

# North East Invasive Non-native Species Strategy and Action Plan

2020 – 2024



**TWEED  
FORUM**



In partnership with  
**Environment  
Agency**

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Northumbria University  
**Northumbrian Water Limited**  
River Tweed Commission  
**Tees Rivers Trust**  
Tweed Foundation  
**Tyne Rivers Trust**  
**Wear Rivers Trust**

## Abbreviations

AONB	Area of Outstanding Natural Beauty
ASC	American signal crayfish
CABI	Centre for Agriculture and Biosciences International
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ERIC NE	Environmental Records Information Centre North East
EU	European Union
GB	Great Britain
GH	Giant hogweed
HB	Himalayan balsam
IAS	Invasive alien species (used in EU)
INNS	Invasive non-native species
IUCN	World Conservation Union
JK	Japanese knotweed
NE	North East
NHLF	National Heritage Lottery Fund
NNR	National Nature Reserve
NNSS	Non-Native Species Secretariat
NW	Northumbrian Water
NZP	New Zealand pigmyweed
RAMSAR	Ramsar Convention on Wetlands of International Importance
RBAG	Regional Biodiversity Action Group
RBMP	River Basin Management Plan
RIMP	Regional Invasive Species Management Plan
RSPB	Royal Society for the Protection of Birds
RTC	River Tweed Commission
SAC	Special Area for Conservation
SC	American skunk cabbage
SPA	Special Protected Area
SSSI	Sites of Special Scientific Interest
TF	Tweed Forum
TFo	Tweed Foundation
WCC	White-clawed crayfish
WFD	Water Framework Directive

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## Executive Summary

This five-year strategy for the five north east England river catchments presents a coordinated strategic approach for the prevention, early detection, rapid response and long-term control of specified freshwater and riparian invasive non-native species. Emphasis is placed on preventing INNS further impacting on the status of waterbodies, as defined by Water Framework Directive and designated conservation areas.

The aim of the North East INNS Strategy is:

***To develop and maintain cost-effective strategic approaches to prevent, detect, control and eradicate specified INNS in North East river catchments through coordinated action of river catchment partnerships.***

Particular focus will be placed on preventing the arrival of high-impact species and those with restricted distribution and/or low abundance. Coordinated action will contribute to work on containing species approaching the Region's boundaries and to more cost-effective means of control or eradication.

The regional strategy has four objectives. The first addresses the need for more strategic, coordinated and sustainable approaches to all aspects of INNS management in the North East. The remaining three reflect the key elements of INNS management; prevention; surveillance, detection and rapid response, and longer-term control.

**Objective 1:** Increased coordination of strategic and sustainable approaches to key aspects of INNS management in the North East.

**Objective 2:** Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity.

**Objective 3:** Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses.

**Objective 4:** Strategic and sustainable implementation of longer-term local control and eradication programmes.

The implementation of the North East INNS Strategy and Action Plan will have the following outputs and outcomes:

- Raised awareness of INNS pathways within key stakeholder groups;
- Increased use of biosecurity measures and protocols at likely points of introduction and by key stakeholder groups;
- Consistent messaging to raise awareness of biosecurity issues;
- Reduced risk of the introduction of 21 high-impact INNS to the North East;
- Development of pathway action plans for priority species;
- Increased regional partnership working to prevent introductions and undertake rapid response;
- A regional surveillance network with consistent data collection collated and maintained by one organisation;
- Protocols and trained regional and catchment teams for effective and appropriate rapid response to the introduction or spread of specified INNS;

- Strategic and collaborative control programmes for non-native riparian plants to maximise the cost-effectiveness of existing plant control programmes;
- Better protection for natural biodiversity and the conservation of important natural habitats for native species such as white-clawed crayfish, great crested newt, pearl mussel and water vole that would otherwise be impacted by the arrival of INNS;
- More effective preservation of the distinctive natural identities of areas of conservation value at risk from INNS;
- Limiting the spread of established high-impact aquatic species to safeguard aquatic biodiversity and fisheries;
- Improved coordination, strategic implementation and sustainability of long-term management and control initiatives;
- Improved lesson-learned capability and increased input to INNS policy forums;
- Wider and more effective platform to harness funding;
- Climate change resilience;
- WFD status of waterbodies improved or safeguarded;
- Raised awareness of the need for increased funding for pro-active action, i.e. prevention, surveillance and rapid response as the most cost-effective means of INNS management.

Without a strategic, coordinated and sustainable approach to the prevention of introduction and control of the spread of INNS, it is likely that the ecological, social and economic impacts and the costs for mitigation, control and eradication of these species will continue to increase. This strategy and action plan is a first step to set out and implement such an approach at a multi-catchment scale for INNS that significantly impact the aquatic and riparian environment.

The following action plan details which agency has responsibility for the implementation of the action (Lead) and which organisations are key partners (Partners) alongside a proposed timeframe. A solid line means a continuous period of implementation whereas a dotted line signifies implementation as required. North East (NE) INNS Practitioners includes Wildlife Trusts, Rivers Trusts, Local Authorities, private companies such as Northumbrian Water, and Government agencies such as the Environment Agency and Natural England.

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
<b>Objective 1:</b> Regional biosecurity action group established for the implementation of coordinated and strategic approaches to key aspects of INNS management in the North East							
<b>Output 1.1</b> Regional biosecurity action group with defined role and functions							
Identification of group members	EA	NE INNS Practitioners	<div></div>				
Establishment of the group	EA	NE INNS Practitioners	<div></div>				
Development of roles and functions of the group	EA	NE INNS Practitioners	<div></div>				
<b>Output 1.2</b> Biosecurity plans developed for four catchments							
Development of plan template	RBAG	Wear RT / TF	<div></div>				
Collation of required information	Catchment Hosts	Catchment Stakeholders		<div></div>			
Draft plan and consultation	Catchment Hosts	Catchment Stakeholders		<div></div>			

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
Final plan produced	Catchment Hosts	Catchment Stakeholders		—			
<b>Output 1.3</b> Development of coordinated funding strategy(ies) and proposals for agreed actions across the North East region							
Development of regional funding proposal	RBAG	Catchment Hosts	—				
Formulation of long-term funding strategies document	RBAG	Catchment Hosts		—			
<b>Objective 2:</b> Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity							
<b>Output 2.1</b> Receptor and source areas for INNS identified in each catchment							
Database updated with information relevant to receptor or source areas	ERIC NE	NE INNS Practitioners	— — —	— — —	— — —	— — —	— — —
Database made available for use of all regional partners	ERIC NE	NE INNS Practitioners	— — —	— — —	— — —	— — —	— — —
Identification of receptor and source areas	RBAG	NE INNS Practitioners		—			
<b>Output 2.2</b> Increased protection for non-impacted designated sites and species and/or waterbodies							
Field verification of potential non-infested areas	RBAG	NE INNS Practitioners					
Records updated as required	NE INNS Practitioners	ERIC NE	— — —	— — —	— — —	— — —	— — —
Use of area, potential pathways and stakeholders identified	Catchment Hosts	NE INNS Practitioners		—	—		
Identification and implementation of preventative measures	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 2.3</b> Increased awareness of good practice across stakeholders involved with key pathways to prevent introduction and spread of INNS							
Identification or development of good management practices for key stakeholder groups (see also Outputs 2.1 and 2.2)	RBAG	NE INNS Practitioners	—				
Establish regional pilot schemes with identified key stakeholders in each catchment	Catchment Hosts	NE INNS Practitioners		—			
Assess effectiveness of pilot schemes and modify as required	RBAG	Catchment Hosts		—			
Expansion of effort within catchments and across the region	Catchment Hosts	NE INNS Practitioners		—	—	—	—
<b>Objective 3:</b> Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses							
<b>Output 3.1</b> Common surveillance, reporting and information display systems established across the region							
Development of regional fast-track reporting	ERIC NE	Catchment Hosts		—			

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
Further development and maintenance of regional INNS database to provide strategic tools for, and assessments of, INNS management	ERIC NE	Catchment Hosts	---	---	---	---	---
Development of online tools to display the results of INNS management	ERIC NE	Catchment Hosts			—		
Testing and establishment of eDNA surveillance for selected freshwater species	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 3.2</b> Agreed survey and monitoring protocols and data formats							
Identify and agree appropriate monitoring protocols and data formats (where applicable)	RBAG	NE INNS Practitioners	—				
Development and maintenance of database for information storage and analysis	RBAG	ERIC NE		—			
Identification and development of appropriate mechanisms to disseminate survey and monitoring information	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 3.3</b> Rapid response mechanism to prevent establishment of INNS not currently present in North East catchments							
Development of rapid response protocols for non-GB species	RBAG	NE INNS Practitioners	—	—	—		
Establishment of regional and/or catchment-based teams	RBAG	Catchment Hosts		—		—	—
Identification and purchase of required equipment	Catchment Hosts	NE INNS Practitioners		—		—	—
Training of team members according to rapid response role	RBAG	NE INNS Practitioners		—		—	—
Identify, and where possible obtain, all required permissions	RBAG	Catchment Hosts		---	---	---	---
Implementation of appropriate responses	RBAG or Catchment Hosts	NE INNS Practitioners		---	---	---	---
<b>Objective 4:</b> Strategic and sustainable implementation of longer-term local control and eradication programmes							
<b>Output 4.1</b> Control initiatives for selected, established red- and amber-listed INNS populations							
Identification of candidate sites and control mechanisms within catchments	RBAG / Catchment Hosts	NE INNS Practitioners	—				
Implementation of control trials using outcomes of assessments undertaken as part of Output 4.2	Catchment Hosts	NE INNS Practitioners			—	—	
Evaluation and expansion of cost-effective control activities	RBAG	NE INNS Practitioners				—	—
<b>Output 4.2</b> Cost-effective implementation of treatment (and containment) measures							
Identification of good practice from review of efficacy of measures utilised to date	RBAG	NE INNS Practitioners	—				

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
Trials of identified treatments established as part of Output 4.1	Catchment Hosts	NE INNS Practitioners		—	—	—	—
Monitoring and evaluation of cost-effectiveness of trialled treatments	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 4.3</b> Cost-effective strategies developed and implemented for sustainable long-term control of red- and amber-listed INNS populations							
Assessment of efficacy of strategies currently employed including trials of biological control	RBAG	NE INNS Practitioners		—	—	—	—
Investigate means to enable landowners to take responsibility for the control of INNS on their land	RBAG	Government Agencies		—	—	—	—
Engage landowners to take responsibility for INNS control on their land	Catchment Hosts	NE INNS Practitioners		—	—	—	—

## 1. Introduction

This five-year strategy presents a coordinated strategic approach for the prevention, early detection, rapid response and long-term control of specified freshwater and riparian invasive non-native species across five north east England river catchments. Emphasis is placed on preventing INNS further impacting on the status of waterbodies as defined by the Water Framework Directive (WFD) and designated conservation areas. The geographic area covered by the strategy ranges from the Tees catchment in the south, to the Till catchment located in the north (Fig. 1) and includes the Tees, Wear, Tyne, Till and Northumberland Rivers catchments. The Northumberland Rivers catchment includes the Blyth, Wansbeck, Coquet, Aln, Pont and Lyne.

**Invasive non-native species (INNS)** are broadly defined as “species whose introduction and/or spread threaten biological diversity or have other unforeseen impacts”<sup>1</sup>. For the purposes of this strategy a list of priority INNS have been identified and agreed by local stakeholders, and are presented in Section 3. This strategy focusses on freshwater and riparian INNS but also includes some coastal and estuarine species. Many of these species are highly problematic and once established can have a high impact on biodiversity, ecosystem processes, river morphology and/or the economy. These INNS can have a marked impact on how we live and can also reduce the conservation and amenity value of rivers, lakes and other waterbodies, as well as threaten the survival of rare and iconic species in the region. Their impacts also negatively influence our ability to meet obligations set by international policy and legislation, particularly the EU WFD, the Habitats Directive, the Convention on Biodiversity<sup>2</sup> and the GB Invasive Non-native Species Strategy.

Currently it is not possible to eradicate or cost-effectively control many of these high-impact species once they become established. As such, the most effective strategy is to prevent their introduction to the region. If that fails and they are introduced, action is required to either eradicate them before they become established or, if that is not possible, restrict the spread. Management of established species is possible but requires long-term management where populations and/or individuals are still present, and long-term monitoring/surveillance in areas where they have been removed.

Within the North East region, several catchment-based or local (smaller than catchment) initiatives have been completed, are underway, or are planned by several local organisations and/or partnerships (e.g. Durham Wildlife Trust, Tees Rivers Trust, Wear Rivers Trust, North Pennines AONB partnership). By and large these projects have been working separately and have utilised different approaches for key aspects of INNS management. This pattern of separate working reduces the opportunity for more cost-effective INNS management; for example, through cross-catchment planning, increased stakeholder awareness, identification and learning of lessons, design and implementation of effective control strategies, development of long-term sustainability strategies, and effective rapid response protocols and capability. Separate, smaller-scale implementation also frequently leads to missed opportunities for local projects to feed into national and regional strategies for prevention, detection, eradication and control of INNS.

The need for more strategic and coordinated INNS management in the North East has been recognised by organisations working in the catchment partnerships in the region and has led to the production of this

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<sup>1</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/455526/gb-non-native-species-strategy-pb14324.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/455526/gb-non-native-species-strategy-pb14324.pdf)

<sup>2</sup> <https://www.cbd.int/doc/legal/cbd-en.pdf>



strategy and its accompanying action plan. The strategy has been developed by the working group with representatives from the Environment Agency, Northumbrian Water, Environmental Records Information Centre North East, and catchment partnerships of the Tees, Wear, Tyne and Northumberland catchments, facilitated by Tweed Forum.

The aim of the North East INNS Strategy is:

**To develop and maintain cost-effective strategic approaches to prevent, detect, control and eradicate specified INNS in North East river catchments through coordinated action of river catchment partnerships.**

Particular focus will be placed on preventing the arrival of high-impact species and those with restricted distribution and/or low abundance. Coordinated action will contribute to work on containing species approaching the Region's boundaries and to more cost-effective means of control or eradication.

The aim will be achieved through the realisation of four objectives:

**Objective 1:** Increased coordination of strategic and sustainable approaches to key aspects of INNS management in the North East.

