ENVIRONMENTAL
Standards Scotland
Ìrean Àrainneachdail na h-Alba

Call for Evidence on the Control and Impact of Invasive Non-Native Species: Summary of Responses

Contents

Glossary

eDNA – Environmental DNA

EICAT – Environmental Impact Classification for Alien Taxa

eNGO – Environmental Non-Governmental Organisation

ESS – Environmental Standards Scotland

GBF – Global Biodiversity Framework

GBNNSS – Great Britain Non-Native Species Secretariat

GBNNSIP – Great Britain Non-Native Species Information Portal

INNS – Invasive Non-Native Species

IPBES – The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

LAs – Local Authorities

LERC – Local Environmental Records Centre

NBN – National Biodiversity Network

SISI – Scottish Invasive Species Initiative

WANE – Wildlife and Natural Environment (Scotland) Act 2011

1. Key themes

1.1 Terminology and awareness of INNS: Responses emphasised the need for greater public awareness and education on invasive non-native species (INNS), with suggestions for more clear and accessible language to improve understanding and engagement. While campaigns like ‘Check, Clean, Dry’ were highlighted as being effective, respondents noted that public awareness remains inconsistent in Scotland. Simplifying terminology and distinguishing between invasive native and invasive non-native species were both recommended to improve clarity. Additionally, some respondents called for a precautionary approach in classification and management of INNS, especially under changing climate conditions.

1.2 Management strategies: A recurring theme was the need for clarity in the roles and responsibilities of duty bearers, with respondents indicating that outdated guidance creates confusion. Many respondents called for landscape-scale, coordinated approaches, to ensure effective, long-term management. Increased support for early detection and rapid response, particularly in marine and freshwater environments, was recommended, along with more comprehensive biosecurity measures. Insufficient funding was cited as a major barrier, with many respondents calling for more investment in both preventative and reactive measures.

1.3 Legislation and policy: Respondents identified enforcement as a significant weakness in current INNS legislation. While laws like the Wildlife and Natural Environment (Scotland) Act 2011 (WANE) include enforcement tools, these are rarely used. Respondents recommended integrating INNS management into planning consents and strengthening the Scottish Biodiversity Duty to assign clear responsibilities on INNS management. Additionally, some respondents called for the adoption of the Kunming-Montreal target of reducing INNS introductions by 50% by 2030 as part of the upcoming Natural Environment (Scotland) Bill. Concerns were raised about the exemption of species like Sitka spruce and certain gamebirds from INNS regulations, which some respondents felt shifts the burden of control onto public bodies and conservation organisations.

1.4 Understanding of impacts: Respondents highlighted the significant environmental and economic impacts of INNS in Scotland. Specific recommendations included prioritising the control of rhododendron in temperate rainforests, implementing island

biosecurity programmes to protect seabirds, and tightening freshwater biosecurity measures. Respondents also pointed to gaps in knowledge on the impacts of certain species, particularly in marine and freshwater environments.

1.5 Data gaps: Significant data gaps were identified in understanding the full scope of INNS impacts, particularly regarding economic costs, ecological effects, and the combined pressures of climate change and INNS. While platforms like the Great Britain Non-Native Species Information Portal (GBNNSIP) and the National Biodiversity Network (NBN) Atlas provide valuable information, respondents noted the need for databases to be regularly updated and consistent. Improved data sharing and greater public engagement through citizen science were suggested to address data gaps. Establishing a user-friendly, Scotland-specific portal could further improve data accessibility and encourage public reporting of INNS.

2. Introduction

2.1 Between 02 May 2024 and 11 July 2024, Environmental Standards Scotland (ESS) carried out a call for evidence on the Control and Impact of Invasive Non-Native Species. The purpose was to gather views and evidence that would help ESS identify potential issues in the current approach to the control of INNS in Scotland, with particular focus on the effectiveness of existing legislation and policy frameworks.

2.2 The call for evidence forms part of a broader scoping project aimed at assessing the control and impact of INNS and determining if further scrutiny by ESS is necessary. Scoping projects at ESS are designed to evaluate emerging issues and environmental risks. Depending on the results, the scoping stage can lead to a range of outcomes: no further action, detailed analysis of prioritised topics, referral to investigations, or raising the issue with the Scottish Parliament or a relevant public authority.

