- Some taxa and ecological groups are particularly problematic when introduced as non-natives, with a high proportion of species becoming invasive; the key examples are: freshwater fish; crayfish and other freshwater invertebrates; aquatic plants; vertebrate predators; terrestrial platyhelminths (flatworms).
- Some environments are particularly vulnerable to invasion damage: the primary examples are islands, native woodlands, peatlands and freshwater habitats.
- International experience and information on invasive potential of species can usefully inform domestic assessments.
- For most marine invertebrates, remedial action following establishment is difficult or impossible – prevention is the only effective option.

#### **Prevention and pathways**

Early action and preferably preventing establishment is, as emphasised by the UN Convention on Biological Diversity, a key imperative in tackling INNS – see LINK Principle 1 below. Predicting invasiveness in a species involves uncertainties.<sup>27</sup> Formal Risk Assessment by taxon expert scientists, conducting comprehensive literature and information reviews, including input from affected communities of place and interest, is often considered the best guide to predicting invasive issues and planning resource allocation.<sup>28</sup>

Likelihood of establishment and invasion is related to the number and rate of organisms released/escaping – 'propagule pressure'. This is the often the best predictor of establishment probability.<sup>29</sup> Reducing propagule pressure is key to effective prevention action, even if every single release cannot be stopped.

Despite well-targeted efforts by the GBNNSS, implementation of national biosecurity for INNS is currently inadequate to prevent damaging new arrivals. Over £1 billion worth of live plants are imported into the UK every year, the majority without biosecurity measures and frequently with associated soils that harbour invertebrates and propagules. These imports greatly increase the risk of importing invasive species and pathogens – for example, the introduction of non-native flatworms such as the Obama flatworm (*Obama nungara*) through plant material from overseas. It is difficult to implement preventative measures when scheduled species can be purchased readily in garden centres and over the internet. Tackling pathways of introduction is key.

The GB INNS Inspectorate, established in 2022, is helping to build effective national biosecurity through work on pathways and vigilance for new introductions. LINK fully supports its current work in Scotland, urges that it continues and is extended by the Scottish Government, as required in response to the intensifying threat, through dedicated resources in Scotland.

#### **Detection and response**

There is currently a strong reliance on voluntary input from naturalists, botanists, and entomologists for spotting new invasives. This brings inherent risks. There is a critical role for volunteer input but it needs to be strategically deployed on a concerted basis linked to professional expertise. Where sustained large-scale control and specialist knowledge is required, the deployment of professional operatives or contractors is necessary and should be a core consideration in resourcing and funding, which can be required at levels comparable to large-scale ecosystem restoration initiatives, e.g. peatlands. Training and support for this network and a clear pathway of raising concern would be beneficial – the Observatree citizen science project is a positive example.<sup>30</sup>

The role of professional ecologists, environmental managers, professional INNS specialists (e.g. invasive plant control contractors) in identifying INNS through, for example, Preliminary Ecological Appraisal (PEA) and other ecological surveys must be recognised and fully integrated into wider efforts at rapid response, biosecurity and control. Work should as standard practice contribute INNS records to appropriate Local or National Environmental Records Centres. Surveys require mapping the location of invasive species, therefore contributing to population assessment and prioritising of control and eradication. Members of the public must have access to easy information allowing them to identify and report sightings of INNS. Currently, early detection and surveillance do not adequately translate into alerts and rapid response. Resources on the GBNNSS website offer excellent opportunities to elevate public vigilance and engagement.

#### **Pathogens**

One key impact of INNS is the transfer of disease to people<sup>31</sup> or to native wildlife – e.g. squirrel pox passed from grey squirrels to red squirrels.<sup>32</sup> While the latter impact is a core consideration in this report, we do not directly consider pathogenic organisms themselves such as tree pathogens and pests e.g. Chalara ash dieback<sup>33</sup> and *Phytophthora* pathogenic water mould parasites. Whilst some of these can be considered as INNS, they functionally fall under plant health arrangements<sup>34</sup> and we do not include them here for clarity.