**Objective 2:** Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity.

**Objective 3:** Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses.

**Objective 4:** Strategic and sustainable implementation of longer-term local control and eradication programmes.

These objectives are in accordance with key elements of the GB Invasive Non-native Species Strategy and the North Regional Invasive Species Management Plan (NRIMP)<sup>3</sup>: Prevention, early detection, surveillance, monitoring and rapid response, mitigation, control and eradication

**The ultimate key to the effectiveness of this strategy is the building of local awareness, capacity and partnerships to ensure the success and long-term sustainability of INNS management in the region.**

The implementation of the North East INNS Strategy and Action Plan will have the following outputs and outcomes;

- Raised awareness of INNS pathways within key stakeholder groups;
- Increased use of biosecurity measures and protocols at likely points of introduction and by key stakeholder groups;
- Consistent messaging to raise awareness of biosecurity issues;
- Reduced risk of the introduction of 21 high-impact INNS to the North East;

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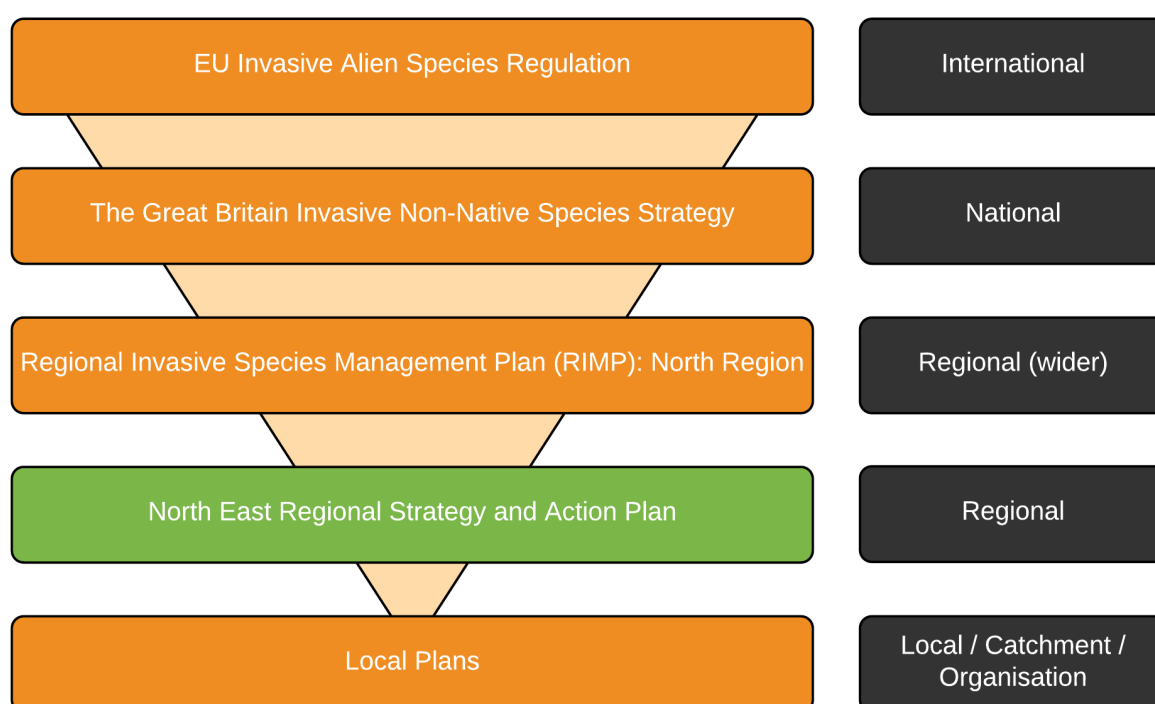
<sup>3</sup> <http://www.nonnativespecies.org/index.cfm?pageid=632>

- Development of pathway action plans for priority species;
- Increased regional partnership working to prevent introductions and undertake rapid response;
- A regional surveillance network with consistent data collection collated and maintained by one organisation;
- Protocols and trained regional and catchment teams for effective and appropriate rapid response to the introduction or spread of specified INNS;
- Strategic and collaborative control programmes for non-native riparian plants to maximise the cost-effectiveness of existing plant control programmes;
- Better protection for natural biodiversity and the conservation of important natural habitats for native species such as white-clawed crayfish, great crested newt, pearl mussel and water vole that would otherwise be impacted by the arrival of NNS;
- More effective preservation of the distinctive natural identities of areas of conservation value at risk from INNS;
- Limiting the spread of established high-impact aquatic species to safeguard aquatic biodiversity and fisheries;
- Improved coordination, strategic implementation and sustainability of long-term management and control initiatives;
- Improved lesson-learned capability and increased input to INNS policy forums;
- Wider and more effective platform to harness funding;
- Climate change resilience;
- WFD status of waterbodies improved or safeguarded;
- Raised awareness of the need for increased funding for pro-active action, i.e. prevention, surveillance and rapid response as the most cost-effective means of INNS management.

Without a strategic, coordinated and sustainable approach to the prevention of introduction and control of the spread of INNS, it is likely that the ecological, social and economic impacts and the costs for mitigation, control and eradication of these species will continue to increase. This strategy is a first step to set out and implement such an approach at a multi-catchment scale for INNS that significantly impact the aquatic and riparian environment.

## 2. Policy, Legislation and Plans

The threat posed by INNS is increasingly recognised in international, national and local policy and planning frameworks. The Convention on Biological Diversity is a major driver for national strategies on INNS. On 1 January 2015, the EU Invasive Alien Species Regulation (EC 1143/2014)<sup>4</sup> came into force on and represents a step change in approach, requiring Member States to implement a range of measures for the prevention and management of INNS. The list of invasive alien species was amended in 2017<sup>5</sup> and 2019<sup>6</sup>. Within the existing domestic policy and planning framework, the North East INNS strategy provides a link between catchment initiatives, the Northern Regional Invasive Management Plan (NRIMP) and the national-level GB INNS Strategy (2015) (Fig. 2). As such it will contribute to, and be supported by, the following domestic policy documents, strategies, legislation and plans.



**Figure 2. Relationship of NE INNS strategy to national and local strategies and plans.**

The national and regional policies, strategies and plans have a focus on prevention and appropriate rapid response to the detection of INNS with high ecological, economic and social impacts. There is also a focus on the protection of areas of high conservation and aesthetic value. Local plans have measures for protection of recreational areas and the removal and/or control of INNS.

<sup>4</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1143&from=EN>

<sup>5</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1263&from=EN>

<sup>6</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1262&from=EN>

## 2.1 National/Regional Policies and Strategies

The key national-level policy instrument for INNS is the **GB INNS Strategy**. First published in 2008, it was revised in 2015. The GB INNS Strategy has an emphasis on partnership approaches, prevention and early action and sets out a series of key actions to achieve its aims:

- to provide clarity and coordination of responsibilities and functions within government and its associated bodies;
- to improve coordination of actions to tackle INNS in partnership with key interest groups outside government;
- to achieve an appropriate level of awareness of non-native species issues and promote appropriate changes in behaviour or attitudes throughout all relevant sectors;
- to reduce and, where possible, prevent the intentional and unintentional introduction of INNS; to ensure, where possible, that effective contingency response capabilities are in place to prevent the establishment of new invasions;
- to help ensure that strategic action to control established INNS is adequately resourced and delivered;
- to make optimum use of available capacity and resources to improve detection and monitoring capabilities; and to identify gaps and priority areas for further development.

**The Regional Invasive Species Management Plan<sup>7</sup>:** North Region (RIMP) was published in November 2018 under the auspices of the EU Life-funded Reducing and Preventing Invasive Alien Species Dispersal (RAPID)<sup>8</sup> project. The RIMP was formulated to provide a link between national strategy and local action and presents strategic actions and tools for that purpose. However, it does not present the more specific strategic actions that will form the NE INNS strategy. The NE INNS strategy will build upon and further detail the strategic actions and tools in the RIMP.

## 2.2 Legislation

The UK has international obligations to address INNS issues, principally through the WFD<sup>9</sup>, the EU IAS Alien Species Regulation (EC 1143/2014), the EU Habitats<sup>10</sup> and Birds Directives<sup>11</sup>, the Convention on Biological Diversity including the International Plant Protection Convention<sup>12</sup> and the Bern Convention on Conservation of European Wildlife and Habitats<sup>13</sup>.

There are a number of UK Government legal instruments that can be utilised in the prevention and management of INNS:

- Section 14 of The Wildlife and Countryside Act (1981)<sup>14</sup> makes it an offence to allow any animal (including hybrids) which is not ordinarily resident in Great Britain, to escape into the wild; or

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<sup>7</sup> <http://www.nonnativespecies.org/index.cfm?pageid=632>

<sup>8</sup> <http://www.nonnativespecies.org/index.cfm?sectionid=139>

<sup>9</sup> [https://ec.europa.eu/environment/water/water-framework/index\\_en.html](https://ec.europa.eu/environment/water/water-framework/index_en.html)

<sup>10</sup> [https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index\\_en.htm](https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm)

<sup>11</sup> [https://ec.europa.eu/environment/nature/legislation/birdsdirective/index\\_en.htm](https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm)

<sup>12</sup> <https://www.ippc.int/en/>

<sup>13</sup> <https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/104>

<sup>14</sup> [www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1981/cukpga\\_19810069\\_en\\_1](http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1981/cukpga_19810069_en_1)

release it into the wild; or to release or to allow to escape from captivity, any animals that are listed on Schedule 9 of the 1981 Act. It is also an offence to plant or otherwise cause to grow in the wild any plant listed on schedule 9 of the 1981 Act.

- The Environmental Protection Act 1990<sup>15</sup> contains a number of legal provisions concerning “controlled waste”, which are set out in Part II. Any Japanese knotweed or Giant hogweed contaminated soil or plant material discarded is likely to be classified as controlled waste. This means that offences exist with the deposit, treating, keeping or disposing of controlled waste without a licence.
- The Waste Management Licensing Regulations 1994<sup>16</sup> define the licensing requirements which include “waste relevant objectives”. These require that waste is recovered or disposed of “without endangering human health and without using processes or methods which could harm the environment”.
- [Controlled Waste \(Registration of Carriers and Seizure of Vehicles\) Regulations 1991](#)<sup>17</sup> and the [Environmental Protection \(Duty of Care\) Regulations 1991](#)<sup>18</sup> provide guidance for the handling and transfer of controlled waste.
- The [Prohibition of Keeping or Release of Live Fish \(Specified Species\) \(Scotland\) Order 2003](#)<sup>19</sup> requires that a licence be obtained for the keeping or release of species listed on Schedules 1 and 2.
- [Keeping and Introduction of Fish Regulations 2015](#)<sup>20</sup> give the Environment Agency the power to regulate fish movements. Any movements of fish into waters that drain to the sea (other than registered fish farms) must be consented by the Environment Agency.
- The RTC controls fish movements within the Tweed catchment (including the Till) through consenting to stocking operations under the Tweed Order 2006. The Environment Agency regulates “still waters that do not drain to the sea (Stanks)”.
- The Scottish/Northern Irish [NetRegs](#)<sup>21</sup> website contains useful guidance on INNS and their control.

## 2.3 Plans and Local Strategies

The North East INNS strategy links Government policy, legislation and higher-level strategic action with catchment and local actions (Fig. 2). It will help facilitate the implementation of the Solway-Tweed and Northumbria River Basin Management Plans, Biodiversity Action Plans and two other strategies in Northumberland (Table 1). This strategy also supports the conservation objectives of Sites of Special

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<sup>15</sup> [www.opsi.gov.uk/acts/acts1990/ukpga\\_19900043\\_en\\_1](http://www.opsi.gov.uk/acts/acts1990/ukpga_19900043_en_1)

<sup>16</sup> [http://www.opsi.gov.uk/si/si1994/uksi\\_19941056\\_en\\_1.htm](http://www.opsi.gov.uk/si/si1994/uksi_19941056_en_1.htm)

<sup>17</sup> [www.opsi.gov.uk/si/si1991/uksi\\_19911624\\_en\\_1.htm](http://www.opsi.gov.uk/si/si1991/uksi_19911624_en_1.htm)

<sup>18</sup> [www.opsi.gov.uk/si/si1991/uksi\\_19912839\\_en\\_1.htm](http://www.opsi.gov.uk/si/si1991/uksi_19912839_en_1.htm)

<sup>19</sup> <http://www.scotland.gov.uk/resource/doc/47133/0009766.pdf>

<sup>20</sup> <https://www.legislation.gov.uk/ukdsi/2015/9780111123072>

<sup>21</sup> <http://www.netregs.gov.uk/netregs/default.aspx>

Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and local Reserves within the North East region.

Table 1. Provisions or requirements of local strategies and plans supported by the NE INNS Strategy.

Existing Plan	Provision or Requirement
Solway-Tweed River Basin Management Plan (RBMP) <sup>22</sup>	INNS are recognised as a pressure preventing the attainment of “good” status for waterbodies without “protection”, and as an emerging threat. Actions include influencing water users to slow the spread through increased awareness, understanding and biosecurity.
Northumbria River Basin Management Plan 2015 <sup>23</sup>	INNS are recognised as a significant pressure on <1% of waterbodies. The RBMP presents management measures for the protection and use of waterbodies. It is stated that without these measures 46% of surface waters would deteriorate, mainly because of unmitigated physical modifications and the spread of INNS. Measures include emphasis on prevention, early detection and response and protection of key areas.
Scottish Borders <sup>24</sup> , Northumberland <sup>25</sup> and Durham <sup>26</sup> Local Biodiversity Action Plans	Recognise INNS as a factor in decline of biodiversity, particularly in riparian and aquatic habitats.
The North Pennines AONB Management Plan 2019–2024 <sup>27</sup>	Promotes action to control riparian INNS and other non-native species impacting on priority habitats and species (e.g. mink and grey squirrel).
Northumberland Coastal Mitigation Strategy <sup>28</sup>	The aim of the strategy is “to prevent any net increase in disturbance to SSSI and SPA bird species arising from increased recreational pressure on the coast caused by new development, and similarly to ensure no net increase in the rate of spread of pirri-pirri-bur arising from increased recreational pressure on dune grasslands caused by new development”.
Northumberland Crayfish Conservation Strategy 2019–23	Produced to reduce the risk of further decline of the endangered native white-clawed crayfish (WCC) ( <i>Austropotamobius pallipes</i> ) populations in Northumberland. American signal crayfish (ASC, <i>Pacifastacus leniusculus</i> ) and the crayfish plague that they carry is a significant threat. A key strategic aim of the strategy is to: “Identify and implement actions to reduce the impact of existing ASC populations in Northumberland”. Measures include: 1. Identify and confirm locations where ASC populations may be significantly impacting on habitat, biodiversity and/or water quality. Based on evidence, implement measures to restrict, reduce or remove ASC from relevant locations. 2. Proactively highlight the threats to WCC populations and promote key conservation measures such as biosecurity and habitat protection.
Tweed Catchment Management Plan 2015–21 <sup>29</sup>	Objective 3.3: Monitor and control the introduction and establishment of non-native riverine and riparian species and, where appropriate, control or eradicate established populations.

<sup>22</sup> [https://www.sepa.org.uk/media/218890/rbmp\\_solway\\_tweed\\_2015.pdf](https://www.sepa.org.uk/media/218890/rbmp_solway_tweed_2015.pdf)

<sup>23</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/718333/Northumbria\\_RBD\\_Part\\_1\\_river\\_basin\\_management\\_plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718333/Northumbria_RBD_Part_1_river_basin_management_plan.pdf)

<sup>24</sup> [https://www.scotborders.gov.uk/downloads/file/928/local\\_biodiversity\\_action\\_plan](https://www.scotborders.gov.uk/downloads/file/928/local_biodiversity_action_plan)

<sup>25</sup> [https://www.nwt.org.uk/sites/default/files/2018-10/Nland\\_Biodiversity\\_Action\\_Plan.pdf](https://www.nwt.org.uk/sites/default/files/2018-10/Nland_Biodiversity_Action_Plan.pdf)

<sup>26</sup> <https://www.gateshead.gov.uk/media/1866/170-SD-Durham-Biodiversity-Action-Plan/pdf/170.-SD-Durham-Biodiversity-Action-Plan.pdf?m=636657845198770000>

<sup>27</sup> <https://www.northpennines.org.uk/wp-content/uploads/2019/06/MPlan-220719-webres.pdf>

<sup>28</sup> <https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Local%20Plan/Northumberland-Coastal-Mitigation-Service-Strategy-Document-December-2018.pdf>

<sup>29</sup> [https://tweedforum.org/wp-content/uploads/2018/09/Tweed\\_full\\_CMP\\_web.pdf](https://tweedforum.org/wp-content/uploads/2018/09/Tweed_full_CMP_web.pdf)

Existing Plan	Provision or Requirement
Tyne Catchment Management Plan <sup>30</sup>	Goal A2b: Remove or manage problem non-native species, and prevent the introduction of new invasive species where possible.
River Tweed Commission policy on fish stocking and movements	Prevention of new fish species establishing in the catchment or the extension of existing alien fish species to new parts of the catchment. Prevention of stocking of any fish species, local or alien, to areas upstream of impassable waterfalls.
The Fisheries Management Plan for the Tweed and Eye Fisheries District (6 <sup>th</sup> Edition in prep)	Management of non-native species; monitoring of the fish and crayfish of the Tweed and Eye catchments and biosecurity.

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<sup>30</sup> <https://www.newcastle.gov.uk/sites/default/files/2019-01/tyne-catchment-plan-print-version.pdf>

### 3. Freshwater and Riparian INNS

#### 3.1 Priority Invasive Non-Native Species

The first stage in developing this strategy was the identification of priority INNS for the North East region. INNS for inclusion were to be those classified as high impact with a high risk of introduction, establishment and spread. Species could be absent or already present in the region. Candidate INNS were initially identified from a survey of organisations working with INNS in the region; the RIMP North Region; the RIMP Eastern Region; the WFD UK Technical Advisory Group list of high-impact species<sup>31</sup> and the Scottish Biosecurity Plans. This initial candidate list was reduced to freshwater, riparian and coastal-estuarine species. The remaining species were then assessed for risk of introduction (High, Medium or Low), establishment and the ability to spread. Degree of threat to biodiversity, economy, morphology and ecosystem services was also assessed using the same High, Medium and Low scale utilised for “risk”. Information for the assessments came from the UK TAG risk and impact<sup>32</sup> assessments, the GB Non-native Species Secretariat<sup>33</sup>, CABI datasheets<sup>34</sup> and the IUCN Global Invasive Species Database<sup>35</sup>. Distributions of the identified species were examined from data supplied by the Environmental Records Information Centre North East (ERIC NE)<sup>36</sup> and the National Biodiversity Network Atlas<sup>37</sup>.