2.3 The consultation included 18 questions, divided into two sections: 'Control of INNS' and 'Impact of INNS'. In the 'Control of INNS' section, questions covered topics such as terminology, public awareness, management strategies, and the effectiveness of relevant legislation and policy. The 'Impact of INNS' section focused on the understanding of ecological impacts of INNS, as well as identifying data gaps.

2.4 Annex 1 contains a full list of the questions posed during the call for evidence. The main findings from the analysis of responses are summarised in Section 2.

2.5 The Scottish Government has committed to addressing the challenges posed by INNS through various targets and initiatives in the past. Notably, the Convention on Biological Diversity Aichi 2020 Targets contained a goal that "by 2020, invasive alien species and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment". However, NatureScot's progress report on the 2020 Aichi targets concluded that there was insufficient progress towards this objective.[1]

[1] NatureScot (2021). Scotland's Biodiversity Progress to 2020 Aichi Targets. Retrieved from: Scotland's Biodiversity Progress to 2020 Aichi Targets - Final Report | NatureScot

2.6 Scotland is also committed to targets in the recently adopted Kunming-Montreal Global Biodiversity Framework (GBF)[2], which includes a goal to reduce the rate of establishment of INNS by at least 50% by 2030. Additionally, the Great Britain Invasive Non-Native Species Strategy (2023 – 2030) aims to reduce establishments of INNS by at least 50% compared to 2000 levels.[4]

2.7 Despite these frameworks, the spread of INNS continues to pose a significant and growing threat to biodiversity in Scotland and across Great Britain. The UK Biodiversity Indicator B6 shows that the number of invasive non-native species has increased significantly since 1969 in freshwater, marine, and terrestrial environments.[3] Recent studies have estimated that 10 to 12 new non-native species become established in the UK annually, with approximately 10 to 15% of these species causing significant adverse effects.[4] A 2023 study conducted by the Scottish Government identified 30 invasive non-native species with a high risk of arriving, establishing and impacting biodiversity in Scotland in the next decade.[5]

[2] Convention on Biological Diversity (2022). Kunming-Montreal Global Biodiversity Framework. Retrieved from: 2030 Targets (with Guidance Notes) (cbd.int)

[3] Joint Nature Conservation Committee (2023). UK Biodiversity Indicators 2023: Indicator B6 – Pressure from invasive species. Retrieved from: UKBI - B6. Invasive species | JNCC - Adviser to Government on Nature Conservation

[4] DEFRA, Welsh Government, and Scottish Government (2023). The Great Britain Invasive Non-Native Species Strategy, 2023 to 2030. Retrieved from: GB Strategy » NNSS (nonnativespecies.org)

[5] Scottish Government (2023). Provision of horizon scanning and analysis of pathways of spread of invasive species into Scotland. Retrieved from: Spread of invasive species into Scotland: study - gov.scot (www.gov.scot)

