

## Wester Ross and Lochalsh Biosecurity Plan 2021-30



**Wester Ross Fisheries Trust  
&  
Skye and Lochalsh Rivers Trust**

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Cover pictures: Himalayan balsam control, Japanese knotweed on the River Broom before and after control, a drawing of an American mink from a pupil's poster: all by Skye and Wester Ross Fisheries Trust (SWRFT).

## Background

This document is one of a set of 10 biosecurity plans developed as part of a regional programme implemented through the Scottish Invasive Species Initiative (SISI) with backing and support from the National Lottery Heritage Fund (NLHF) and NatureScot. This plan follows on from a biosecurity plan produced by the Wester Ross Fisheries Trust (WRFT) in 2010.

SISI is a 4-year partnership project set up to tackle invasive non-native species along water courses in northern Scotland. The project aims to deliver a programme of prioritised management and control of a suite of invasive plant species (Giant hogweed, Himalayan balsam, Japanese knotweed, American skunk cabbage and White butterbur) and the American mink, as well as raising public awareness of invasive non-native species and biosecurity issues. Control is delivered via a combination of staff, contractor, and volunteer-based activities. The Project is currently scheduled to finish in October 2021. Further information about the project can be found at <https://www.invasivespecies.scot/>.

When SISI funding was initially secured the WRFT area extended from the River Kanaird in the north to the Barrisdale in the south (**Figure 1**). However, this targeted area now falls within the remit of two Trusts, WRFT and the Skye and Lochalsh Rivers Trust (SLRT) – these formed from a separation of operations and area between the Skye and Wester Ross Fisheries Trust (itself originally extended from the WRFT) and the new SLRT. At the time of writing, SISI work is undertaken throughout the project area by a project officer managed by SLRT. This document has been written for the SISI-funded area. However, the contents of the plan, specifically the actions and monitoring, are relevant for the entire geographical area covered by both Trusts in terms of for example, preventative action, awareness raising and currently present invasive species.

## 1. Introduction

The need for ongoing action on biosecurity issues has been identified in the [River Basin Management Plan for the Scotland river basin district: 2015–2027](#)<sup>1</sup> and more recently in the draft Highland Nature Biodiversity Action Plan (2021-26). The present plan is a platform for local action to address those biosecurity issues and has been developed from the previous [WRFT Biosecurity Management Plan](#)<sup>2</sup>. As the spread of INNS is not isolated to the Wester Ross area, this plan will also facilitate coordination and communication with the neighbouring fisheries Trusts, Boards, local authorities and other stakeholders of neighbouring areas e.g., West Sutherland, Lochaber, and Cromarty Firth. This plan will operate over the period 2021-2030 and as part of an adaptive management cycle its outcomes and impacts will be reviewed and incorporated in the next generation plan. The successful implementation of this plan will rely on the formation of strong local partnerships founded on solid legal and policy principles by a range of interested parties.