Identified INNS were classified via a colour code system used in the RIMPs i.e. Black, Red, Amber and Green. Category definitions, with their listed INNS and distributions, are given in Tables 2–5 and Figs. 3–5.

Table 2. Black List INNS: Alert species that are not **currently** present in the region but assessed as a high risk and threat. (!) denotes a species of EU concern; (\*) GB Alert Species; (+) Schedule 9-listed where Section 14 of the Wildlife and Countryside Act 1981 applies.

Freshwater (Animal)	Freshwater (Plant)	Riparian
Killer shrimp (*) <i>Dikerogammarus villosus</i>	Large flowered waterweed (+) <i>Egeria densa</i>	Himalayan knotweed <i>Persicaria wallichii</i>
Demon shrimp (*) <i>Dikerogammarus haemobaphes</i>	Water hyacinth (!) (+) <i>Eichhornia crassipes</i>	Hybrid knotweed (+) <i>F. japonica</i> v <i>F. sachalinensis</i>
Quagga mussel (*) <i>Dreissena rostriformis bugensis</i>	Water primrose (*) (!) (+) <i>Ludwigia grandiflora</i>	Hottentot fig (+) <i>Carpobrotus edulis</i>
Bloody red shrimp <i>Hemimysis anomala</i>	Creeping water primrose (*) (!) (+) <i>Ludwigia peploides</i>	
Spiny cheeked crayfish (!) (+) <i>Orconectes limosus</i>	Broad-leaved watermilfoil (!) <i>Myriophyllum heterophyllum</i>	
Virile crayfish (!) <i>Orconectes virilis</i>	Mosquito fern <i>Azolla caroliniana</i>	
Red swamp crayfish (!) (+) <i>Procambarus clarkii</i>		
Marbled crayfish (!)		

<sup>31</sup> <http://www.wfduk.org/sites/default/files/Media/Assessing%20the%20status%20of%20the%20water%20environment/UKTAG%20classification%20of%20alien%20species%20working%20paper%20v7.6.pdf>

<sup>32</sup> <https://www.wfduk.org/reference/characterisation-water-environment>

<sup>33</sup> <http://www.nonnativespecies.org/factsheet/index.cfm>

<sup>34</sup> <https://www.cabi.org/ISC>

<sup>35</sup> <http://www.iucngisd.org/gisd/>

<sup>36</sup> <http://www.ericnortheast.org.uk/>

<sup>37</sup> <https://species.nbnatlas.org>

Freshwater (Animal)	Freshwater (Plant)	Riparian
<i>Procambarus marmokrebs</i>		
Asian clam <i>Corbicula fluminea</i>		
American bullfrog (!) <i>Lithobates catesbeianus</i>		
Ponto-Caspian gobies (See text)		
Topmouth gudgeon (!) (*) <i>Pseudorasbora parva</i>		

The Ponto-Caspian gobies included in the black category are a group of species that have demonstrated invasiveness in Europe and North America. These include the tubenose goby (*Proterorhinus semilunaris*), round goby (*Neogobius melanostomus*), bighead goby (*Ponticola kessleri*) and racer goby (*Babka gymnotrachelus*).

Table 3. Red List INNS: High-impact species that are present in a small number of sites but not well-established or abundant. (!) denotes a species of EU concern; (\*) GB Alert Species; (+) Schedule 9-listed where Section 14 of the Wildlife and Countryside Act 1981 applies.

Freshwater (Animal)	Freshwater (Plant)	Riparian
Zebra mussel <i>Dreissena polymorpha</i>	Fanwort (!) (+) <i>Cabomba caroliniana</i>	Three-flowered leek (+) <i>Allium triquetrum</i>
Chinese mitten crab (!) (+) <i>Eriocheir sinensis</i>	Floating pennywort (!) (+) <i>Hydrocotyle ranunculoides</i>	Common cord grass <i>Spartina anglica</i>
	Parrot's feather (!) (+) <i>Myriophyllum aquaticum</i>	American skunk cabbage (!) <i>Lysichiton americanus</i>
	Curly waterweed (!) (+) <i>Lagarosiphon major</i>	

Table 4. Amber List INNS: Well-established species whose eradication is difficult or not feasible, but control is important due to their impact. (!) denotes a species of EU concern; (\*) GB Alert Species; (+) Schedule 9-listed where Section 14 of the Wildlife and Countryside Act 1981 applies.

Freshwater (Animal)	Freshwater (Plant)	Riparian
American signal crayfish (!) (+) <i>Pacifastacus leniusculus</i>	Water fern <i>Azolla filicoides</i>	Pirri-pirri-bur <i>Acaena novae-zelandiae</i>
	New Zealand pigmyweed (+) <i>Crassula helmsii</i>	Giant hogweed (!) (+) <i>Heracleum mantegazzianum</i>
		Japanese knotweed (+) <i>Fallopia japonica</i>
		Giant knotweed (+) <i>Fallopia sachalinensis</i>
		Himalayan balsam (!) (+) <i>Impatiens glandulifera</i>
		American mink (+) <i>Neovison vison</i>
		Sea buckthorn <i>Hippophae rhamnoides</i>

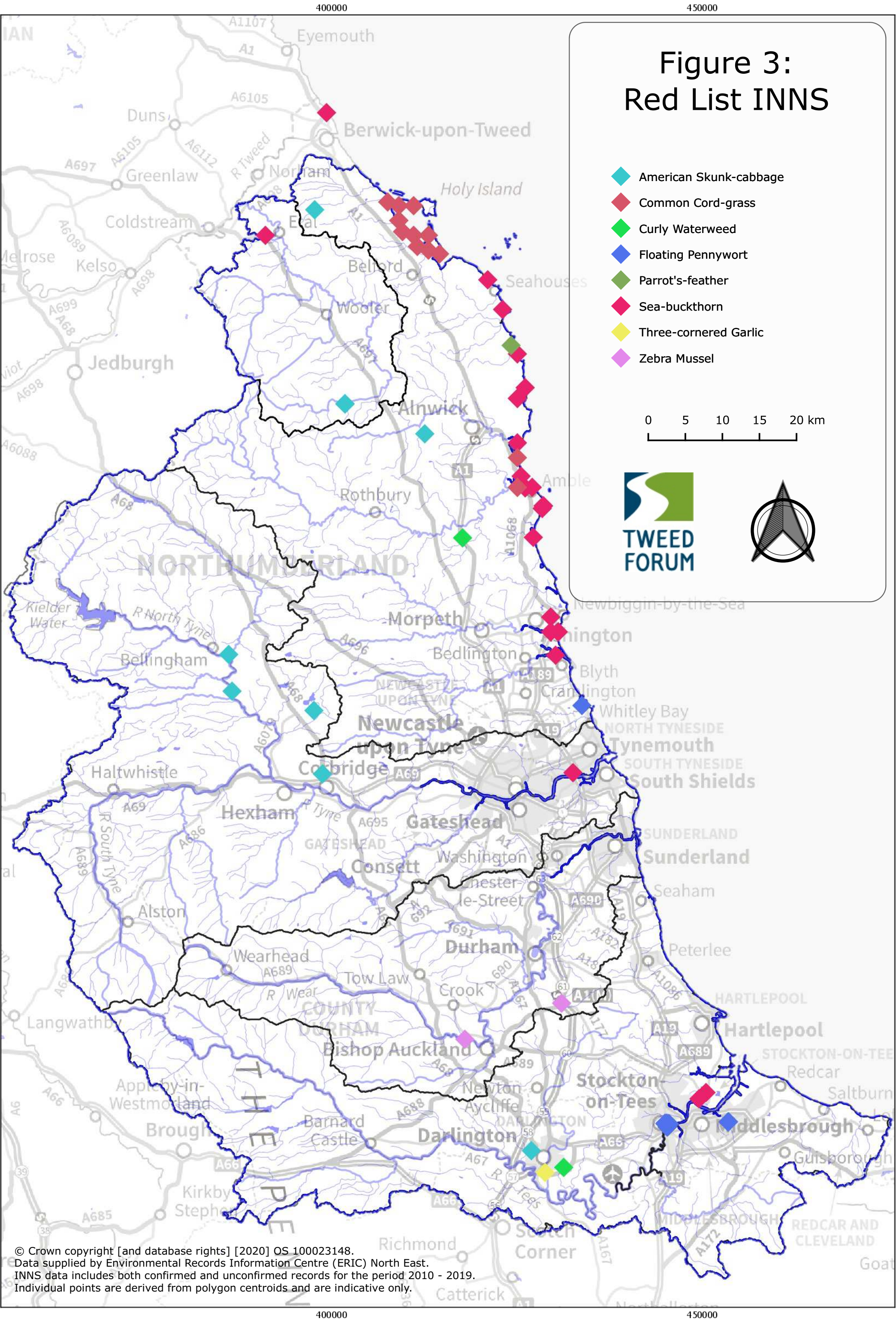
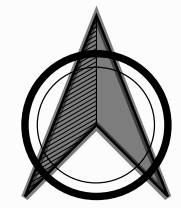


Figure 3:  
Red List INNS

- American Skunk-cabbage
- Common Cord-grass
- Curly Waterweed
- Floating Pennywort
- Parrot's-feather
- Sea-buckthorn
- Three-cornered Garlic
- Zebra Mussel

0 5 10 15 20 km



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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.

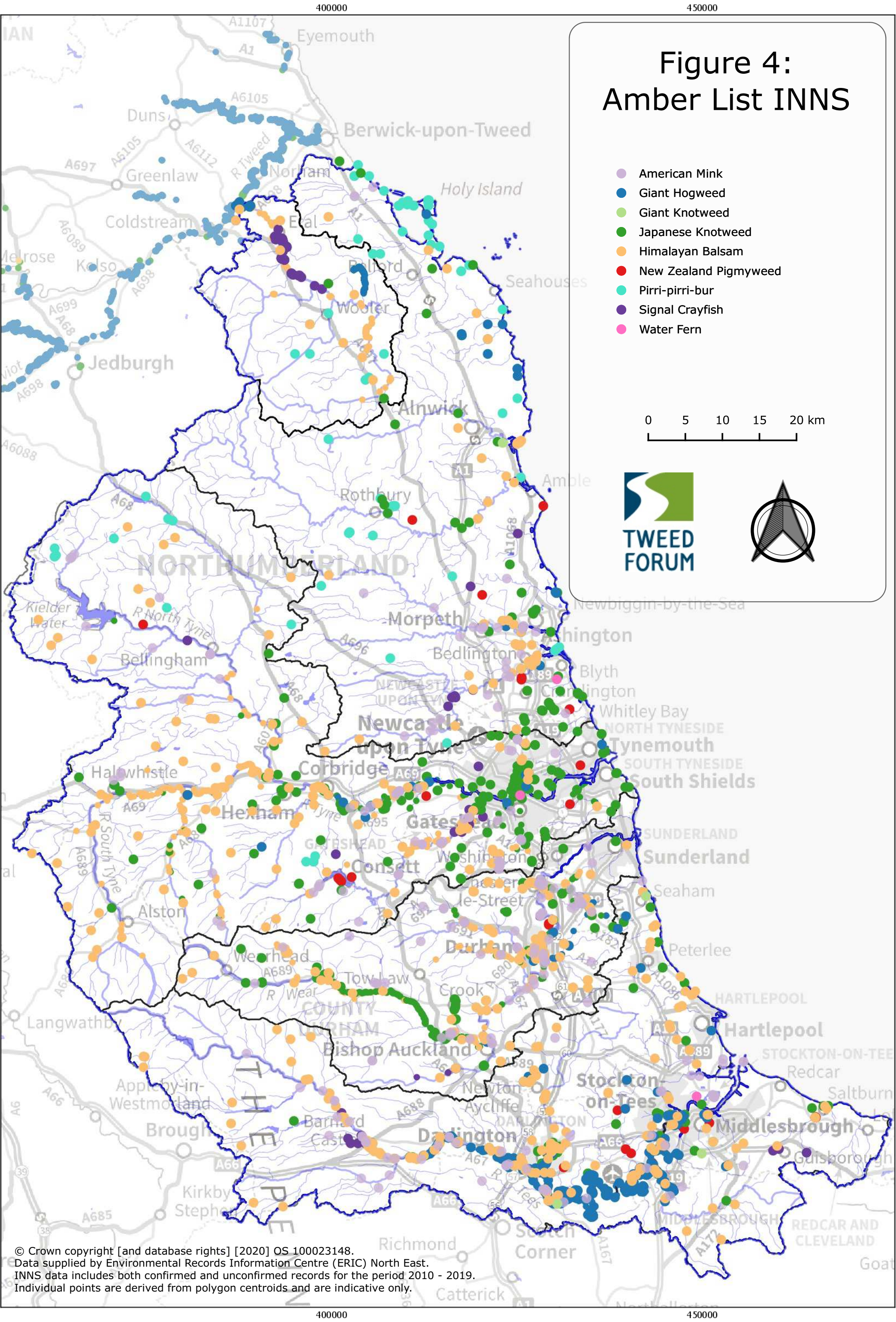
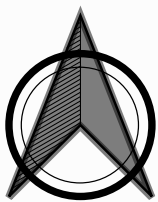


Figure 4:  
Amber List INNS

- American Mink
- Giant Hogweed
- Giant Knotweed
- Japanese Knotweed
- Himalayan Balsam
- New Zealand Pigmyweed
- Pirri-pirri-bur
- Signal Crayfish
- Water Fern

0 5 10 15 20 km



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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.

# Figure 5: Green List INNS

- Canadian Waterweed
- New Zealand Pigmyweed
- Nuttall's Waterweed
- Pink Purslane
- Rhododendron
- Snowberry

0 5 10 15 20 km

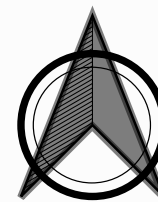


Table 5. Green List INNS: Species present or established in the region, whose eradication is currently not feasible and management is not a priority because of low impact or poor cost-effectiveness. (!) denotes a species of EU concern; (\*) GB Alert Species; (+) Schedule 9-listed where Section 14 of the Wildlife and Countryside Act 1981 applies.

Freshwater (Animal)	Freshwater (Plant)	Riparian
Red-eared terrapin ( <i>Trachemys scripta elegans</i> )	Canadian pondweed (+) <i>Elodea canadensis</i>	Monkey flower <i>Mimulus guttatus</i>
Pink salmon <i>Oncorhynchus gorbuscha</i>	Nuttall's pondweed (!) (+) <i>Elodea nuttalli</i>	Snowberry <i>Symphoricarpos albus</i>
		Rhododendron (+) <i>Rhododendron ponticum</i> & hybrids
		Summer lilac/Butterfly bush ( <i>Buddleia davidii</i> )

### 3.2 Management Options

Management options (e.g. prevention, rapid response and/or control) for each species were also assessed using information from the same sources as for risk and threat (Section 3.1). This information was used to identify the most appropriate management response to the introduction, spread and/or control of the identified INNS in the North East region.

Given that black-listed species are not present in the area, prevention is the management priority. However, if they are introduced then there should be either a GB or local level rapid response to either a) contain, or b) where feasible contain and eradicate, the founder population. Several of the black-listed species are also of national priority and as such the GB rapid response will be led by national government organisations. Response measures for the remaining species would require a regional or local response. The suggested rapid response measures and the level of response for the black-listed species in this strategy are presented in Table 6.

Table 6. GB rapid response species and suggested rapid response measures for local organisations for black-listed species.

GB Response	Local Containment	Local Containment & Eradication
Killer shrimp ( <i>D. villosus</i> )	Bloody red shrimp ( <i>H. anomola</i> )	Himalayan knotweed ( <i>P. wallichii</i> )
Demon shrimp ( <i>D. haemobaphes</i> )	Virile crayfish ( <i>O. virilis</i> )	Hybrid knotweed ( <i>F. japonica</i> v <i>sachalinensis</i> )
Water primrose ( <i>L. grandiflora</i> )	Red swamp crayfish ( <i>P. clarkii</i> )	Hottentot fig ( <i>C. edulis</i> )
Creeping water primrose ( <i>L. peploides</i> )	Spiny cheeked crayfish ( <i>O. limosus</i> )	Broad-leaved water milfoil ( <i>M. heterophyllum</i> )
Topmouth gudgeon ( <i>P. parva</i> )	Marbled crayfish ( <i>P. marmokrebs</i> )	Large-flowered waterweed ( <i>E. densa</i> )
American bullfrog ( <i>L. catesbeianus</i> )	Asian clam ( <i>C. fluminea</i> )	Water hyacinth ( <i>E. crassipes</i> )
Quagga mussel ( <i>D. rostriformis bugensis</i> )	Ponto-Caspian gobi (Various)	
	Mosquito fern ( <i>A. caroliniana</i> )	

Upon introduction, black-listed species will move to the red list, where species are only present in a small number of populations that are not well established. Management options for current red-listed species in this strategy (Table 7) are:

1. Containment and surveillance;
2. Rapid response to new populations (containment with possible treatment for eradication);
3. Where feasible, treatment to eradicate existing populations.