Rhododendron management Photo: Dan Paris

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### **Building Effective Responses 10** INNS Response Principles for Action

#### 1 Act early:

Action to combat the impacts of INNS must be strategic and implemented at the *earliest establishment stage possible*. This minimises environmental damage and costs, often very considerably. This includes situations where environmental damage has yet to be detected and where Risk Assessment indicates potential for future environmental damage.

In line with the Convention on Biological Diversity, and the Scottish Government's Code of Practice:

- > Prevention of invasions via biosecurity measures is the first preference;
- > Early warning and rapid response to newly established species is the next option;
- Eradication or long-term control and containment programmes, where feasible, are the appropriate responses to well established INNS.

These three should be considered in balance.

#### **2** Precautionary Principle:

The precautionary principle should apply to INNS responses – remedial action must not wait until evidence of damage is manifest in relation to species movement and introductions.

#### **3** Action must be strategic:

The eradication or long-term control of well and widely established INNS must be undertaken using planned and strategic operations, with clear and specific environmental/ecological outcomes based on monitoring. Action must adopt and build on best practice. Success cannot be measured via indirect measures such as the number of volunteers engaged, resources deployed or extent of effort. Piecemeal, unplanned or random killing or removal of species cannot effect eradication or effective control, and should not be undertaken or supported.

#### 4 Action must work at the Correct Ecological Scales:

Eradication and control must be undertaken at the correct ecological scale to minimise re-invasion risk from the outset. If they are not, re-invasion cannot be avoided sustainably in the long term, biosecurity is impossible to guarantee, and maintenance risks becoming a perpetual drain on finances. For example, riparian INNS – plants and animals – must be eradicated across the whole river catchment; island invasives must be eradicated from the whole island; eradication of Rhododendron in rainforest or other woodland must be planned and undertaken at whole population or whole catchment scale to avoid re-invasion. Success must not be claimed or announced until eradication is proven at whole-population, whole-catchment, whole island, or other appropriate scale, and following a monitoring period (normally 2 years for islands) to check for remaining INNS organisms.

#### 5 **Prevention and biosecurity**:

Action must proceed at **both** the national scale – the prevention of new non-native species being introduced to Scotland – **and** local scale – preventing further damaging spread of non-natives established in some parts of Scotland but not others, eg mammal biosecurity on islands; plant/invertebrate biosecurity in river catchments and water bodies; action to prevent grey squirrel incursion into the highlands.

#### 6 Eradication and Biosecurity:

All eradication initiatives must include explicit plans for biosecurity legacy to prevent re-invasion with a focus on any pathways of introduction and comprehensive follow up surveillance/monitoring. Eradication or control measures can be undermined if release of an invasive species continues in an unconstrained manner, effort to restrict further release (e.g. bans on sale) should therefore run alongside control, eradication and long-term biosecurity.

#### 7 No premature success assumptions:

Eradications get harder and often more expensive towards completion (not easier as is often assumed), as densities of the target species fall. Planned budgets for specific initiatives must reflect this, as must comms – with no premature announcements of eradication success. For example, in island eradications, at least two clear years of monitoring with no records of the target species should elapse before success is assumed and/or communicated.

#### 8 The Polluter Pays:

The Polluter Pays Principle should apply to INNS action (as in the Articles of the EU Invasive Alien Species Regulation as transposed into Scottish legislation), with industries, businesses and individuals responsible for – deliberately or accidentally/incidentally – introducing the target species paying for all remedial eradication, control and biosecurity actions, e.g. the forestry industry should bear the costs of the removal of non-native commercial conifer trees seeding onto important peatland habitats and native woodlands.

#### 9 International Action and Responsibility:

INNS issues are by nature cross-border and require action at both national and international levels. Statutory frameworks focused on INNS should coordinate across geographies and trade partnerships. Active measures should be implemented to prevent the exporting of high-risk species from Scotland to other UK countries or overseas.