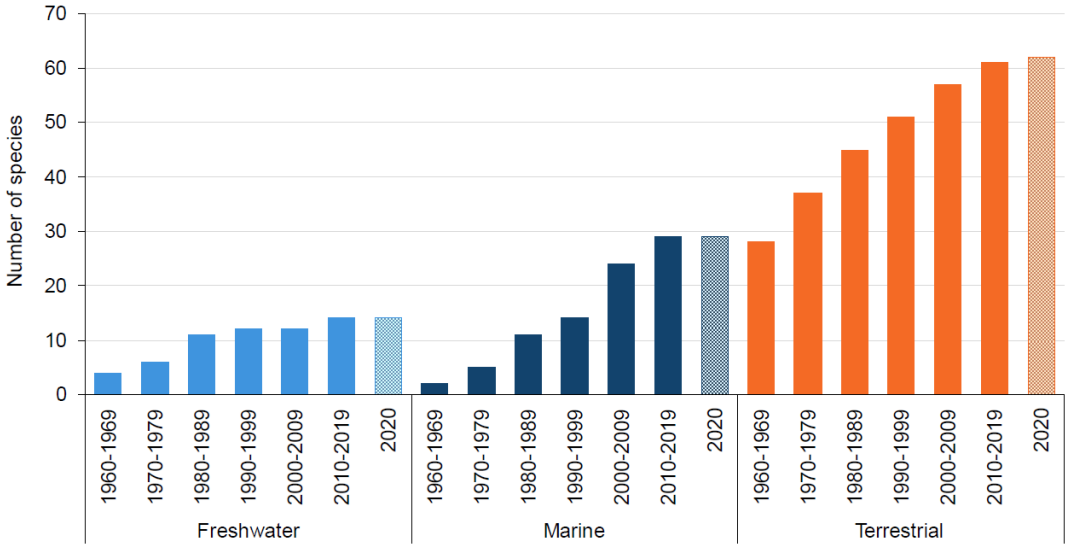

Figure 2-1 Number of invasive non-native species established in or along 10% or more of Great Britain's land area or coastline, 1960 to 2020 (Contains public sector information licensed under the Open Government Licence v3.0. Source: DEFRA, Welsh Government and Scottish Government, 2023. The Great Britain Invasive Non-Native Species Strategy, 2023 to 2030).

2.8 INNS are a top driver of biodiversity loss globally, contributing to 60% of recorded global extinctions.[6] In addition to ecological damage, INNS pose a substantial economic burden, costing Great Britain's economy an estimated £1.9 billion annually.[2] Climate change further exacerbates the challenge, as rising temperatures and altered ecosystems create favourable conditions for the spread of INNS. Many INNS are highly adaptable, with rapid growth and reproductive rates, allowing them to thrive in a broad range of environmental conditions.

[6] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2023). Summary for Policymakers of the IPBES Assessment Report on Invasive Alien Species and their Control. Retrieved from: Thematic Assessment Report on Invasive Alien Species and their Control | IPBES secretariat

3. Analysis and response

The respondents and the responses

3.1 A total of 31 responses were received, representing a diverse array of stakeholders, including individuals, local authorities, government agencies, environmental NGOs (eNGOs), and others. The majority of responses were comprehensive and well-evidenced, demonstrating strong engagement with the issue. Three out of four regulatory bodies responsible for INNS in Scotland submitted responses, these were from NatureScot, Marine Directorate, and SEPA.

Respondent type	Number of Responses
Individuals	9
eNGOs	6
Local authorities	5
Government/Agencies	4
Other	4
Estates	2
National Park	1
Total	**31**

Table 3-1 Breakdown of responses by group.

About the analysis

3.2 This report presents a qualitative, thematic analysis of responses to the call for evidence, focusing on key themes and the range of views expressed rather than quantifying specific opinions. Consensus was also examined, both overall and among the various stakeholder groups, to highlight areas of agreement and disagreement.

3.3 This summary captures common themes rather than every viewpoint expressed. As responses were submitted by a self-selecting group, they are not representative of the wider population.

3.4 The views summarised in this report reflect respondent opinions and do not represent the position of ESS.

Findings

This section provides a summary of findings within each category (i – v) of questions posed in the call for evidence.

(i) Terminology and Awareness of INNS

3.5 Public awareness and education:

There was an emphasis in responses on the need to improve public awareness of INNS. While professionals understand INNS terminology, the broader public often finds it confusing. Recommendations included using local campaigns and clear, accessible language to better educate the public on INNS risks and management responsibilities. Additionally, campaigns should largely focus on preventative actions. Some campaigns, such as Check Clean Dry, Be Plant Wise, and Save Our Seabirds from Invasive Predators, were noted as successful. However, it was also highlighted that certain campaigns are not as well-promoted in Scotland compared to the rest of the UK. Evidence-based citizen science was noted as a valuable tool, both for tracking the spread of INNS and for raising public awareness through active participation.

3.6 Consistency across agencies:

Some respondents called for standardised terminology to be used across public bodies to prevent misunderstanding and ensure coherent management practices. Aligning with international publications, such as those from The International Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), was suggested to reduce inconsistencies and improve communication. Several respondents also stressed the importance of aligning with international frameworks like the Environmental Impact Classification for Alien Taxa (EICAT). However, some respondents felt that specifying a strict threshold for damage could complicate rapid response efforts under the precautionary principle, which does not require detected impacts before action is taken. NatureScot's response noted that the five-point scale in the GB risk analysis process is consistent with EICAT, and has been part of horizon scanning exercises since 2019. However, the process of reviewing the

impacts of species included in the GB Non-Native Species Information Portal is still ongoing.

3.7 Simplified language:

There was strong support for using simpler, non-technical language in public materials on INNS. Respondents suggested avoiding specialised scientific terms in these publications to improve public understanding. Several responses stressed the need to clarify terms such as ‘invasive non-native’ versus ‘non-native’ species, as well as ‘former natives’ being considered as non-native species.