Table 7. Red-listed species and their management options.

Containment	Eradication/Control
Fanwort ( <i>C. caroliniana</i> )	Three-flowered leek ( <i>A. triquetrum</i> )
Parrot's feather ( <i>M. aquaticum</i> )	Common cord grass ( <i>S. anglica</i> )
Zebra mussel ( <i>D. polymorpha</i> )*	American skunk cabbage ( <i>L. americanus</i> )
Chinese mitten crab ( <i>E. sinensis</i> )	Floating pennywort ( <i>H. ranunculoides</i> )
	Curly waterweed ( <i>L. major</i> )

\* If this species is present in restricted ponds, destruction of the pond may be an option for its eradication.

If there is a failure to contain the spread of a red-listed species then it could be considered for reclassification to the amber list. Successful eradication of a red-listed species in the region would move it to the black-list.

Amber-listed species are established and widespread through the region. Generally, eradication is not feasible in the short term (five years) but control to reduce their populations is important in order to reduce their impact. Eradication may be possible in some areas if either, populations are small and have only been established for a short period, or there can be well-managed long-term (10+ years) treatment. Management options for these species are either containment and surveillance, or longer-term treatment/control and monitoring (Table 8).

Table 8. Amber-listed species and recommended management response.

Containment	Control – Long term eradication
American signal crayfish ( <i>P. leniusculus</i> )*	Pirri-pirri-bur ( <i>A. novae-zealandiae</i> )
New Zealand pigmyweed ( <i>C. helmsii</i> )	Giant hogweed ( <i>H. mantegazzianum</i> )
	Japanese knotweed ( <i>F. japonica</i> )
	Giant knotweed ( <i>F. sachalinensis</i> )
	Himalayan balsam ( <i>impatiens</i> )
	Water fern ( <i>Azolla filicoides</i> )
	American mink ( <i>N. vison</i> )
	Sea buckthorn ( <i>H. rhamnoides</i> )

\*American signal crayfish may be eradicated from small ponds but not open water or river systems.

With some species it may be possible to reduce populations of amber-listed species to an extent that they would then be moved to the red list. However, with others there are either currently no effective treatments (e.g. American signal crayfish in river systems) or treatment is required on an annual basis (e.g. *Azolla filicoides*<sup>38</sup>). A species from the amber list will move to the green list if control becomes too expensive or difficult (e.g. through changes in regulations that would impact control measures) thus significantly reducing cost-effectiveness.

<sup>38</sup> Treatment is through the annual introduction of a water beetle that eats the plant and clears visible growth from the infested waterbody. The beetle then dies off and the plant regenerates. Hence the need for repeated introduction of the beetle and longer- term control.

By definition green-listed species are those that have a relatively low impact in the region or whose control is not cost-effective (Table 9). As such, there are currently no management options for containment or treatment/control of green-listed species in the NE INNS strategy unless there are specific circumstances.

Specific circumstances that would trigger a management response would be:

1. A population that threatens the conservation status of a protected species;
2. An emergent population in an area of high aesthetic or recreational value;
3. A sudden increase in abundance within a locality, particularly if it has an ecological, economic and/or social impact.

Given that the above events would trigger a management response then there is a need for surveillance of green- as well as amber-, red- and black-listed species.

Table 9. Green-listed species and the reason for their categorisation.

Lower regional impact	Poor cost-effectiveness of control
Rhododendron ( <i>R. ponticum</i> + hybrids)	Nuttall's pondweed ( <i>E. nuttalli</i> )
Snowberry ( <i>S. albus</i> )	Red-eared Terrapin ( <i>Trachemys scripta elegans</i> )
Summer lilac ( <i>Buddleia davidii</i> )	Monkey flower ( <i>M. guttatus</i> )
Canadian pondweed ( <i>E. canadensis</i> )	
Pink salmon ( <i>O. gorbuscha</i> )*	

\*NB. It is not yet confirmed that pink salmon can successfully reproduce and thereby establish.

## 4. Pathways and Stakeholders

The 14 pathways for introduction and spread of the priority listed INNS above were identified from the GB Non-native Species Secretariat, CABI datasheets and the IUCN Global Invasive Species Database (Table 10). Half (7) of the pathways are common to both freshwater and riparian INNS, with four and three solely applicable to freshwater and riparian species respectively. All the priority species exhibit natural dispersal to a larger or lesser degree; but two species, pink salmon and American mink invade or spread solely through natural dispersal. American mink can travel over 40 km per year and the migratory feats of sea-going salmon often mean travelling hundreds of kilometres.

Table 10. Pathways of the identified priority freshwater and riparian species.

Freshwater & Riparian	Freshwater	Riparian
Garden escape - gardens & ponds	Coastal ballast	Garden waste
Intentional introduction	Freshwater ballast	Walkers, cyclists, dogs
Equipment - water sports & scientific/ecological management	Water/stock transfer	Debris and waste
Horticulture-pet trade	Contaminant	
Machinery & plant		
Improper INNS control & disposal		
Natural dispersal		

Misguided physical control of INNS can also lead to increased spread of riparian and aquatic plants such as Japanese and giant knotweed, and fanwort. There are now bans on the sale of the crayfish species and five species of listed aquatic plants: fanwort, floating pennywort, water primrose, parrot's feather and New Zealand pigmyweed (also known as Australian stonecrop). However, the banned aquatic plants have been known to contaminate sales of legal species as growers have had difficulty eradicating them from their nurseries. The contaminant pathway differs from horticulture which represents the number of species, for which there is a demand, that can be sold legally. Coastal ballast is included as it is a known pathway for the Ponto-Caspian gobies that have invaded waterways in eastern and western Europe. Equipment, either from water sports or that used by management organisations provides an important pathway for a wide range of INNS. Walkers and dogs are known pathways for the introduction and spread of pirri-pirri-bur and Himalayan balsam. As all species are either water-based or present in the riparian corridor, they can all be potentially dispersed by extreme flooding. However, this has not been included as a pathway, as flood mitigation or prevention is beyond the scope of this strategy.

The transfer of water, or water-based stock such as fish, provide a pathway for the greatest number of black-listed INNS, closely followed by introduction/spread via water sports equipment (e.g. angler's nets), trade and garden escapes (Fig. 6). Other important pathways for introduction to the North East catchments are intentional introduction and freshwater ballast from boats. As previously detailed, coastal ballast provides a route for the introduction, but not spread, of Ponto-Caspian gobies and the Asian clam. Garden waste, debris/waste and machinery and plant are identified as pathways for some riparian species but these may be more important pathways for spread rather than introduction.

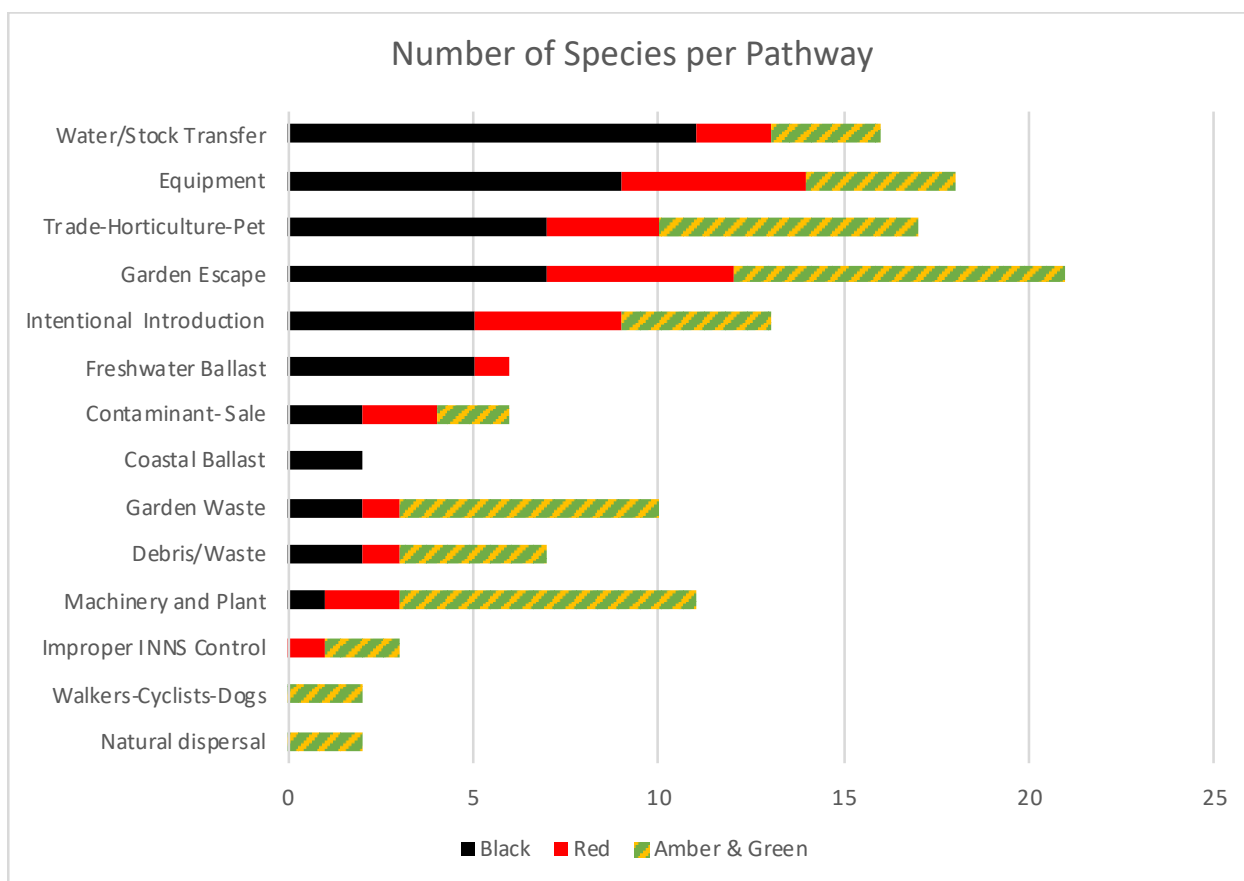


Figure 6. Known pathways for black-, red-, amber- and green-listed INNS.

Pathways for the introduction and spread of red-listed species are similar to those for black-listed species i.e. aquatic plants and invertebrates. Important pathways for the majority of amber and green species are horticulture, garden escapes, garden waste, machinery, debris and waste.

The engagement of key stakeholders is imperative for the success of this plan. Regulatory agencies and bodies associated with management include:

<b>Regulatory Bodies</b> Environment Agency Defra Natural England Local Councils <sup>39</sup> River Tweed Commission	<b>Catchment Management</b> Environment Agency Tweed Foundation River Tweed Commission Northumberland Rivers' Trust Tyne Rivers Trust Wear Rivers Trust Tees Rivers Trust
<b>Recreation</b> Angling Associations Walkers Canoeists British rowing	<b>Conservation and Biodiversity</b> Borders Forest Trust Lothian & Borders Wildlife Crime Unit Northumberland Local Biodiversity Action Group Northumberland National Park Authority

<sup>39</sup> Scottish Borders Council, Northumberland County Council, Durham County Council, Darlington, Gateshead, Hartlepool, Middlesbrough, Newcastle upon Tyne, North Tyneside, Redcar and Cleveland, South Tyneside, Stockton and Sunderland.

Royal Yachting Association Recreational 4x4 vehicles Mountain biking Horse riding/British eventing	Northumberland Wildlife Trust Durham Wildlife Trust Tees Wildlife Trust Royal Society for the Protection of Birds Scottish Borders Local Biodiversity Action Group ERIC Environmental Records Information Centre NE North Pennines AONB
<b>Transportation</b> National Rail Port authority	<b>Land Resources</b> Countryside Landowners Association Forestry Commission National Farmers Union National Trust
<b>Water Resources</b> Northumbrian Water Durham Water Services	

Organisations and stakeholders that are involved with the identified pathways, and as such are important for the prevention of introduction and spread of INNS in the North East catchments are presented in Table 11. Changing the behaviour and/or working practices of the identified stakeholder groups to better address the threat of INNS is essential to the success of this strategy and INNS management in the North East region.

Table 11. Pathways and their associated stakeholder groups.

Pathway	Stakeholders
Water and stock transfer	Northumbrian Water, EA, RTC, still water fisheries, fish farmers, Canal and Rivers Trust
Equipment: Contaminated equipment (e.g. from anglers, canoeists, management activities, scientists)	Local sailing/canoe/water sports organisations, anglers, angling associations, fishing agents and tackle shops, management organisations and research institutions
Trade: Sale from garden, pet or pond centres	Horticultural trade association, ornamental fish producers
Garden escapes - ponds, gardens, water gardens	EA, planning authorities, fish farmers, landowners, members of the public, horticulture publications
Intentional introduction or planting	Landowners, members of the public, local councils
Ballast water of freshwater vessels	Northumbrian Water, sailing, canoe and water sports organisations, Canal and Rivers Trust
Contaminated legal sales of aquatic plants	EA, growers, garden centres, aquatic gardeners
Coastal ballast	EA, Tees Port Authority, Berwick Harbour Commission
Garden waste	Gardeners, local councils, EA
Debris/waste	EA, local councils, environmental health, quarries, building contractors
Machinery, plant and 4x4 vehicles	EA, local councils, quarries, building contractors, Canal and Rivers Trust
Improper INNS control and disposal e.g. cutting and dumping without treatment	EA, local councils, environmental health, riparian owners, members of the public
Walkers, cyclists, dogs, wild swimmers	Walkers, off-road cyclists, wild swimmers, dog walkers, residents and tourists
Railway lines	National Rail

Management measures required for the reduced risk of introduction and spread of the listed INNS will include but will not necessarily be limited to:

- Implementation of ballast pumping regulations in ports;

- Implementation of riparian INNS control on railways or other restricted access transportation networks;
- Raising awareness of how INNS can be introduced and spread with target stakeholder groups;
- Development of effective biosecurity protocols and/or procedures;
- Training of target stakeholders in biosecurity protocols;
- Establishment of biosecurity stations at key locations;
- For water and stock transfer:
  - Risk assessments across transfer networks;
  - Mitigation measures identified and implemented;
- Development of pathway plans;
- Introduce biosecurity requirements into public contracting procedures and encourage use in private sector contracts;
- Training of garden centre staff in the identification of aquatic INNS;
- Investigate with garden centres and pet trade for issuance of awareness materials to be given to customers making purchases of INNS. Implement if agreement possible;
- Signage (footpaths, around recreation areas) to:
  - Help report INNS to the right place (rapid response) (ERIC);
  - Warning of areas (with crayfish for example – not go in etc);
  - Reminder to check, clean, dry.

Although it is desirable that the appropriate management measures be implemented with all stakeholders across the region, this will not be possible given the limited resources available for INNS management. Therefore, to maximise the effectiveness of INNS management, work needs to be focussed on stakeholder groups within important geographical areas.

## 5. Important Geographical Areas

Important geographical areas have been identified as those of importance to conservation and WFD classification, and locations that are:

1. Potential receptor sites for newly introduced INNS;
2. Sources for the spread of existing INNS populations;
3. Previously treated areas that have been cleared of INNS but require continued surveillance.

Areas of conservation importance are defined as those with a conservation designation such as Special Area of Conservation (SAC), Special Protected Area (SPA), Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR) or Local Nature Reserve (LNR). INNS are recorded to impact 40 of the 253 SSSIs in the North East (Fig. 7) with only 4 of these having a recorded management response to that impact.

INNS also pose a significant challenge for the 2021 river basin management plans and WFD classification. A 2019 Environment Agency report<sup>40</sup> states that the impact of INNS on waterbody status and resilience is currently underestimated. The report further states that INNS with known ecological impacts are established in 1100 waterbodies (29%), and 400 of those waterbodies have at least two species present. The North East is no exception with high-impact INNS found in a significant number of “less than good” status waterbodies (Fig. 8). Presence of these INNS is likely preventing waterbodies achieving good ecological status. INNS also interact with other pressures such as nutrients and physical modification to compound their effects. Updated guidance for river basin planning is expected to reflect this impact on good ecological status unless there are “clear reasons not to do so”. The Environment Agency estimates that 85% of lakes and 71% of rivers and transitional waters are at risk of deterioration because of INNS.