#### **10 No Demonising of INNS:**

Invasive non-native organisms should never be blamed or demonised in dialogues of communications: this is an anthropogenic problem, and it is fundamentally and functionally separate from human migrations (which all involve people as a single species).

## >>> Priorities for action

In response to the Kunming-Montreal Global Biodiversity Framework, the Scottish Government should adopt the target to **reduce the rates of introduction and establishment of INNS by at least 50% by 2030 and subsequent commitments** (listed on p2 above). This target should be incorporated into Nature Restoration Targets in the proposed 2024 Natural Environment Bill.

The Scottish Government should also adopt the Kunming-Montreal target to **eradicate or control INNS especially on priority sites**, and to this end should identify a list of strategically identified priority sites where significant progress towards eradication will be achieved by 2030. The **Scottish Biodiversity Strategy 5-year Delivery Plans** should set out the actions that will be taken to deliver this. These actions should include:

- A full sense-check against best practice principles as outlined above or similar as agreed among key stakeholders during development of the National INNS Plan, to embed consistent best practice in INNS decisions, plans and programmes in Scotland.
- A National Programme of Island Restoration and Biosecurity across the whole Scottish Archipelago prioritised for seabirds,<sup>46</sup> as response to massive declines since the 1980s as recorded by the Seabirds Count<sup>47</sup> census and following catastrophi HPAI impacts.<sup>48</sup>
- The completion to full eradication of current island INNS initiatives, including the Orkney Native Wildlife Project (stoats) and the Western Isles Mink Project.
- Firm government-led action to prevent incursion of grey squirrels into the Highlands. This is currently actioned by the Saving Scotland's Red Squirrels initiative but this project will end in coming months. This will not only benefit red squirrels, it will be essential to facilitate and support rainforest restoration and expansion initiatives in the west.
- A programme of action to remove and prevent further invasion of non-native conifers onto peatlands, native woodlands and other important habitats including community woodlands. This is a rapidly intensifying problem and will consume future conservation budgets without early action and adoption of the Polluter Pays Principle. The expansion of woodlands should be carefully planned in terms of location and tree species to avoid negative impacts on Scotland's habitats, species, carbon storage and landscape.
- The National INNS Plan must include a dedicated strategy for Rhododendron ponticum management, with a priority focus on Scotland's rainforest, operating at whole-population scale, with clear direction from the Scottish Government and coordination, enforcement and facilitation from and among public agencies, and with integrated and flexible grants to secure and support delivery.
- Freshwater Biosecurity: Keeping Scotland's lochs, rivers and catchments free from spreading INNS, especially the Ponto-Caspian species. This will need a step-change in SEPA monitoring programme and stringent biosecurity, and in public and target audience communications on biosecurity, as initiated by the Check Clean Dry campaign.<sup>49</sup>

> The establishment of a fully operational INNS Inspectorate active in Scotland to promote and maximise effectiveness of national INNS biosecurity efforts, with a focus on pathways of introduction.