3.8 Clarifying responsibilities for INNS management:

Respondents noted a common public misconception that INNS management is solely the responsibility of councils or government bodies. Responses advocated for targeted outreach campaigns that emphasise simple preventative actions individuals can take and clearly convey that everyone has a role in preventing and controlling the spread of INNS.

3.9 Precautionary approach to classification and management:

Some respondents advocated for a more precautionary approach in the classification and management of species, monitoring those with invasive traits even if they are not currently classified as INNS, especially in the context of changing climatic conditions. Additionally, there were concerns raised about the exclusion of certain species under INNS’ regulations, such as Sitka spruce, via ministerial order.

3.10 Avoiding demonisation of INNS:

Some respondents highlighted the importance of adopted a balanced approach in public messaging around INNS. They cautioned against demonising INNS, which can create fear, misunderstanding, or hostility toward certain species without acknowledging the complexity of ecological impacts. Public communication should focus on the specific ecological, economic, and social impacts of these species in a measured way.

(ii) Management Strategies

3.11 Clarity, coordination, and roles of duty bearers:

A recurring theme was the need for clarity and updated definitions of roles and responsibilities across duty bearers involved in INNS management. Respondents highlighted that the current Code of Practice is outdated, with roles and contacts no longer relevant, and suggested the document may also need to be revised to reflect changes such as those in forestry governance.

Local authorities highlighted that the public often misunderstands their role in controlling INNS, assuming they have enforcement powers over private land, which they do not. This often leads to misplaced complaints. One local authority indicated that being excluded from enforcement powers limits the ability of local authorities to address local INNS issues effectively. Some respondents, including a local authority, proposed strengthening the enforcement tools that local authorities can use, such as Species Control Agreements and Species Control Orders, to compel landowner action where appropriate.

Some responses from public authorities acknowledged the need for greater public awareness of INNS roles and responsibilities, especially for landowners and the general public. They emphasised the importance of ensuring reasonable approaches are taken when implementing Species Control Agreements and Species Control Orders, supported by feasible eradication methods.

3.12 Need for landscape-scale and coordinated approaches:

Many respondents called for coordinated, landscape-scale approaches to INNS management, with examples like Saving Scotland’s Red Squirrels and the Scottish Invasive Species Initiative (SISI) cited as effective models. However, responses were mixed, with some questioning SISI’s success and measures of effectiveness. Additionally, some responses from public authorities noted that while current strategies show success in certain priority areas, these are not consistently replicated across Scotland, particularly in urban or under-resourced regions. Successful long-term control examples, such as giant hogweed management by the Tweed Forum, were mentioned as positive models that could be replicated.

Local authorities expressed the need for ring-fenced funding and greater prioritisation of INNS by national bodies to ensure these coordinated approaches are sustainable and effective. One local authority reported that despite requesting a Species Control Agreement to manage giant hogweed in their area, support was denied, potentially highlighting a gap for local initiatives.

Respondents stressed that actions must be implemented at the right ecological scale and projects should continue until completion to ensure effectiveness. The new Scottish Plan for INNS Surveillance, Prevention, and Control, as signalled in the draft delivery plan for the Scottish Biodiversity Strategy, was seen as a step in the right direction, recognising gaps in current management strategies.

3.13 Early detection and rapid response:

Respondents emphasised the need for a stronger focus on prevention and early response measures. Some respondents suggested a need to scale up the work of the INNS inspectorate for early detection and rapid response, with some noting that this work has been limited in Scotland compared to England and Wales. Responses highlighted the need for the new INNS Plan to set out clearer strategies for early warning and rapid response for high-risk species.

Marine and freshwater environments were specifically noted as lacking active biosecurity measures, such as for ballast water and the movement of small crafts. Respondents also urged for more comprehensive inclusion of at-risk species beyond those listed by the EU. The 'polluter pays' principle was also raised as a potential mechanism for recovering costs from those responsible for the spread of INNS. However, a public authority indicated that there is uncertainty about how this principle could be practically applied, and it has yet to be tested in Scotland.

3.14 Funding and resource allocation:

Many respondents highlighted insufficient funding and resource allocation as major barriers to effective INNS management. Without adequate financial support, local authorities and other bodies struggle to implement both proactive and reactive strategies. There was generally consensus that more public funding should be allocated to support coordinated landscape-scale projects and to address gaps in species-specific management efforts, such as for invasive pathogens, marine species, and non-native conifers. One response indicated that large sums of money, through the Peatland Action Fund, are being used to remove invasive conifers from peatland because these species are exempt from control policies.