Potential receptor areas<sup>41</sup> and source sites<sup>42</sup> have been identified from the pathways of the priority species and the stakeholders involved in those pathways. Successful INNS management will reduce the risk of introduction of black-listed species and reduce the spread of other identified species. This entails disrupting the pathways that have the most potential to introduce and spread the listed species. Identification of high-risk receptor areas and areas that act as the source for the spread is essential to a prioritised strategy. Surveillance of priority receptor areas should also be a management priority. Receptor and source areas can be identified through their use; and in the case of source areas, their link or proximity to existing INNS populations.

Other sites of importance are those where INNS have been successfully removed. Experience from the Tweed and elsewhere shows that there can be regeneration of INNS such as giant hogweed or Japanese knotweed in areas that have not had any observed growth for a number of years. These areas should also be prioritised for surveillance. Failure to do so could result in re-establishment of INNS populations and

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<sup>40</sup> 2021 River Basin Management Plans: Invasive non-native species challenge (October 2019). EA Report.

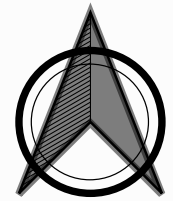
<sup>41</sup> A receptor area or site is one that could provide an entry point for previously undetected INNS. An example could be a lake used by water sports enthusiasts and/or anglers. A high-risk site has international users, or national users from regions of the UK where listed INNS are present.

<sup>42</sup> Source areas or sites are those that have population(s) of INNS adjacent, or linked to, a potential pathway. Examples include rail-river crossings or industrial areas with untreated populations of INNS.

# Figure 7: SSSI's with INNS Threat

- SSSI with recorded INNS threat (Site name labelled)
- SSSI

0 5 10 15 20 km



650000

650000

600000

600000

550000

550000

500000

500000

# Figure 8: WFD Classification & Significant INNS

## Significant INNS\*:

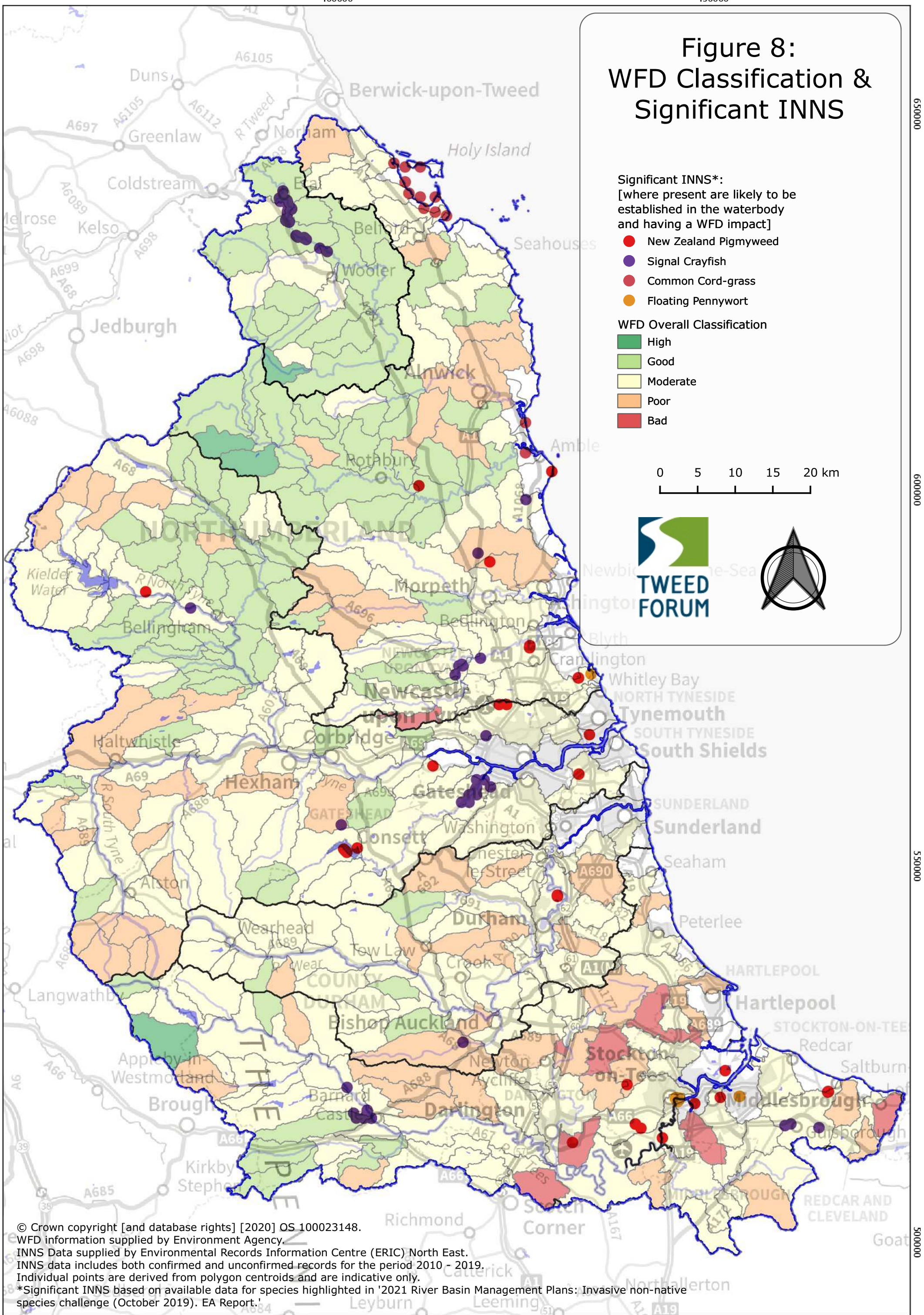
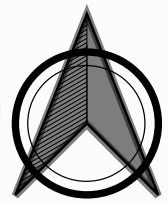
[where present are likely to be established in the waterbody and having a WFD impact]

- New Zealand Pigmyweed
- Signal Crayfish
- Common Cord-grass
- Floating Pennywort

## WFD Overall Classification

- High
- Good
- Moderate
- Poor
- Bad

0 5 10 15 20 km



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WFD information supplied by Environment Agency.

INNS Data supplied by Environmental Records Information Centre (ERIC) North East.

INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.

Individual points are derived from polygon centroids and are indicative only.

\*Significant INNS based on available data for species highlighted in '2021 River Basin Management Plans: Invasive non-native species challenge (October 2019). EA Report.'

loss of the investment made in their initial removal. In the following section examples of these different types of areas along with a brief description of the catchment in which they occur are presented.

## 5.1 Till

The River Till (a tributary of the Tweed) and its main tributaries the Bowmont-Glen, Breamish and Wooler Water/Harthope Burn have a total river length of 600 km and a catchment area of 692 km<sup>2</sup>. All of these main watercourses are designated SSSI and SAC due to their high conservation and ecological importance. Particularly, they support important ground and water beetle populations and aquatic plant species such as Water-crowfoot and the seasonal blooming of the diatom *Didymosphenia* (species of international significance). The headwaters are also important for otter, Atlantic salmon and native species of lamprey.

The major urban settlement in the Till catchment, Wooler, accounts for a large proportion of the population, and the remainder of the population is dispersed among small rural communities. Employment in the area is heavily dependent on farming, tourism and recreation. The Till is part of the world-renowned Tweed salmonid fishery, previously valued at £24 million a year to the local economy, supporting over 500 jobs.

Key aspects of INNS presence in the Till catchment (see Figure 9):

- Red list: American skunk cabbage at Ingram, at the top of the catchment, located on the border of the National Park and NNR.
- Himalayan balsam chemically controlled annually on the river Till; new sightings have occurred on Bowmont Glen (tributary of Till). Trial of rust fungus ongoing.
- Giant hogweed outbreak along the Hetton Burn.
- American signal crayfish on main stem of lower Till that could act as a source for contamination of water courses with populations of white-clawed crayfish.
- Pirri-pirri-bur in uplands, located in the National Park and NNR.
- *Crassula* in one agricultural irrigation pond.

Main Pathways:

- Industrial companies and local authority – Giant hogweed
- Domestic gardens – American skunk cabbage
- Roadside highway maintenance sites – Japanese knotweed
- Urban areas – Japanese knotweed and Himalayan balsam
- Footpaths – pirri-pirri-bur and Himalayan balsam
- Water sports/angling equipment – American signal crayfish

Priority areas for prevention (indicated by green star in Figure 9):

- River Till SSSI and SAC
- Northumberland National Park and The Cheviots (uplands)

# Figure 9: Till Catchment Important Areas

★ Important Area: Prevention

Amber List INNS

- American Mink
- Giant Hogweed
- Himalayan Balsam
- Japanese Knotweed
- Pirri-pirri-bur
- Signal Crayfish

Red List INNS

- ◆ American Skunk-cabbage
- ◆ Common Cord-grass
- ◆ Sea-buckthorn

SSSI

SPA

SAC

RAMSAR

National Nature Reserves

Local Nature Reserves

National Park

AONB

0 5 10 km

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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.



- Tributaries free of INNS and “*refugia*”, such as areas protected by natural and artificial barriers. Examples of natural barriers are the College Burn upstream of the Hethpool Linns, upstream of Harthope Spout, and the waterfall on the Carey Burn.

## 5.2 Northumberland

The Northumberland Rivers catchment comprises the following river systems: Aln, Blyth, Coquet, Pont, Wansbeck, Lyne and the smaller coastal streams. The River Coquet is 90 km, from its tributaries south of Cheviot summit to the sea below Warkworth. As a relatively unmodified fast-flowing upland river supporting characteristic fauna and flora, the Coquet is of key significance in the national resource for nature conservation and is a SSSI. The lower and middle reaches of the river provide undisturbed habitat for otters. The rich insect life also creates feeding grounds for bat colonies which roost and rear their young within the valley. The Coquet valley has several rare woodlands which are long established, relatively unmodified by planting and retain semi-natural plant communities. There are important salmon populations, on the River Aln and the River Coquet which provide income from the fishery to the local economy. The Wansbeck has one of the best populations of native white-clawed crayfish in western Europe. The Northumberland Crayfish Conservation Steering Group has unveiled a new “Crayfish Area Conservation Strategy”.

The Berwickshire and Northumberland Coastline is designated SAC and is characterised by an extensive and diverse stretch of sand and mudflats supporting a diverse range of infauna. The areas of Lindisfarne, Budle Bay and the surroundings of Holy Island are the most extensive in north east England, with the largest intertidal beds of narrow-leaved eelgrass *Zostera angustifolia* and dwarf eelgrass *Z. noltei* on the east coast of England, a diverse infauna, and some large beds of mussels *Mytilus edulis*. Some of the bays along the open coast have mobile sediments, with populations of sand-eels *Ammodytes* sp., small crustaceans and polychaete worms. More sheltered sediments have very stable lower shore communities of burrowing heart-urchins *Echinocardium cordatum* and bivalve molluscs. Coastal areas of national importance for their bird populations or plant communities are protected through designation as SSSIs, and areas of international importance are also designated as SPAs and Wetlands of International Importance under the Ramsar Convention (RAMSAR Sites). Dune grasslands of international importance are designated as SACs.

Key aspects of INNS presence in the Northumberland Rivers catchment (see Figure 10):

- Red list: main issue is sea buckthorn on coastline and Northumberland Coast AONB, SPA, SSSI, SAC and RAMSAR.
- Pirri-pirri-bur is an issue on the coastline and within the Northumberland Coast AONB, SPA, SSSI, SAC and RAMSAR site. It is also an issue across tourist locations e.g. Hadrian’s Wall, National Trust sites, forests, cheviot and Simonside hills.
- Small populations of giant hogweed inland and near coastline.
- Himalayan balsam and Japanese knotweed have their highest abundances in urban areas such as Rothbury, Ashington, and Cramlington.
- River Coquet is a SSSI and generally has low abundances of INNS.
- River Pont and Blyth have issues with American signal crayfish.
- Rivers Aln and Wansbeck are important refugia for white-clawed crayfish.
- Sporadic populations of giant hogweed.

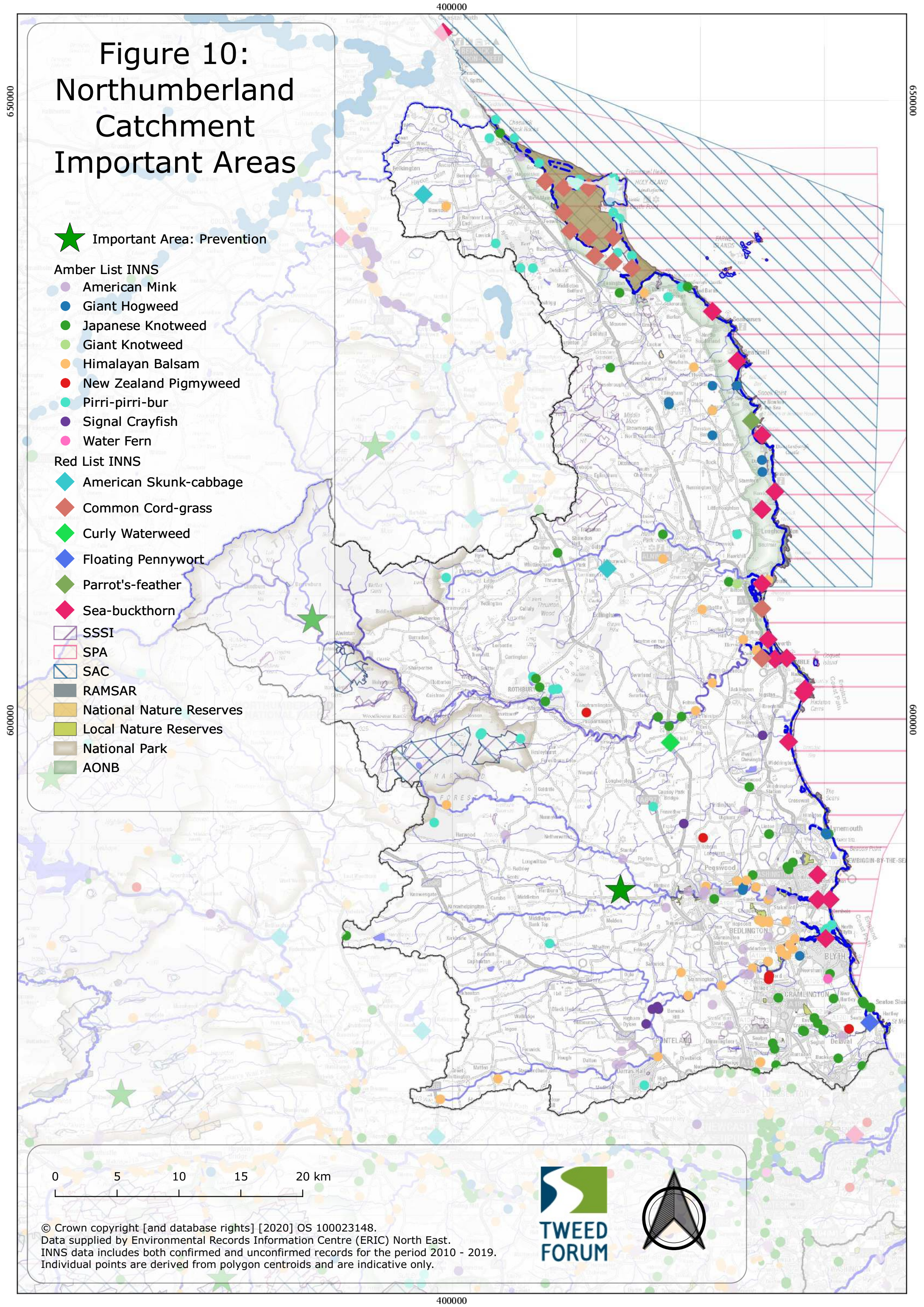


Figure 10:  
Northumberland  
Catchment  
Important Areas

★ Important Area: Prevention

Amber List INNS

- American Mink
- Giant Hogweed
- Japanese Knotweed
- Giant Knotweed
- Himalayan Balsam
- New Zealand Pigmyweed
- Pirri-pirri-bur
- Signal Crayfish
- Water Fern

Red List INNS

- American Skunk-cabbage
- Common Cord-grass
- Curly Waterweed
- Floating Pennywort
- Parrot's-feather
- Sea-buckthorn

- SSSI
- SPA
- SAC
- RAMSAR
- National Nature Reserves
- Local Nature Reserves
- National Park
- AONB



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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.