#### > Improved monitoring and modelling of INNS to cover:

- > The impact of climate change on future INNS spread
- > The impact of new trade deals to determine risk on novel INNS introductions
- > Assessment of the invasive potential of established species
- Sale of INNS: Regulation of the sale of invasive or potentially invasive species can be a key tool in tackling the INNS threat strategically. There is a ban on sale currently of 38 INNS species in Scotland.<sup>50</sup> Banning the sale of species already extensively established eg *Rhododendron ponticum* is not an alternative or significant contributor to successfully tackling ongoing invasion through control and eradication at whole-population scale. The GBNNSS Horizon Scanning exercise identified the top 30 non-native species likely to become invasive in Britain over the next ten years. LINK recommends that the sale of all relevant species on this list should be banned in Scotland. Species that are relatively recently established and extending range in Scotland should be the next priority, including *Contoneaster* (some varieties) and *Gaulteria*.
- Monitoring and Reporting: To facilitate early warning and rapid response (early action, principle 1 above), reporting systems should be simplified, with clear and explicit government-led guidance on reporting of INNS for both professionals and the public. When INNS control programmes are undertaken, monitoring must extend beyond the lifetime of individual projects to detect re-invasion. For example, with rodent eradications on islands, two years of monitoring following the completion of operations should be planned for and implemented as a minimum, before eradication success can be confirmed or otherwise.
- Soil: the movement of soil into and within Scotland is insufficiently monitored and regulated with regard to INNS. The National INNS Plan should include measures to address this situation, with checks and restrictions on soil imports and regulation of soil movements as a key pathway for INNS introduction locally, as key pathway management actions.
- Biological Control Techniques: 'Biocontrol' is the use (planned release) of an invasive species' natural pathogens, parasites or predators to control or eradicate it. Such techniques are widely used globally, but are employed relatively infrequently, in Scotland. Instances of unintended effects have been recorded, as have instances of significant success. The National INNS Plan should consider promoting, supporting or proposing the use of biocontrol mechanisms on a case-by-case basis with decisions guided by formal Risk Assessment (above).
- Gene editing technology: gene-editing techniques, for example CRISPR/Cas9 and synthetic gene drive technologies, are a highly active research focus globally, and are increasingly being cited as potentially cheap and effective means of eradicating established INNS. This technology is as yet untested, particularly with regard to environmental and biosecurity concerns and reversing effects once initiated. Proof of concept is restricted to modelling studies or lab experiments on short-lived species. We urge a precautionary approach, with the National INNS Plan guiding the tracking of developments and regulation, and constructing policy accordingly as and if the techniques develop further with regard to INNS.
- Roles and Responsibilities the National INNS Plan should include a reiteration/refresh of national roles and responsibilities as specified in Chapter 10 of the Scottish Government Code of Practice on Non-native Species. It should also give clarity on roles and responsibilities at local and regional scales, where it is often unclear where responsibility lies for action on locally establishing or spreading INNS.

Non-native conifers Photo: Alistair Whyte

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## **Case studies**

#### **Non-native Commercial Conifers**

Sitka Spruce is a non-native tree commonly grown in commercial forestry plantations and a species of economic importance in Scotland. Sitka, and other non-native conifer species grown commercially, are increasingly seeding invasively onto neighbouring habitats, including important peatlands, ancient woodlands and community-managed woodlands, posing significant risks to ecosystems and carbon sequestration, and can lead to biodiversity loss in all habitats.<sup>38</sup> The BSBI Plant Atlas 2020 found that Sitka had undergone the greatest increase in range of any plant species in the UK, with researchers warning of the need to carefully control and manage its spread. Forthcoming measures to reduce deer densities – much needed for biodiversity – are likely, if effective, improve establishment conditions for invasive seeding conifers.

Under current legislation, tree species used in commercial forestry enjoy an exemption from INNS regulations via ministerial order, and the Polluter Pays principle does not apply to them as it does other INNS. The burden of managing the invasive spread of Sitka and other non-native commercial species is therefore falling onto the public purse and environmental organisations, threatening significant strain on limited current and future conservation budgets. Forthcoming legislative agendas are an opportunity to ensure that commercial forestry plays a responsible role in managing the impact of Sitka spreading from its operations onto neighbouring land through the application of the "Polluter Pays" principle (as in the Articles of the EU Invasive Species Regulation, as transposed into Scots law). The industry that profits from planting and harvesting these conifers should either remove invasive seeding conifers or bear the costs of remedial action on invasive seeding, and be required to ensure better buffering of plantations near sensitive sites.