3.15 Addressing gaps in management and research:

Significant gaps were identified in management efforts, particularly for marine, freshwater, and pathogen INNS. Respondents cited species such as signal crayfish

and invasive pathogens like ash dieback as areas needing more attention. The recent IPBES INNS report further highlighted knowledge gaps in invasive pathogens and marine invasions.

Respondents expressed a need for more research to understand the biology and spread of problem species better. Again, it was noted that non-native conifer species like Sitka spruce require stricter control measures considering the increasing spread from commercial sites.

(iii) Legislation/policy

3.16 Lack of enforcement:

A key concern in responses was the lack of enforcement of existing INNS legislation. While laws like the Wildlife and Natural Environment Act and tools such as Species Control Agreements and Species Control Orders are in place, they are rarely used, resulting in limited impact. Respondents noted that Species Control Agreements and Species Control Orders are often seen as too resource-intensive, risky, or inappropriate for timely control actions.

Responses from public authorities acknowledged that enforcement relies heavily on voluntary compliance from landowners, which limits the effectiveness of these tools. One public authority noted that Species Control Agreements and Species Control Orders are typically used as a last resort and require significant resources to obtain, issue, and monitor compliance. These discretionary powers are primarily used to ensure that inaction on a landholding does not undermine a coordinated control programme.

In practice, very few Species Control Agreements and Species Control Orders have been issued, highlighting a potential reluctance to use these measures or limited resources to enforce them effectively. Specific examples include cases like the control of stoats on Orkney or hedgehogs on the Uists, where Species Control Orders have proven highly problematic. Some responses from local authorities suggested that Species Control Agreements and Species Control Orders should not remain discretionary. They proposed allowing local authorities to issue these agreements or orders when the relevant body fails to act, especially in cases where neighbouring landowners hinder INNS control efforts.

In terms of prosecution, one public authority highlighted that no prosecutions have been made in Scotland under Section 14(2) of the Wildlife and Countryside Act 1981 for planting or causing an invasive species to grow in the wild. They explained that the high level of evidence required to prove responsibility in court has been a barrier to successful prosecutions.

Responses also pointed out that there is currently no offence for landowners who have invasive non-native plants on their property, limiting the power to control INNS on private land and creating challenges for downstream landowners impacted by upstream infestations. Respondents recommended integrating INNS management requirements into planning consents and considering making it an offence to possess certain high-risk INNS. Local authorities reported difficulties relying on planning consents and conditions of the Environmental Protection Act 1990 to enforce INNS control, as these measures are often limited in scope and effectiveness. Additionally, some respondents called for improved access powers for NatureScot or designated agents to conduct surveillance and control activities on private land during large-scale eradication initiatives.

3.17 Clarity and strengthening of duty bearers' roles:

Respondents reiterated the need for clearer and updated roles and responsibilities among duty bearers within the Code of Practice, which they claimed contains outdated information. Respondents highlighted confusion among the public about the enforcement powers of local authorities on private land, where the public often expects local authorities (LAs) to manage INNS but where LAs lack enforcement authority. Some responses, including a local authority response, recommended delegating more enforcement powers to LAs to address INNS at a local level, especially for Species Control Orders.

Concerns were also raised about over-reliance on volunteers, particularly in red squirrel conservation, and a lack of clarity for landowners on their responsibilities under the current legislation. Respondents noted that the Scottish Biodiversity Duty could play a greater role in assigning INNS responsibilities across sectors and agencies.

3.18 Resource and administrative constraints:

A major theme was the need for greater resources and administrative support to effectively implement and enforce INNS legislation. Respondents suspected that the low number of issued Species Control Agreements and Species Control Orders is partly due to resource limitations, with relevant bodies like NatureScot lacking the funds and capacity to negotiate and monitor these agreements. A response from a public authority indicated that the significant levels of resource required to manage Species Control Agreements and Species Control Orders, coupled with their discretionary nature, limit their application. They indicated that these challenges will be addressed in the development of the Scottish INNS Plan.