Main pathways:

- Tourist transmission of pirri-pirri-bur
- Recreation – Northumberland Coast AONB, SPA, SSSI, SAC and RAMSAR
- Urban areas – Japanese knotweed and Himalayan balsam
- Transport – A1 and East Coast Mainline transporting INNS along coast
- Construction activities in catchment

Priority areas for prevention (indicated by star in Figure 10):

- River Coquet SSSI
- Upper catchment – Northumberland National Park
- Aln and Wansbeck for white-clawed crayfish
- Whole region for low abundance species that could spread such as giant hogweed

### 5.3 Tyne

The Tyne catchment covers an area of 2,936 km<sup>2</sup> and is recognised for the stark contrast between urban and natural environments. The south west uplands fall within the North Pennines AONB, and the mid and north parts of the catchment are part of Northumberland National Park. The high ground is dominated by moorland and peatland. The North Tyne above Kielder is dominated by Kielder Water (reservoir) and Kielder Forest Park (commercial forestry). Both offer excellent recreational opportunities as well as unique features, such as Kielder observatory in the Northumberland International Dark Sky Park. The Salmon Centre at Kielder mitigates the impacts of Kielder dam on spawning migratory fish.

Tributaries on the Tyne include Cockshaw Burn, Devils Water, Red Burn, Stocksfield Burn, Whittle Burn. Designations include Hadrian's Wall World Heritage Site, and North Pennine Moors SAC and SPA. The River Derwent flows from the North Pennine Moors SAC to the tidal limit. Urban areas predominate in the lower half of the catchment; with moorland and Derwent Reservoir, a centre for recreation, dominating the landscape upstream. The areas around the tidal areas, estuary and coast are heavily urbanised; and industry is focused along the Tyne valley, from the coast to Hexham 40 km inland, though with greater density in the urban areas around Newcastle/Gateshead.

Key aspects of INNS presence in the Tyne catchment (see Figure 11):

- Red list: mostly found in and around Newcastle (e.g. sea buckthorn and curly waterweed).
- Mink numbers low in North Tyne now after previous eradication measures and monitored through the "Restoring Ratty" project.
- Main stem of Tyne and downstream of Derwent Reservoir host the main populations of amber-listed species, particularly Himalayan balsam and Japanese knotweed.
- High abundance of Japanese knotweed in Newcastle.
- River Don, Ouseburn and Team: amber-listed species such as Himalayan balsam common and Japanese knotweed localised.
- North Tyne generally has a low number of INNS records compared to South Tyne, with exception of pirri-pirri-bur in Kielder Forest.

# Figure 11: Tyne Catchment Important Areas

★ Important Area: Prevention

## Amber List INNS

- American Mink
- Giant Hogweed
- Japanese Knotweed
- Giant Knotweed
- Himalayan Balsam
- Himalayan Knotweed
- New Zealand Pigmyweed
- Pirri-pirri-bur
- Signal Crayfish
- Water Fern

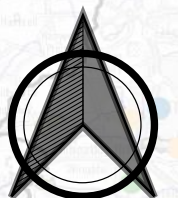
## Red List INNS

- ◆ American Skunk-cabbage
- ◆ Common Cord-grass
- ◆ Curly Waterweed
- ◆ Floating Pennywort
- ◆ Sea-buckthorn
- ◆ Zebra Mussel

- ▨ SSSI
- ▨ SPA
- ▨ SAC
- ▨ RAMSAR
- ▨ National Nature Reserves
- ▨ Local Nature Reserves
- ▨ National Park
- ▨ AONB

0 5 10 15 20 km

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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.



- One site of American signal crayfish on North Tyne upstream of known white-clawed crayfish populations. It is not yet known if the population is infected with crayfish plague (*Aphanomyces astaci*). American signal crayfish are also found in other urban catchments e.g. Derwent.

#### Pathways:

- Riparian spread of Himalayan balsam
- Riparian spread of American signal crayfish and crayfish plague (*A. astaci*)
- Footpaths and recreation in North Tyne (pirri-pirri-bur)
- Reservoirs spreading crassula (Derwent Reservoir)
- Transport - railway line and A69 on South Tyne
- Urban areas - Japanese knotweed

#### Priority areas for prevention (indicated by star in Figure 11):

- North Pennines AONB, SSSI, SAC and SPA. Low number of INNS and an important population of water voles.
- White-clawed crayfish and freshwater pearl mussel are present in the North Tyne and tributaries, particularly in the vicinity of Greenlee Lough SSSI and SAC.
- Rede has a low incidence of INNS and has both white-clawed crayfish and freshwater pearl mussel.
- North Tyne open water / reservoirs.
- Whole catchment for giant hogweed.
- Low number of INNS at Newcastle coastline.

## 5.4 Wear

The River Wear rises from the coast to the Pennines. Most of the upper Wear is within the North Pennines AONB, characterised by upland heather and peat moors, and is within the Moor House SAC and North Pennine Moors SPA. The area is rural, having a long history of hill farming and mining. Reservoirs at Burnhope, Tunstall and Waskerley provide water suitable for domestic use. Fish migration is restricted by natural waterfalls. The total catchment area is approximately 1080 km<sup>2</sup> and the main river is approximately 97 km long. There are many tributaries, the largest being the Rivers Browney and Gaunless where the most significant protected area is in the North Pennine Moors SAC/SPA. The source area of the catchment is characterised by grass moorland with heather and blanket bog; and the dominant land use in the river valley is agricultural, changing from pastoral agriculture in the west to more mixed arable farming in the east, with various-sized urban settlements along the river's course. The Wear has an industrial heritage; these activities, such as coal mining, have influenced the landscape.

#### Key aspects of INNS presence in the Wear catchment (see Figure 12):

- Red list: most red-listed species have been recorded in the lower catchment particularly sea buckthorn and curly waterweed. Importantly there are two records of zebra mussel in the middle catchment, and one record of American skunk cabbage.
- Most amber-listed INNS are concentrated on the main River Wear downstream from the Rookhope Burn confluence, and from the River Browney. The largest concentrations are around Durham.
- Japanese knotweed and Himalayan balsam are widespread throughout these locations.

# Figure 12: Wear Catchment Important Areas

★ Important Area: Prevention

## Amber List INNS

- American Mink
- Giant Hogweed
- Japanese Knotweed
- Giant Knotweed
- Himalayan Balsam
- Himalayan Knotweed
- New Zealand Pigmyweed
- Pirri-pirri-bur
- Signal Crayfish
- Water Fern

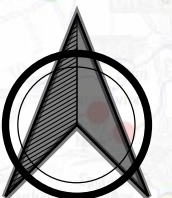
## Red List INNS

- American Skunk-cabbage
- Curly Waterweed
- Sea-buckthorn
- Three-cornered Garlic
- Zebra Mussel

- SSSI
- SPA
- SAC
- RAMSAR
- National Nature Reserves
- Local Nature Reserves
- National Park
- AONB

0 5 10 15 20 km

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Data supplied by Environmental Records Information Centre (ERIC) North East.  
INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.



- Giant hogweed is only recorded in the lower catchment originating at Old Beck.
- There are few records of INNS in the River Gaunless, Waskerley Beck, Tursdale Beck, and smaller upper tributaries (excluding Rookhope Burn).

#### Pathways:

- Roads from urban areas, e.g. Rookhope, Durham and Crook
- Recreation and abstraction from water bodies with zebra mussel
- Construction: debris and plant.

#### Priority areas for prevention (indicated by green star in Figure 12):

- North Pennines AONB, SSSI, SAC and SPA. Low number of INNS and possible population of water voles.
- Bedburn Beck due to low number of INNS.
- Lamprey populations in upper tributaries.
- Water bodies infested by zebra mussel.

## 5.5 Tees

The River Tees rises on the eastern slope of Cross Fell in the North Pennines, and flows eastwards for 137 km to reach the North Sea between Hartlepool and Redcar near Middlesbrough. The head of the valley is surrounded by the moorland and hills of the North Pennine AONB. Cauldron Snout is a cascade on the upper reaches of the River Tees and lies immediately below the dam of the Cow Green Reservoir. The Middle Tees is typified by more intensive agriculture. Significant tributaries include the River Greta; a large proportion of which forms part of the North Pennine Moors SPA/SAC near Bowes. Protected areas in the lower catchment include the Teesmouth and Cleveland Coast SPA, and bathing waters at Seaton Carew North and Centre, North Gare and Redcar Coatham.

#### Key aspects of INNS presence in the Tees catchment (see Figure 13):

- Red list: Concentrated in urban and coastal areas (sea buckthorn), and fresh water aquatic and riparian plants in vicinity of River Skerne (three-cornered garlic and curly waterweed).
- The upper catchment is relatively free of INNS, except for the occasional Himalayan balsam population in designated areas. There are however increased INNS populations downstream of the River Greta confluence
- The River Skerne is a major source of INNS, particularly Himalayan balsam and Japanese knotweed.
- Large populations of Himalayan balsam and Japanese knotweed along coastline, between A19 and coast in the northern catchment.
- Coastal populations of red- and amber-listed INNS are in conservation designated areas.

#### Pathways:

- Illegal tipping of landscape and garden waste
- Dog walkers in upper catchment spreading Himalayan balsam, particularly in conservation designated areas

400000

450000

Figure 13:  
Tees Catchment  
Important Areas

0 5 10 15 20 km



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INNS data includes both confirmed and unconfirmed records for the period 2010 - 2019.  
Individual points are derived from polygon centroids and are indicative only.

★ Important Area: Prevention

#### Amber List INNS

- American Mink
- Giant Hogweed
- Japanese Knotweed
- Giant Knotweed
- Himalayan Balsam
- Himalayan Knotweed
- New Zealand Pigmyweed
- Pirri-pirri-bur
- Signal Crayfish
- Water Fern

#### Red List INNS

- ◆ American Skunk-cabbage
- ◆ Curly Waterweed
- ◆ Floating Pennywort
- ◆ Sea-buckthorn
- ◆ Three-cornered Garlic
- ◆ Zebra Mussel
- ▨ SSSI
- ▨ SPA
- ▨ SAC
- ▨ RAMSAR
- ▨ National Nature Reserves
- ▨ Local Nature Reserves
- ▨ National Park
- ▨ AONB

550000

550000

500000

500000

400000

450000

- Coastal recreation spreading amber- and red-listed species
- Industrial areas, e.g. giant hogweed source at Teesside Industrial Estate on Bassleton Beck
- Urban areas at the top of sub-catchments, e.g. Newton Aycliffe, Chilton and Ferryhill
- Railway line, e.g. Japanese knotweed on East Coast Mainline at Darlington

Priority areas for prevention (indicated by green star in Figure 13):

- Areas with low incidences and abundances of INNS: e.g. Staindrop sub-catchment in north and Upper Skerne
- North Pennines AONB, SSSI, SAC and SPA particularly areas where INNS are absent are only present in low number of INNS and/or could have populations of water voles
- North York Moors National Park (as above)
- Native white-clawed crayfish populations within the River Boulder

## 6. Planned and Existing INNS Management Initiatives

Information on current and planned INNS management initiatives came from a survey of practitioners in the North East catchments. The information provided demonstrated that control of established (typically widespread and abundant) populations of INNS provides the focus for the majority of current or planned projects within each of the catchments in the North East region (Table 12). The exceptions are the Coastal Mitigation Service that aims to prevent the spread of pirri-pirri-bur and Northumbrian Water's plans to assess pathways of risk for all INNS as part of work with the Environment Agency to install biosecurity equipment at key sites over the next business plan cycle (2020-2025). The focus on control was likely brought about through a combination of reacting to the establishment and rapid spread of the target species in areas important to the implementers, combined with the relative ease of securing funding for their removal compared with prevention of their introduction. It is much easier to demonstrate a positive outcome if that outcome is the removal of a species rather than the prevention of its introduction.

Table 12. Current and planned INNS initiatives in the North East region.

Project	Description
<b>Till Catchment</b>	
Tweed INNS Programme <sup>43</sup>	<p>The Tweed Invasives Programme was initiated in 2002 covering the whole of the Tweed catchment. Species targeted are:</p> <ul style="list-style-type: none"> <li>- Giant hogweed (<i>GH</i>)</li> <li>- Japanese knotweed (<i>JK</i>)</li> <li>- Himalayan Balsam (<i>HB</i>)</li> <li>- North American Skunk Cabbage (<i>SC</i>)</li> </ul> <p>Successful ongoing control of GH means that the project is now focussing on its eradication. JK and SC control are ongoing. JK now not a pressing issue on Tweed and all sites continue to reduce in size each year. Skunk cabbage: new reported sightings occur each year, but existing sites are being controlled or have been eradicated. Control of HB has been ongoing since 2007 Results show that chemical control will not bring about eradication in established existing populations as this method cannot target every individual throughout the growing season and it is not cost-effective. Chemical control on small new outbreaks will be effective if the source is targeted. Tweed Forum is taking part in a trial<sup>44</sup> of a HB bio-control programme as a long-term control method.</p>
<b>Northumberland Catchment</b>	
Northumberland Crayfish Strategy	The strategy was formulated by the Northumberland Catchment Partnership made up of Northumbrian Water (NW), EA, Northumberland Rivers Trust, National Trust, Northumberland Wildlife Trust, Natural England, Northumbrian Water Group, Northumberland County Council, Tyne Rivers Trust, and Northumberland National Park Authority. NW is also investigating transfer pathways with universities.
Japanese knotweed & giant hogweed control	Local control programme by Northumberland Rivers Trust, implemented in 2017/18 on the Coquet, that eliminated signs of growth of Japanese knotweed. There was also some limited control of giant hogweed at two sites on the Wansbeck at Bothal Weir and Wallington during 2018.
Coastal Mitigation Service	Run by Northumberland County Council with the aim "to prevent any net increase in disturbance to SSSI and SPA bird species arising from increased recreational pressure on the coast caused by new development, and similarly to ensure no net increase in the rate of spread of pirri-pirri-bur arising from increased recreational pressure on dune grasslands caused by new development. This will be achieved by raising awareness and promoting behavioural change among visitors to the coast and implementing projects to manage visitor access, improve bird habitats and remove

<sup>43</sup> <https://tweedforum.org/our-work/projects/tweed-invasives-project/>

<sup>44</sup> See [www.cabi.org](http://www.cabi.org)

Project	Description
	pirri-pirri-bur.” This will be achieved through initially attempting to change behaviour through increased awareness. Wardens will report to a Steering Group who will monitor impact and recommend introduction of other measures if required.
Northumberland Wildlife Trust (NWT)	NWT is undertaking <i>ad hoc</i> control of Himalayan balsam and giant hogweed and monitoring of New Zealand pigmyweed on their reserves.
<b>Tyne Catchment</b>	
Northumberland National Park Authority	Removal of small populations of Himalayan balsam on Brackies Burn (south Tyne) and support given to water vole restoration, including monitoring of mink.
Tyne Invasive Non-Native Species (TINNS) <sup>45</sup>	Catchment based initiative of Tyne Rivers Trust for control of Japanese knotweed, giant hogweed and Himalayan balsam and monitoring of signal crayfish (North Tyne only), American skunk cabbage and mink.
Kielder Water Vole Re-introduction	Mink control was undertaken in the Kielder area (upper North Tyne catchment) as part of a trial for the re-introduction of upland water voles by the Forestry Commission.
<b>Wear Catchment</b>	
Wear Invasive Non-Native Species Project (WINNS) <sup>46</sup>	An 18-month (January 2019–June 2020) catchment-based project by Wear Rivers Trust in partnership with Durham County Council for the prevention, control and monitoring of Japanese knotweed, giant hogweed and Himalayan balsam.
Durham Wildlife Trust (estate-based)	Ongoing estate-based /farm holding control of Japanese knotweed and Himalayan balsam taking place between the Rivers Tyne and the Wear and covering the south and north of those respective catchments.
<b>Tees Catchment</b>	
TOPHOG (Operation Hogweed) <sup>47</sup> Alien Invaders <sup>48</sup> TEES INNS-OUT	The Tees Rivers Trust has implemented several consecutive projects for the prevention, control and monitoring of the riparian INNS, giant hogweed, Japanese knotweed and Himalayan balsam. The INNS-OUT project terminated in 2015 and was succeeded by Alien Invaders that was completed in 2018. The TOPHOG project concentrates efforts on giant hogweed and is scheduled to be completed in 2023.
<b>Regional</b>	
Naturally Native	Durham Wildlife Trust in partnership with Durham Wildlife Trust, Northumberland Wildlife Trust, Tyne Rivers Trust, Wear Rivers Trust, Tees Rivers Trust, Forestry England, North Pennines AONB, Natural England, EA and nine local authorities have developed a 3-year North East Region mink control initiative that has been submitted for Delivery Phase funding to the NHLF. Funding will support 3 project officers.
Northumbrian Water	Planned installation of security measures at recreational sites around reservoirs. Annual control of Himalayan balsam, Japanese knotweed and giant hogweed at various sites. Will be supporting PhD study analysing the risk of American signal crayfish transfer from north Tyne to the Hallington reservoir.