#### Rhododendron ponticum

*Rhododendron ponticum* is a non-native garden-escapee plant that has established and spread across large swathes of Scotland. It thrives especially well in oceanic climates in the rainforest zone in the west and, once established, can overwhelm other plants and prevent natural woodland regeneration. It is damaging for woodland plants, including the lichens and mosses that form botanical communities of international importance in Scotland's rainforest. Invasive Rhododendron can be found in at least 40% of rainforest sites. Tackling and reversing the spread of Rhododendron is a critical factor in securing the recovery of Scotland's heavily reduced and fragmented native woodlands, including our rainforest. Rhododendron is a reservoir host of Phytophtora plant pathogens that can seriously impact woodlands.

Key elements for successful rhododendron management include removal at whole-population scale, commitment and support for long-term biosecurity monitoring and management to prevent re-invasion, and collaborative action between land managers. Rainforest restoration initiatives and Forestry Grant Schemes should support rhododendron management at the right ecological scale, and grant integration mechanisms be in place to allow effective control work inside and outside of woodland areas to cover whole populations of Rhododendron, rather than small scale or piecemeal control among established populations as this approach brings a high probability of re-invasion.



#### **Grey squirrels**

The grey squirrel is a non-native rodent that was introduced to the UK from North America in the late 1800s. Alongside habitat loss, this invasive species is the primary reason for the decline of the native red squirrel across the UK. Grey squirrels have replaced reds throughout most of England and Wales and across the Central Belt of Scotland due to competition for food and habitat and cross-species disease transmission. Grey squirrels can also adversely affect wider woodland biodiversity and regeneration through the damage they cause to young broadleaved trees.

The Saving Scotland's Red Squirrels partnership project has been working since 2009 to protect Scotland's core red squirrel populations from the threats of grey squirrel incursion through strategic, targeted grey control in priority areas. As a result of the partnership, Scotland is the only country in Britain where red squirrels have not declined, with populations showing recovery at a regional level e.g. Aberdeenshire. The project recently received over £1M from the Nature Restoration Fund to continue delivery over the next two-years. This funding will allow the project to continue defending the red-only Highland region from grey incursion, to keep working towards eradication in Aberdeen, and to develop community focussed rapid response networks in the Central Lowlands, with a long-term view of shifting the Highland Line Control Zone southwards. Although this funding award is great news for the project in the short-term, to ensure a future for the red squirrel in Scotland it will be necessary to find a more sustainable, long-term solution for delivering this vital work. NatureScot recently reconvened the Scottish Squirrel Group to begin work updating the Scottish Strategy for Red Squirrel Conservation, and through this process it is hoped that effective long-term solutions for landscape-scale grey squirrel control will be agreed upon.

As well as being vital for the protection of the red squirrel, targeted management of greys as an INNS is necessary and coherent with the Scottish Biodiversity Strategy to 2045 commitments to tackle invasive species, to continue effective species recovery programs, and to prioritise biodiversity enhancement in forest and woodland management. LINK believes that mainstreaming grey squirrel control and bringing its delivery under the remit of the statutory agencies would be the quickest, simplest and most effective long-term approach, and would significantly contribute to the successful delivery of the SBS.



#### Japanese Knotweed

Japanese knotweed (*Fallopia japonica*) is a highly invasive species in the UK. It was first recorded in the UK at Maesteg, South Wales, in 1886.<sup>39</sup> It was considered an ornamental garden plant, but has since become established in woodlands, riverbanks, coastal areas and urban parks as clones through vegetative reproduction (growing from displaced fragments). It forms dense stands which can overshadow native plants. The dispersal of this plant is due to both deliberate or inadvertent human activity where fragments of the root system are washed downstream, spread and propagate.

Japanese knotweed can change the habitat structure of river banks which can impact biodiversity, ecosystem structure, conservation efforts and salmonid fisheries. While it dies back over Winter, from March to April it returns and can destroy pipework, drains and can weaken building foundations. This plant is among the most economically important invasive non-native species in the UK. The cost of its disposal is high.