Responses from eNGOs noted issues surrounding Species Control Agreements and Species Control Orders include the requirement that an Order can only be made if an Agreement has been refused or ignored. Species Control Agreements are often voluntary agreements that require funding for landowners to take action, meaning that Species Control Orders are seldom used due to cost constraints. Respondents pointed to practical challenges with Species Control Orders, such as the time required for negotiation and the difficulties in obtaining evidence of the presence of an INNS, which requires access—an issue the order itself is intended to address. Long-term funding and administrative support were viewed as essential, particularly for significant eradication projects like the Orkney Native Wildlife Project.

3.19 Legislative issues and the precautionary approach:

Respondents frequently highlighted the need to update Scotland’s INNS legislation to support more proactive and precautionary management. Many recommended adopting a precautionary approach that allows early intervention when a species shows invasive potential, rather than waiting until damage is extensive. Strategies suggested included early warning systems and horizon scanning to identify emerging threats.

Several respondents pointed to the EU Invasive Alien Species Regulation as a foundation for UK and Scottish legislation but expressed concerns about potential post-Brexit divergences. They suggested developing a stronger, Scotland-specific list of INNS of national concern, potentially through the national INNS Plan and forthcoming Natural Environment (Scotland) Bill, which could address issues around trade agreements and novel species. Additionally, respondents urged Scotland to adopt the Kunming-Montreal Global Biodiversity Framework target of reducing INNS

introductions by at least 50% by 2030, embedding this in the Natural Environment (Scotland) Bill.

3.20 Legislative gaps for specific species:

There were concerns that INNS legislation has significant gaps, particularly for marine and freshwater species and invasive pathogens. Respondents highlighted that species like signal crayfish and certain invasive aquatic plants are underregulated, as well as pathogens such as ash dieback, which have severe ecological impacts.

Respondents expressed frustration that non-native tree species used in commercial forestry, such as Sitka spruce, are currently exempt from INNS regulations. These comments suggested that this exemption shifts the financial burden of managing the spread of these species to the public sector, and called for the polluter pays principles to apply in these cases.

Respondents expressed concern over the biosecurity risks associated with the international horticulture trade in pot plants, noting that it remains largely unregulated online. Species like non-native flatworms pose risks through the importation and sale of pot plants and soil. Respondents suggested that biosecurity for plant imports should be tightened to reduce the introduction of invasive species. Additionally, they proposed stricter measures for pathways like ballast water in the marine environment and soil movement across sectors, such as infrastructure projects, to control the spread of INNS.

3.21 Coherence and cross-sectoral coordination

Respondents highlighted issues with policy coherence across sectors, noting that INNS strategies sometimes conflict with other national policies, such as glyphosate reduction initiatives. They recommended better integration of INNS responsibilities across forestry, agriculture, and other sectors to prevent fragmentation. Suggestions included developing funding mechanisms similar to the Forestry Cooperation Grant to support cross-sector collaboration and large-scale INNS projects. The Scottish Statutory Group on Non-Native Species was acknowledged for coordinating policy implementation, but some respondents called for broader representation and closer engagement with eNGOs in shaping the National INNS Plan.

(iv) Understanding of Impacts

3.22 Impact on native Species and Priority Habitats

A recurring theme in responses was the severe impact of INNS on Scotland's native species and priority habitats, leading to biodiversity loss. Key INNS and other non-native species highlighted include rhododendron, Sitka spruce, giant hogweed, Himalayan balsam, American mink, tree diseases (e.g., rapid oak death, ash dieback), carpet sea squirt, and signal crayfish. Specific impacts noted include:

- Rhododendron: Degrades Scotland's temperate rainforest, reducing biodiversity.
- Sitka Spruce: Encroaches on peatlands and temperate rainforest, negatively impacting native ecosystems.
- American mink: Preys on native water voles and seabird populations.
- Other Species: Giant hogweed (human health risks), Japanese knotweed (infrastructure damage), and signal crayfish (habitat destruction and predation on native species).
- Genetic Risks: Hybridization threats (e.g., sika deer with red deer) that compromise native species' genetic integrity.
- Specific regional impacts: Hedgehog predation on wading birds in the Uists, and non-native pines invading peatlands of international importance.

3.23 Proposed priorities for action:

In response to these environmental threats, several respondents recommended strategic actions to be incorporated in Scotland's INNS management. They suggested that Scotland should incorporate the GBF target of reducing INNS introduction and establishment by at least 50% by 2030 into Nature Restoration Targets within the upcoming Natural Environment (Scotland) Bill.