With the exception of the Tees giant hogweed initiative and the Tweed Invasives Programme<sup>49</sup>, most initiatives have been implemented on a typically 3–5 year project timeframe with some examples of even shorter duration. Both the longer-term projects clearly demonstrate the need for well-managed long-term control programmes to locally eradicate or significantly reduce the ongoing cost of established and widespread INNS, even when effective treatments are available and practical to use. The short durations for initiatives are a consequence of a reliance on project funding. Project funding often demands the demonstration of innovation and/or short-term demonstrable results. Failure to meet those criteria reduces the chances to secure initial or subsequent funding. Competition for funding between

<sup>45</sup> <https://www.tyneriverstrust.org/project/invasive-species/>

<sup>46</sup> <https://wear-rivers-trust.org.uk/>

<sup>47</sup> <http://teesriverstrust.org/services/tophog/>

<sup>48</sup> <https://www.riverteesrediscovered.com/tees-alien-invaders>

<sup>49</sup> The Tweed Invasives Project: 18 years of catchment-wide control (*in prep*)

practitioners could also reduce the opportunities for demonstrable results on a geographical scale meaningful to the possible eradication or low-cost long-term control of the target INNS.

Catchment-based invasive non-native (INN) plant control initiatives mainly focus on larger and/or established populations of giant hogweed, Himalayan balsam and/or Japanese knotweed. These species are also controlled on an asset or estate basis by Wildlife Trusts and the Environment Agency; as is *Rhododendron spp.* by the Forestry Commission (FC). The FC also offer incentives to private foresters for *Rhododendron* control. Some of these estate/asset-based initiatives take place in catchments where larger control initiatives are underway. However, there has been no reporting of cooperation or strategic collaborative approaches. In addition to these four species, there is also a growing recognition of the threat posed by other INN plant species such as American skunk cabbage on the Till and Tyne and the opportunity for early action for eradication or effective control.

In terms of the effectiveness of these control initiatives, significant reductions in distributions and abundance with local eradication of giant hogweed have been reported on the Till/Tweed and two relatively small areas on the Wansbeck now no longer have any visible signs of growth. The information received did not indicate the effectiveness of the other control initiatives. Although areas may seemingly be clear of INNS, this does not mean that the target species has been eradicated. As the Tweed programme has shown, there is a need for long-term surveillance and response to any regrowth. How long-term surveillance is implemented and funded is a key challenge to effective INNS management.

Control of INN plant species is invariably reported as being via the use of herbicides, although trials of biological control of Himalayan balsam and Japanese knotweed are underway. If biological control proves to be effective in reducing target species abundance, then the cost of long-term control could be reduced. Although many survey respondents reported partnership approaches within their areas of operation, there is no effective collaboration between initiatives. Encouragingly all respondents did acknowledge that better collaboration between initiatives was required.

## 7. Regional Management Strategy

This regional strategy addresses the issues raised in the preceding sections of this document. It has four objectives, three of which reflect the key elements of INNS management: prevention, surveillance, detection and rapid response, and longer-term control. The remaining objective addresses the need for more strategic, coordinated and sustainable approaches to all aspects of INNS management in the North East.

**Objective 1:** Increased coordination of strategic and sustainable approaches to key aspects of INNS management in the North East.

**Objective 2:** Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity.

**Objective 3:** Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses.

**Objective 4:** Strategic and sustainable implementation of longer-term local control and eradication programmes.

### 7.1 Objectives and Outputs

This section describes the expected outputs of the four strategy objectives and the actions required for their realisation. Identification, implementation and **coordination** of sustainable strategic cross-catchment actions will be improved through the establishment of a regional biosecurity action group, the development and implementation of catchment biosecurity plans and development of funding strategies. Actions for **prevention** (of introduction and spread) are focussed on the disruption of the pathways at key receptor and source sites where there will be increased biosecurity through the raising of awareness, training and practical preventative measures. Awareness activities for biosecurity rely on the existing "Check, Clean, Dry" and "Be Plantwise" campaigns. The probability of **early detection** of the introduction or spread of INNS will be improved through faster and more coordinated reporting. Capacity for **rapid response** will be developed at the regional and catchment level. Consistent **monitoring** of INNS populations and management will enable evaluation of approaches on larger scales and better-quality information for deriving lessons and input into policy. Strategic, cost-effective and sustainable approaches to **long-term control** of priority species will be implemented.

**Objective 1:** Increased coordination of strategic and sustainable approaches to key aspects of INNS management in the North East.

#### **Output 1.1** Regional biosecurity action group with defined role and functions

A regional biosecurity action group will be established. This will comprise government and non-government representatives working on the management of freshwater and riparian INNS in the North East. Group members should represent key stakeholders and be able to represent their views during meetings. The overall aim of the group is for the coordination of catchment-based initiatives and the

identification, development and, where applicable, implementation of strategic actions. The group will also develop long-term sustainability strategies for the eradication or containment of identified INNS. The specific role and function of the group will be determined by the group members working with INNS practitioners and key stakeholders in the region. The regional group should only implement activities when it is best placed to do so (e.g. aspects of rapid response (Output 3.3)). Frequency of meetings and the work to be undertaken in any given time period will be the decision of the group.

**Output 1.2** Biosecurity plans developed for four catchments

Information from the survey indicates that there are two catchment biosecurity plans planned or already prepared. Catchment-based biosecurity plans can provide further detail and put into practice the relevant elements of the regional strategy. For example, they can include more comprehensive and/or detailed information on receptor and source sites, and areas for preventative work (see also Output 2.1). They will encapsulate all the required priority management actions within the catchment that will enable more strategic and coordinated approaches within and across catchments.

**Output 1.3** Development of coordinated funding strategy(ies) and proposals for agreed actions across the North East region

Funding obtained by practitioners has been mainly for the treatment and removal, or mitigation, of large established populations. Comparatively little funding has been obtained for prevention and surveillance, detection and rapid response. This is indicative of a disparity between national policy priorities (prevention-rapid response) and those of funders and/or local stakeholders. Given the threat posed by INNS not currently present (black list) or currently present in small populations, there is a clear need for funding for preventative measures at sites vulnerable to their introduction and spread; and the development of more efficient surveillance and rapid response in case they do arrive. There are also areas that do not have records of INNS and some of these are designated sites or WFD waterbodies of good or high status. These areas are good candidates for prevention measures. These priorities could form the basis of a funding proposal that could also support the initial establishment and working of the regional biosecurity group.

There is also a clear need for the development of long-term funding strategies, particularly to safeguard the not inconsiderable investments that have been made in long-term control, e.g. Tees and Tweed. Experience from these projects demonstrates that low-level control is required for a significant period after treatment. There are also occasions where treatment of new arrivals is not possible and long-term containment is required.

**Objective 2:** Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity.

**Output 2.1** Receptor and source areas for INNS identified in each catchment

Identification of receptor sites for the introduction of INNS currently absent in the region, or source sites for the spread of those already present, could focus prevention efforts on high-risk areas for introduction and spread. This approach would enable more efficient use of limited resources and still significantly reduce the risk of introduction and spread. An example of how receptor and source areas can be identified,

and the stakeholders involved in the pathways is presented in Section 5.1. Actions to improve biosecurity and to implement good management can then be focussed on those areas and stakeholders.

**Output 2.2** Increased protection for non-impacted designated sites and species and/or waterbodies

Examination of the information gained for the individual catchments shows that there are a number of areas with no reported incidences of the listed INNS. Some of these are associated with designated areas and others with WFD waterbodies (see Figs. 7–11 for examples). Protection of these areas against colonisation by INNS should be a priority. These areas would have efficient surveillance systems and if an INNS is detected there would be a rapid response (see Output 3.3). Prevention measures should also be focussed on strongholds for vulnerable species e.g. white-clawed crayfish, pearl mussel and water vole (Fig. 14).

**Output 2.3** Increased awareness of good practice across stakeholders involved with key pathways to prevent introduction and spread of INNS

Disruption of the key pathways for the introduction and spread of the listed INNS is an essential part of this strategy. This disruption can occur if good management practices are adopted by the stakeholders involved in those pathways. Good management practices invariably involve the increasing of awareness of INNS and the promotion and implementation of effective biosecurity measures. There are various biosecurity measures that will assist in prevention such as biosecurity stations, biosecurity kits, biosecurity protocols, signage and training. Not all measures are applicable to, and affordable at, all sites. It is therefore important to assess which combination of measures will provide the most prevention for the least cost. Adoption of biosecurity protocols for key user groups such as management agencies, consultants and contractors is a cost-effective measure. Establishment of biosecurity stations with signage, on rivers and lakes that receive visitors from far afield and that are vulnerable to invasion, is a worthwhile investment. Encouraging individual users to adopt simple biosecurity measures such as Check, Clean, Dry would also be efficient and beneficial at those sites. Signage and encouragement of stakeholders to adopt simple biosecurity measures such as removing seeds from clothing and pets in a secure environment is more appropriate to source areas. Staff at garden and pet centres could be trained in the identification of INNS (to prevent contamination) and to raise customer awareness as to the correct disposal of their garden waste, plant trimmings or unwanted pets.

Priority actions to enable good management, and their mechanism for delivery to each stakeholder group, are presented in Table 13. The actions and delivery mechanism vary according to the pathway with which they are involved. The stakeholder groups are those identified in Section 4: Pathways and Stakeholders.

# Figure 14: Native Species

- ▲ Lamprey (Brook / River / Sea)
- ▲ European Water Vole
- ▲ Freshwater Pearl Mussel
- ▲ White-clawed Freshwater Crayfish
- ▲ European Otter

0 5 10 15 20 km

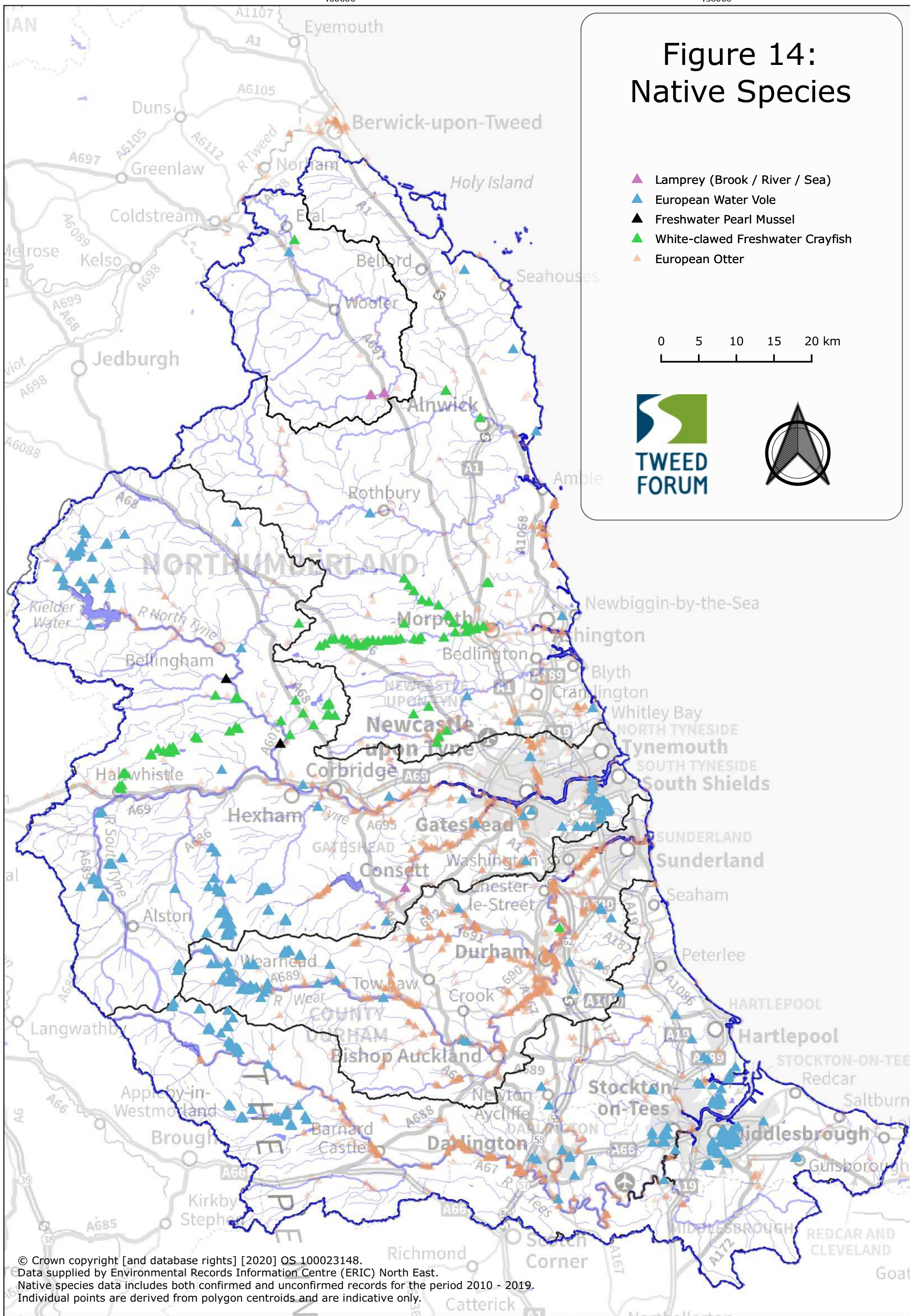
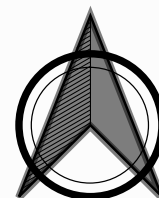


Table 13. Priority actions for stakeholder groups and their mechanisms of delivery.

Stakeholder	Priority Action	Mechanism of Delivery
Port authorities	- Implement regulations to prevent pumping out of non-sterilised ballast water in harbour	-EA to liaise with port authority to ensure adherence to regulations
Northumbrian Water	- Installing biosecurity measures identified through a pathways of risk analysis at various locations -Biosecurity strategy for Essex and Suffolk Water and Northumbrian Water -Assess risk of transferring signal crayfish from the North Tyne into Hallington Reservoir	-Five-year business plan  -PhD study
Fish farms	- Use of biosecurity measures - Awareness of impact of INNS and dangers of importing stock from contaminated areas - Staff trained in biosecurity measures and identification of INNS - Controls on movement of stock and water	-Catchment partnership organisations to work with local industry in key areas to advise members regularly of good practice in respect of INNS -Enforcement agencies (e.g. EA, RTC) to undertake site visits to discuss and advise on issues involving INNS e.g. contaminated transfers
Garden centres	-Promote existing codes of practice covering the security and disposal of INNS to all garden centres - Staff trained in INNS identification and biosecurity -Advise gardeners to dispose of plant material and/or soils in a responsible manner	- EA to contact garden centres about biosecurity arrangements - Catchment organisations to work with garden centres to encourage training of staff and distribution of codes of practice and posters
Gardeners	-Awareness of impacts of INNS -Promote good management of plants to avoid natural dispersal to the wild and correct disposal of plant and garden waste	-EA to facilitate collaboration of RBAG with the Horticulture Society and gardening publications
Local aquarium and pond stockists	-Promote code of practice to all pet shops and suppliers of ornamental fish	-Catchment organisations to work with retailers to encourage distribution of codes and posters (available from Plantlife) and check species on sale.
Water user associations (canoeists, sailing clubs)	-Promote awareness to clubs and participants of the dangers arising from INNS - Establishment of biosecurity stations at priority locations - Training in biosecurity	-Catchment organisations to work with associations to promote appropriate biosecurity measures e.g. disinfection of equipment; train trainers in local organisations in INNS identification, surveillance and reporting
Angling clubs	- Promote knowledge of biosecurity issues amongst all members and visiting anglers - Promote the distribution of information and erection of signage in fishing huts and recognised car parks - Receive and offer training in use of biosecurity measures if using key receptor areas	-Catchment organisations to work with associations to promote appropriate biosecurity measures e.g. disinfection of equipment; train trainers in local organisations in INNS identification, surveillance and reporting.