The River Don Trust, the Don District Salmon Fishery Board (DSFB) and volunteers have been working on the control of this species on the River Don, in the village of Kintore in Aberdeenshire, since 2011.<sup>40</sup> Don District Salmon Fishery Board staff identified a small infestation of Japanese knotweed on the Sheriff Burn which had the potential to spread to the River Don. A programme was introduced, supported by the Water Environment Fund, to undertake invasive plant control. This programme created a pool of trained volunteers who supported local plant control in surveying and mapping the Japanese knotweed. The extent and abundance of the plant was reduced in 2021 when it was recorded as 'frequent'. Annual control involving the spraying of emerging stems meant that the plant's numbers started to decline. Monitoring and control of Japanese knotweed on the Sheriff Burn will continue in 2022 under the Scottish Invasive Species Initiative and via the River Dee Trust with the Don DSFB.

It will be critical, however, that the success of such non-island initiatives on INNS is primarily measured in terms of proven whole-catchment or multi-catchment eradication (as has been achieved in some catchments with American mink,.<sup>41</sup> see principle 4 above), with adequate post-eradication biosecurity measures (principle 6 above), rather than other factors such as numbers of volunteers recruited, or localised clearances on parts of an invaded catchments. Anything less risks reinvasion and thus wasted conservation effort and resources in the medium and longer term.



#### **Ponto-Caspian invasives**

Invasive Non-Native Species are an increasing threat throughout the World. In Europe, many freshwater INNS from the Ponto-Caspian region, with over a hundred species known to have spread from this area to date. hese species thrive together when introduced as a multi-species complex. This leads to a reduction in native species richness and abundance, with mayflies, caddisflies, freshwater shrimps and other crustaceans particularly vulnerable. Ponto-caspian species such as the freshwater shrimps *Dikerogammarus villosus* and *D. haemobaphes*, and the freshwater flatworm *Dendrocoelum romanodanubiale* are now present in the UK posing a serious threat to freshwater biodiversity.<sup>42</sup> They haven't arrived in Scotland yet. This is however likely to be simply a matter of time.<sup>43</sup> We should increase our biosecurity around introduction pathways such as boat movements, angling and water transfer, and particularly ballast water discharges.

#### **New Zealand Flatworm**

The New Zealand Flatworm (*Arthurdendyus triangulatus*) is considered one of the top invasive non-native species of concern by Defra<sup>44</sup> and is now widespread in Scotland since its first discovery in 1965. Studies have shown the New Zealand Flatworm can have a significant impact on native earthworm species, and once established there are no known methods of eradication. A study from Ireland shows Common Earthworm (*Lumbricus terrestris*) numbers reduced by 75% and earthworm biomass decreased by 20% in land infested with New Zealand Flatworms.<sup>45</sup>

As well as being widespread on the Scottish mainland, many islands are also infested. Reports from Fair Isle, the most remote inhabited island in the British Isles, detail the spread of the species. In 2013 a New Zealand Flatworm was discovered on the island in a polytunnel stocked with imported fruit trees. The species was not seen again until 2017, however, just 4 years later, crofters across the island are now finding more than dozens of specimens in separate locations. The rapid spread of this species threatens the islands' native species and soil biodiversity, and those across the country.



## **The Current Policy Context**

#### INNS Targets and Actions – National and International

*The UN Kunming/Montreal Global Biodiversity Framework*, agreed at COP15 of the Convention on Biological Diversity, *Goal A Target 6* calls on signatories to: *Eliminate, minimise, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by:* 

- Identifying and managing pathways of the introduction of alien species;
- Preventing the introduction and establishment of priority invasive alien species;
- Reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 percent, by 2030;
- > Eradicating or controlling invasive alien species especially in priority sites, such as islands.

The SBS to 2045 (SBS),<sup>36</sup> as reviewed during the Biodiversity Framework Consultation ending in December 2023, identifies progress in tackling INNS as a key Outcome and indicator of success. Under the heading 'What does success look like', the Strategy states that: 'Harmful invasive non-native species (INNS) will be managed so that established INNS no longer degrade native habitats and species or impede their restoration and regeneration and new introductions are managed quickly and effectively.'