Some respondents also supported a national programme for island restoration and biosecurity, specifically for seabirds, to address severe declines caused by invasive mammals. Completing current island INNS eradication projects was also identified as a priority, such as the Orkney Native Wildlife Projects that targets stoats and the Western Isles Mink Project. For mainland areas, it was recommended that firm measures are established to prevent grey squirrel incursions into the Highlands and

that a targeted strategy be implemented to control rhododendron, particularly in temperate rainforest zones.

Further proposed actions include enhanced freshwater biosecurity, improved monitoring and modelling of INNS, and greater regulations on the sale of potentially invasive plants, including potential bans on the sale of established invasive species like Himalayan balsam and American skunk cabbage.

3.24 Impact of Specific INNS on Scotland's temperate rainforest and peatlands:

A particular focus was apparent in the responses on the effects of rhododendron on Scotland's rare temperate rainforest, where its growth reduces native plant diversity and forest regeneration. Responses again highlighted the impact of non-native commercial forestry species, especially Sitka spruce, which some respondents stated are encroaching on peatlands. There were calls from some respondents for a better understanding of the prevalence of non-native conifers in peatland and upland areas, as well as strategic actions to limit their spread to protect these valuable ecosystems.

3.25 Need for more impact information on specific species:

Respondents identified several species for which additional impact information is needed. There is a particular gap in understanding the impacts of marine and freshwater INNS, such as Japanese wireweed, carpet sea squirt, New Zealand pygmyweed, and signal crayfish. More research was also recommended for plant pathogens like *Phytophthora spp*. which are a threat to agriculture and forestry.

The need to quantify the economic impact of INNS on industries, communities, and the environment was also highlighted, as this could help build support for management efforts.

Some respondents suggested that an approach focused on protecting vulnerable habitats, rather than targeting individual species, might be more effective for certain ecosystems.

3.26 Evidence on cumulative impacts of INNS and other pressures:

There was general agreement among respondents that there is inadequate evidence on the combined effects of INNS and other pressures, such as climate change and human activities. Some respondents called for long-term monitoring, predictive

modelling, and case studies to better understand these cumulative impacts. They recommended that this should be a core research area under RESAS and national biodiversity research programmes.

Specific gaps were noted, such as the impact of water transfers on INNS spread in Scotland, as well as limited evidence regarding the potential increase in INNS distribution under different climate scenarios. The Scottish Government's recent horizon scanning exercise, which assessed risks posed by various INNS under climate change, was noted as a positive step, though further research was urged to clarify the interrelated impacts of multiple threats to biodiversity.

(v) Data Gaps

3.27 Addressing data gaps and key challenges:

Several approaches were suggested for addressing data gaps, though barriers to implementation remain significant. The cost of eradication is a major barrier, as are the resources needed for effective INNS management. Improved coordination of research efforts and prioritisation of key invasive species could streamline responses.

Public engagement, particularly through a well-funded public relations campaign, could help increase awareness and reporting. Improving funding to Local Environmental Record Centres (LERCs) would also support data collection and analysis.

Respondents noted the potential of leveraging citizen science for INNS monitoring, with platforms like iRecord offering a useful tool for encouraging the public to record sightings. Establishing a national INNS monitoring network, focusing on hotspots, and organising an annual INNS conference were suggested to promote stakeholder collaboration. Advances in environmental DNA (eDNA) techniques could significantly improve INNS data coverage, particularly in water environments. Finally, respondents highlighted the need for a balanced approach between preventative and reactive measures, as well as a clear strategy to hold landowners accountable for managing INNS on their property.

3.28 Accessibility and comprehensiveness of public databases:

Respondents indicated that the Non-Native Species Secretariat (NNSS) website in particular provides valuable information on INNS. While data is readily available on platforms like the NBN Atlas, GBNNSIP, and the Global Biodiversity Information Facility, some respondents indicated that these databases do not appear to be updated frequently, which can lead to outdated or incomplete data. Additionally, information across platforms is not always consistent, with some databases listing species as invasive while others do not.

The Defra Plant Health Register was noted as limited because it does not account for ecological impacts and is searchable only by pest and not host. Greater integration and regular updates would improve these resources for practitioners. Respondents also suggested that intellectual rights and access issues around papers detailing effective management practices is an issue.