Stakeholder	Priority Action	Mechanism of Delivery
Network Rail	-Priority rail/river intersections agreed -Treatment at least 100 m of river-rail intersections that at key source points for re-infestation of river corridors	-EA to facilitate collaboration of Network Rail with RBAG
Local authority services / contract workers	-Adoption of appropriate working practices and waste disposal to avoid spread of NNS	-Local authorities to incorporate appropriate measures into working practices
Quarries/contractors / ground maintenance workers	- General awareness of impacts and measures to prevent/control INNS - Development and adoption of biosecurity protocols	-Catchment management groups to establish contact with key contractors -EA and RBAG to work with relevant industry magazines to promote the need for biosecurity
Landowners	- Promote knowledge of biosecurity issues amongst all tenants and resource users - Establishment of biosecurity stations in key areas (e.g. fisheries)	-Work with catchment partnerships to ensure dissemination of best practices and appropriate signage to reduce threats from INNS -Catchment organisations to provide training in biosecurity and INNS management
Walkers, off road cyclists and dog walkers	-General awareness of impacts and measures to prevent/control NNS - Promote the erection of signage in key areas -Training of wardens to liaise with target groups in priority areas -Landowners such as National and Woodland Trusts to establish signage and biosecurity	-Local media campaigns via catchment partnerships -Catchment partnerships to ensure dissemination of best practices and appropriate signage to reduce threats from INNS -Catchment organisations to provide training in biosecurity and INNS management
Local authorities	- Promote use of codes of best practice for construction, haulage, horticulture and aquaculture amongst local business and relevant departments; particularly construction, garden and pet trade - Promote awareness of planning, waste disposal and transport regulations amongst local business - Promote awareness of the GB communications strategy to the general public	- Councils to promote codes of best practice at every opportunity, e.g. including them with planning applications and building warrants - Production (by Council's legal department) and distribution of information leaflets on all relevant legislation relevant to NNS -Organising awareness event/open days to promote biosecurity issues -Distribute leaflets with council tax bills - Display posters in council offices, libraries and other public places
Environment Agency	- Incorporate INNS issues into relevant guidance documents (as they are developed or updated) -Facilitate contact and where necessary discussions with relevant third parties as suggested in this table	- Digital documents available for download on EA website - Staff resource made available
Natural England	-Promotion of good practice in the prevention, control and eradication of NNS -Facilitate contact and where necessary discussions with relevant third parties	- Digital documents available for download on EA Website - Staff resource made available
Management and scientific organisations	-Adoption of biosecurity protocols -Provide training to other stakeholders	-Development and use of protocols -Development of training course for specific priority stakeholder groups

**Objective 3:** Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses.

### **Output 3.1** Common surveillance, reporting and information display systems established across the region

A key aspect of this strategy will be to enable a rapid response to reported sightings of black-listed and red-listed species outside of their current locations. Currently INNS can be recorded on many different pre-existing platforms including INNS Mapper, Irecord, I.Naturalist and Survey123, in addition to systems within each organisation. Much of this information is eventually fed into the ERIC database, but not consistently so. Surveillance is difficult because high priority INNS (i.e. red- and black-listed) are not flagged up and reported. There are instances of red-listed species not being picked up by a relevant organisation for some years, such as the American skunk cabbage record at Ingram in the Till catchment.

A method for notifying relevant organisations when a priority species is recorded should be in place. This should take place at a national scale, working with all organisations recording wildlife information; and incorporate into existing systems, such as those at the Environment Agency. Regionally, an interim solution could include screening of new records by ERIC for red and black list INNS, and if detected, would be reported to a biosecurity action group. For such a system to work, information should be fed to ERIC from organisations within the North East, and external apps, on a regular basis.

In terms of recording consistency between INNS practitioners, each organisation maintains records of INNS presence and control in different ways. An opportunity exists to use a common methodology, which is managed centrally by ERIC. Such a platform could utilise the pre-existing ArcGIS Online platform and the associated Survey123 app. Data collection can be customised by stakeholders to include at a minimum: location, date, species name, number of species, and whether a species has been controlled. Additional information can include: name of recorder, photograph, area infected (rather than number of plants), density (e.g. DAFOR), and confidence rating. Information collected by other means, e.g. by GPS device, paper forms, or MyTyne App, can be uploaded onto the ArcGIS Online system and incorporated into the wider live dataset. Such a system would facilitate data sharing between organisations, allow practitioners to have control of data, and provide ERIC with up to date information.

In the long term, a system that works on a national scale may be more appropriate. One possibility is the further development of INNS Mapper, managed by Yorkshire Wildlife Trust. This platform has the advantage of already being integrated into existing systems and having several years of use and testing. If regional INNS groups were to form around the UK, a common recording platform would be incredibly beneficial for rapid response and a strategic approach.

### **Output 3.2** Agreed survey and monitoring protocols and data formats

Successful INNS management uses an adaptive management approach, which is dependent on monitoring to inform management decisions and strategy. Monitoring also provides evidence for the identification of lessons that can then be used to inform policy. Currently there is no coordinated monitoring of effect of INNS treatments/actions, and methods used are not compatible or comparable. This lack of consistency is a lost opportunity for wider scale site replication for more rigorous lesson identification. There is a clear need for more rigorous and comparable monitoring. Protocols and data formats would have to be agreed; as well as how this data would be stored, analysed and presented. Geodatabases offer a means to be able to store and display data and demonstrate changes in status of INNS populations over time. This offers a means to simultaneously keep track of the extent, as well as abundance, of INNS populations that could be accessed by INNS practitioners, their volunteers and the general public.

**Output 3.3** Rapid response mechanism to prevent establishment of INNS not currently present in North East catchments

Rapid response protocols will come into effect if there is a report of a black-listed species in the region or a red-listed species in a new location in the region. The type of response to be initiated depends on the species, with some INNS triggering a national or GB response (Table 14). Other INNS will require a local response to contain the infestation as there are no cost-effective treatments or, if treatments are available, a containment and eradication response.

Table 14. Rapid response options for black- and red-listed species.

GB Response	Local Containment	Local Containment & Eradication
Killer shrimp ( <i>D. villosus</i> )	Bloody red shrimp ( <i>H. anomola</i> )	Himalayan knotweed ( <i>P. wallichii</i> )
Demon shrimp ( <i>D. haemobaphes</i> )	Virile crayfish ( <i>O. virilis</i> )	Hybrid knotweed ( <i>F. japonica v sachalinensis</i> )
Water primrose ( <i>L. grandiflora</i> )	Red swamp crayfish ( <i>P. clarkii</i> )	Hottentot fig ( <i>C. edulis</i> )
Creeping water primrose ( <i>L. peploides</i> )	Spiny-cheeked crayfish ( <i>O. limosus</i> )	Broad-leaved water milfoil ( <i>M. heterophyllum</i> )
Topmouth gudgeon ( <i>P. parva</i> )	Marbled crayfish ( <i>P. marmokrebs</i> )	Large-flowered waterweed ( <i>E. densa</i> )
American bullfrog ( <i>L. catesbeianus</i> )	Asian clam ( <i>C. fluminea</i> )	Water hyacinth ( <i>E. crassipes</i> )
Quagga mussel ( <i>D. rostriformis bugensis</i> )	Ponto-Caspian goby (Various)	Three-flowered leek ( <i>A. triquetrum</i> )
	Mosquito fern ( <i>A. caroliniana</i> )	Common cord grass ( <i>S. anglica</i> )
	Fanwort ( <i>C. caroliniana</i> )	American skunk cabbage ( <i>L. americanus</i> )
	Parrot's feather ( <i>M. aquaticum</i> )	Floating pennywort ( <i>H. ranunculoides</i> )
	Zebra mussel ( <i>D. polymorpha</i> )	Curly waterweed ( <i>L. major</i> )
	Chinese mitten crab ( <i>E. sinensis</i> )	

A confirmed sighting of a GB priority species will trigger the GB contingency plan for that species. For other species there is a need for protocols to implement an appropriate response. The elements that could be included in the response to detection of a GB priority species, or for a response to the other listed INNS, are outlined in Table 15.

Table 15. Elements of potential protocols for GB priority, local containment and priority species.

GB Response	Local Containment	Local Containment & Eradication
-Report to local and GB institutions -Determine the extent of infestation -Isolation of area where practicable	-Report to GBNNSS & EA -Determine the extent of infestation -Isolation of area where practicable -Establish source and check related sites -Closure of all pathways -Decision on appropriate actions for containment -Implement action(s) -Monitor	-Report to GBNNSS and EA -Determine extent of infestation -Isolation of area where practicable -Establish source and check related sites -Closure of all pathways -Decision on appropriate actions for containment -Decision on appropriate action for eradication. -Seek required permissions -Implement action(s) -Monitor

Establishment of a rapid response capability in the region will require trained teams of personnel at the catchment level. It may also be an option to consider the formation of a regional team of highly qualified personnel for complex eradication procedures. Teams would require appropriate equipment and training and there will also be a need for flexible funding and streamlined permission processes.

**Objective 4:** Strategic and sustainable implementation of longer-term local control and eradication programmes.

**Output 4.1** Strategic control initiatives for selected established red- and amber-listed INNS populations

At present identification of populations for treatment occurs when they are of a size to cause issues. It is far more efficient to target smaller, less established populations before they get to be a problem. There are examples of smaller, relatively isolated populations of amber-listed species that are located at the top of catchments that, if left untreated, could result in their spread and the requirement for a costly long-term control programme (Fig. 4). Populations of treatable red-listed species should be treated as a matter of priority. American skunk cabbage is a prime example (Fig. 4). Control initiatives should also be developed to reduce the risk of further decline of vulnerable species.

**Output 4.2** Cost-effective implementation of treatment (and containment) measures

There has been a lot of work on treating several INNS, particularly amber-listed species, in the region. This would suggest that, if there is data on the effectiveness of treatment, there is an opportunity to undertake an objective review of the treatments employed and their costs. The findings of this review would inform the development of cost-effective treatment regimes. It is likely that there are no, or very few, examples of costs for long-term containment. If currently untreatable black- or red-listed species are to be effectively contained it would be useful to prepare cost estimates based on likely or existing scenarios.

**Output 4.3** Cost-effective strategies for sustainable long-term control of red- and amber-listed INNS populations developed and implemented

Post-treatment monitoring of large areas that were once heavily infested could involve significant costs. If the investment made in clearing those areas is to be protected, then cost-effective long-term monitoring/surveillance and response systems should be developed. Experience from the Wansbeck, Tweed and Tees, along with that from areas elsewhere, could inform the development of appropriate and relevant cost-effective long-term strategies.

## 7.2 Action Plan

This section presents an action plan for the realisation of the objectives and outputs described in Section 7.1. The plan details which agency has responsibility for the implementation of the action (Lead) and which organisations are key partners (Partners) with a proposed timeframe.

In the plan below a solid line means a continuous period of implementation whereas a dotted line signifies implementation as required. NE INNS Practitioners includes wildlife trusts, rivers trusts, local authorities, private companies such as Northumbrian Water and government agencies such as the Environment Agency and Natural England.

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
<b>Objective 1:</b> Regional biosecurity action group established for the implementation of coordinated and strategic approaches to key aspects of INNS management in the North East							
<b>Output 1.1</b> Regional biosecurity action group with defined role and functions							
Identification of group members	EA	NE INNS Practitioners	—				
Establishment of the group	EA	NE INNS Practitioners	—				
Development of roles and functions of the group	EA	NE INNS Practitioners	—				
<b>Output 1.2</b> Biosecurity plans developed for four catchments							
Development of plan template	RBAG	Wear RT / TF	—				
Collation of required information	Catchment Hosts	Catchment Stakeholders		—			
Draft plan and consultation	Catchment Hosts	Catchment Stakeholders		—			
Final plan produced	Catchment Hosts	Catchment Stakeholders		—			
<b>Output 1.3</b> Development of coordinated funding strategy(ies) and proposals for agreed actions across the North East region							
Development of regional funding proposal	RBAG	Catchment Hosts	—				
Formulation of long-term funding strategies document	RBAG	Catchment Hosts	—				
<b>Objective 2:</b> Reduce the risk of the introduction and spread of freshwater and riparian INNS in the North East through increased awareness and biosecurity							
<b>Output 2.1</b> Receptor and source areas for INNS identified in each catchment							
Database updated with information relevant to receptor or source areas	ERIC NE	NE INNS Practitioners	— — —	— — —	— — —	— — —	— — —
Database made available for use of all regional partners	ERIC NE	NE INNS Practitioners	— — —	— — —	— — —	— — —	— — —
Identification of receptor and source areas	RBAG	NE INNS Practitioners	—	—			
<b>Output 2.2</b> Increased protection for non-impacted designated sites and species and/or waterbodies							
Field verification of potential non-infested areas	RBAG	NE INNS Practitioners					
Records updated as required	NE INNS Practitioners	ERIC NE	— — —	— — —	— — —	— — —	— — —

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
Use of area, potential pathways and stakeholders identified	Catchment Hosts	NE INNS Practitioners		—			
Identification and implementation of preventative measures	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 2.3</b> Increased awareness of good practice across stakeholders involved, with key pathways to prevent introduction and spread of INNS							
Identification or development of good management practices for key stakeholder groups (see also Outputs 2.1 and 2.2)	RBAG	NE INNS Practitioners	—				
Establish regional pilot schemes with identified key stakeholders in each catchment	Catchment Hosts	NE INNS Practitioners	—	—			
Assess effectiveness of pilot schemes and modify as required	RBAG	Catchment Hosts		—			
Expansion of effort within catchments and across the region	Catchment Hosts	NE INNS Practitioners		—	—	—	—
<b>Objective 3:</b> Establish a multi-catchment framework for the detection and surveillance of INNS linked to agreed protocols to ensure appropriate rapid management responses							
<b>Output 3.1</b> Common surveillance, reporting and information display systems established across the region							
Development of regional fast-track reporting	ERIC NE	Catchment Hosts	—	—			
Further development and maintenance of regional INNS database to provide strategic tools for, and assessments of, INNS management	ERIC NE	Catchment Hosts	—	—	—	—	—
Development of online tools to display the results of INNS management	ERIC NE	Catchment Hosts			—	—	
Testing and establishment of eDNA surveillance for selected freshwater species	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 3.2</b> Agreed survey and monitoring protocols and data formats							
Identify and agree appropriate monitoring protocols and data formats (where applicable)	RBAG	NE INNS Practitioners	—				
Development and maintenance of database for information storage and analysis	RBAG	ERIC NE		—	—		
Identification and development of appropriate mechanisms to disseminate survey and monitoring information	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 3.3</b> Rapid response mechanism to prevent establishment of INNS not currently present in North East catchments							
Development of rapid response protocols for non-GB species	RBAG	NE INNS Practitioners	—	—	—	—	
Establishment of regional and/or catchment-based teams	RBAG	Catchment Hosts		—	—	—	—

Action	Lead	Partners	TIMEFRAME				
			2020	2021	2022	2023	2024
Identification and purchase of required equipment	Catchment Hosts	NE INNS Practitioners		—		—	
Training of team members according to rapid response role	RBAG	NE INNS Practitioners		—		—	
Identify, and where possible obtain, all required permissions	RBAG	Catchment Hosts		—	—	—	—
Implementation of appropriate responses	RBAG or Catchment Hosts	NE INNS Practitioners		—	—	—	—
<b>Objective 4:</b> Strategic and sustainable implementation of longer-term local control and eradication programmes							
<b>Output 4.1</b> Control initiatives for selected, established red- and amber-listed INNS populations							
Identification of candidate sites and control mechanisms within catchments	RBAG / Catchment Hosts	NE INNS Practitioners	—				
Implementation of control trials using outcomes of assessments undertaken as part of Output 4.2	Catchment Hosts	NE INNS Practitioners			—	—	
Evaluation and expansion of cost-effective control activities	RBAG	NE INNS Practitioners				—	—
<b>Output 4.2</b> Cost-effective implementation of treatment (and containment) measures							
Identification of good practice from review of efficacy of measures utilised to date	RBAG	NE INNS Practitioners	—				
Trials of identified treatments established as part of Output 4.1	Catchment Hosts	NE INNS Practitioners		—	—	—	—
Monitoring and evaluation of cost-effectiveness of trialled treatments	RBAG	NE INNS Practitioners		—	—	—	—
<b>Output 4.3</b> Cost-effective strategies developed and implemented for sustainable long-term control of red- and amber-listed INNS populations							
Assessment of efficacy of strategies currently employed including trials of biological control	RBAG	NE INNS Practitioners		—	—	—	—
Investigate means to enable landowners to take responsibility for the control of INNS on their land	RBAG	Government Agencies		—	—		
Engage landowners to take responsibility for INNS control on their land	Catchment Hosts	NE INNS Practitioners		—	—	—	—