In addition, the draft first 5-year SBS Delivery Plan, as consulted on to Dec 2023, has as an overarching action to: Implement Scottish Plan for INNS Surveillance, Prevention and Control. In the introductory list of Most Significant Key Actions, the Delivery Plan specifies: Implement the Scottish Plan for INNS Surveillance, Prevention and Control and secure wider support measures to enable long-term effective INNS removal at scale. INNS management and damage costs increase rapidly over time as new species arrive and established ones continue to spread due to many factors, including as a consequence of climate change. Investing in prevention provides economic returns up to fifty times higher than trying to manage an INNS after it arrives. Under this broad INNS Plan heading, the following specific SBS Delivery Plan Actions are listed:

- 1 Take action to ensure pathways for the introduction and spread of INNS are managed to prevent or reduce their rate of introduction and establishment and prevent further damage to ecosystems. To include:
  - reducing the rate of establishment of known or potential INNS by at least 50% by 2030 compared to 2020 level;
  - ii. detection of priority INNS through increased inspections and vigilance of citizen scientists and eradicated or contained before they become established and spread.
- 2 Develop and implement a pipeline of strategic INNS projects to coordinate the control of priority INNS at scale, to eliminate or reduce the impacts of INNS in at least 30% of priority sites by 2030.
- 3 Raise public awareness of the impacts of INNS and embed INNS biosecurity practice across industries and recreational activities linked to the most important pathways of introduction and spread by 2030.
- 4 Develop best practice guidelines and a voluntary code of conduct for INNS biosecurity suitable for supporting marine habitat restoration by 2025.
- 5 Complete feasibility study of eradication/ managed control of marine INNS and develop and implement a rolling programme of island INNS management, focussed on targeted removal of predators impacting on nesting seabirds.

The draft Delivery Plan's National Programme of Ecosystem Restoration explicitly identifies action for *Island ecosystems especially vulnerable to Invasive Non-Native Species* (INNS) or outstanding for nature (Framework p16). Its marine actions include (p19): Work with marine users to establish an effective risk-based monitoring and surveillance programme for marine INNS. The GB Non-Native Species Secretariat (GBNNSS) coordinates information and actions across England, Wales and Scotland, including the development of risk assessments for non-native species. The Non-Native Species Action Group (NNSAG) and the Statutory Group on Non-Native Species (SGNNS) were established to ensure effective policy coordination and implementation, oversee the use of statutory powers and coordinate work between statutory bodies with specific responsibilities in Scotland for non-native species.

## **Current Legislation**

Regarding the legally binding Targets for Nature Restoration signalled in the Bute House Agreement and expected in the Natural Environment Bill in 2024, the Framework consultation lists INNS as one of the Examples of Potential Target Topics thus: *Invasive non-native species (INNS) – reduction and control.* 

The legal framework for tackling INNS in Scotland was most recently updated by the Wildlife and Natural Environment (Scotland) Act 2011 (the WANE Act). The WANE Act made it a criminal offence to release or allow the spread of animals and plants – with certain exceptions specified in the Act or by ministerial order – outside their native range. It empowered Ministers to take additional action under secondary legislation, including the power to prohibit the sale or keeping of invasive species. Secondary legislation was passed under these powers in 2012, while an order restricting the keeping of honey bees in Colonsay and Oronsay was passed in 2013. The WANE Act also required the Scottish Government to establish a Non-Native Species Code of Practice.<sup>37</sup> The Code of Practice states that the Scottish Government's approach to INNS is guided by a three-stage hierarchical approach, prioritising prevention, ensuring rapid response where prevention fails, and pursuing control and containment where species become established.

The Code of Practice also designates NatureScot as the body with overall responsibility for tackling INNS, while Marine Scotland, SEPA and Scottish Forestry have specific responsibilities for INNS in marine, freshwater, and woodland habitats respectively.

## **End Notes**

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