3.29 Challenges and opportunities in the availability of data:

Improving public access to INNS data comes with challenges, but also significant opportunities. Social media was highlighted as a potential channel to increase public awareness of INNS outside traditional government platforms. Concerns about data sensitivity, especially around engaged species and potential illegal activity (e.g. trapping of species like signal crayfish) were noted, emphasising the need for careful data management. Limited funding was also cited as a barrier, as insufficient resources restrict the ability to conduct effective outreach campaigns.

Public engagement can be enhanced by showing the tangible impacts of INNS on biodiversity, and simple, impactful messages could help people understand the steps they can take to contribute. Increased opportunities are also needed for professional ecologists, environmental managers, and practitioners to contribute data. Making data submission easy and accessible through the creation of a dedicated Scottish section on the GB NNSS websites for submissions was suggested. The Scottish INNS Plan includes provisions to increase awareness of INNS impacts and improve preventative measures across sectors.

4. Conclusions and Next Steps

4.1 The responses to the call for evidence on the Control and Impact of Invasive Non-Native Species have provided valuable insights into the challenges and opportunities surrounding the management of INNS in Scotland. The evidence and views gathered highlight a range of issues related to the effectiveness of existing policy and legislation, as well as areas where further analysis by ESS may be beneficial.

4.2 Next steps for ESS will include:

- Monitoring legislative and policy developments: ESS will track progress on relevant legislative and policy developments, such as the Natural Environment (Scotland) Bill, as this may significantly influence the control of INNS. These developments will inform ESS' analysis and recommendations.
- Prioritising issues for further analysis: Drawing on the criteria outlined in ESS' Strategic Plan, such as legislative gaps, the scale of impact, and the potential added value of ESS involvement – ESS will systematically identify key areas that warrant additional analysis.
- Undertaking further analysis: Based on our prioritisation process, ESS will consider undertaking further detailed analysis of selected topics. This may include examining the effectiveness of mechanisms for INNS prevention and control.
- Continuing stakeholder engagement: ESS will continue to engage with stakeholders, including public bodies, eNGOs, land managers, and other relevant parties. These discussions will refine our understanding and provide additional insights for the next phase of our work.

Annex 1 – Call for Evidence on the Control and Impact of Invasive Non-Native Species: Questions.

Control of INNS

Terminology and awareness of invasive non-native species:

a) Is the terminology used to describe invasive non-native species, as understood by duty bearers and the public, sufficiently clear? Is further clarification needed?

b) Do you support the current criteria used by Scottish public bodies to define an invasive species? If not, what improvements are needed? What level of impact must a species have to be considered invasive?

c) How effective are current awareness campaigns and public engagement efforts in educating the public about the risks and impacts associated with invasive non-native species? Are there any notable gaps in public understanding regarding INNS?

Management strategies:

d) How well-defined and understood are the roles for duty bearers in managing INNS?

e) How effective are the current management strategies at addressing INNS? How could management of INNS be improved?

f) Is the current allocation of effort and resources across the categories of (i) prevention, (ii) early detection and rapid response and (iii) long-term management and control appropriate in effectively managing INNS in Scotland? What improvements are needed?

g) Are there any gaps in the management efforts targeting particular INNS species, such as marine species, freshwater species and pathogens?

Legislation/policy:

h) Is the existing legislation used/enforced? What challenges exist in application and enforcement?

i) Are national policies in Scotland for INNS coherent across sectors (e.g. forestry, agriculture)? Is there efficient co-ordination among sectors on INNS control?

j) How does the approach in Scotland compare internationally? Is Scotland keeping pace with the EU and the global community on these issues?

k) What improvements are needed in current legislative/policy frameworks to enhance the prevention, detection and management of INNS?

Impact of INNS

Understanding of impacts:

a) What do you consider are the key environmental impacts of INNS in Scotland across freshwater, marine and terrestrial species? Please provide specific examples with evidence where possible.

b) Are there specific species for which more impact information is needed? How could further information be gathered on these species?

c) Is there sufficient evidence on the potential cumulative impacts or risks from the combined effects of INNS and pressures such as climate change and other anthropogenic activities?

Data gaps:

d) What are the key data gaps in understanding the impact of INNS in Scotland?

e) How can these gaps be addressed, and what are the key challenges/barriers to filling these gaps?

f) How accessible and comprehensive are publicly available databases on known and potential invasive non-native species? What improvements could be made?

g) What challenges and opportunities exist in making more information publicly available and how might they be addressed?

ENVIRONMENTAL
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Ìrean Àrainneachdail na h-Alba

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