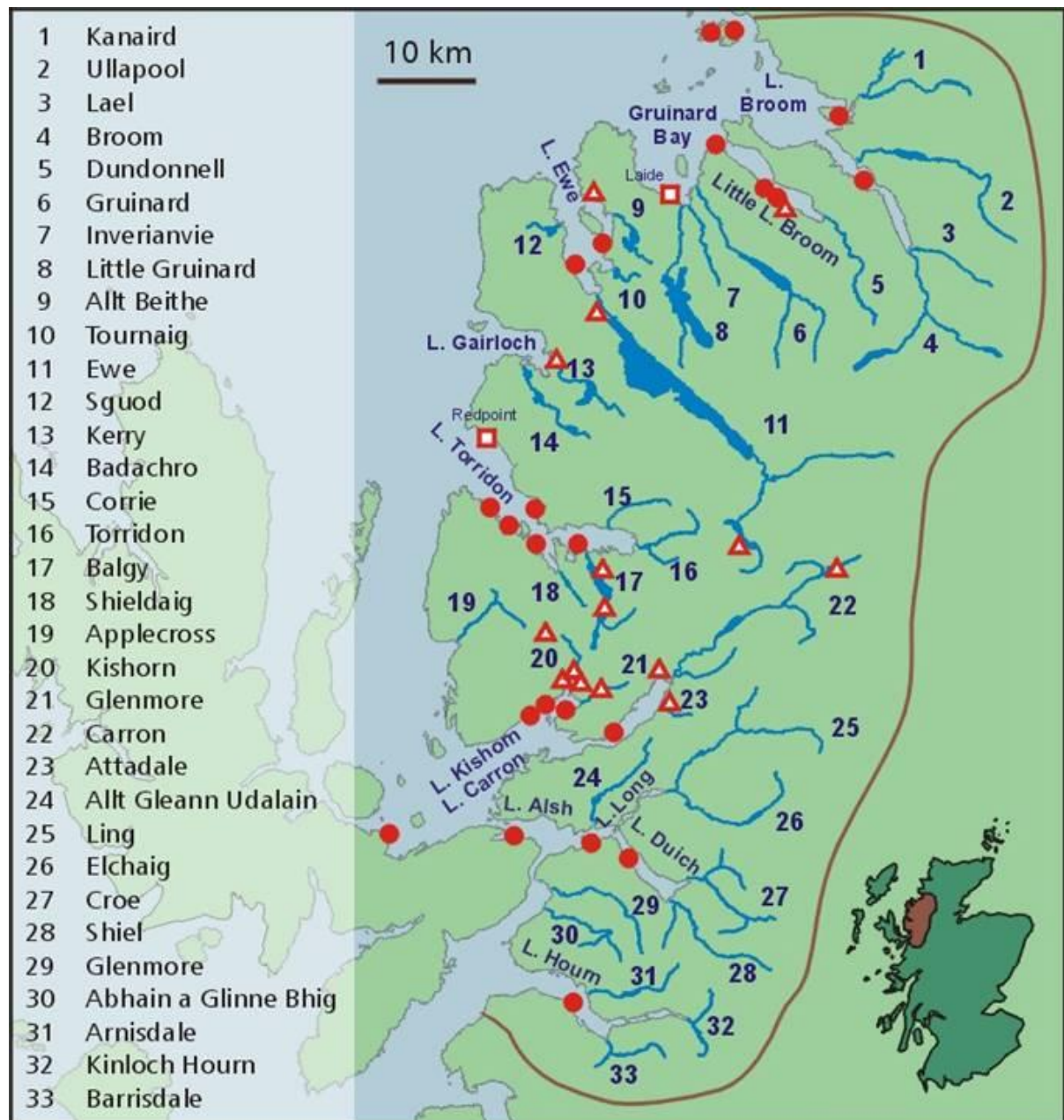
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<sup>1</sup><https://www.sepa.org.uk/media/163445/the-river-basin-management-plan-for-the-scotland-river-basin-district-2015-2027.pdf>

<sup>2</sup><https://www.wrft.org.uk/files/WRFT%20Biosecurity%20Plan%20Final%20Ver%20Aug2010.pdf>



**Figure 1:** The red boundary denotes the area within the remit of the Scottish Invasive Species Initiative. (The Wester Ross Fisheries Trust area covers the Kanaird to Applecross rivers, while the Carron and southern rivers lie within the new Skye and Lochalsh Rivers Trust area.)



## 2. Context

### 2.1 Biosecurity: The Nature of the Problem

Biosecurity issues are of increasing economic and ecological significance. Globalisation has expanded the possibilities, extent and complexity of world trade and the growth of the tourism market has expanded the number of destinations for travellers. These trends have led to the increased probability of the unintentional as well as intentional introduction, establishment and spread of INNS, parasites and diseases in Scotland and the UK. In the context of this revised plan, biosecurity issues in the rivers and lochs of Scotland are considered in relation to the potential introduction and spread of a priority list of INNS and fish diseases.

The threat from INNS is growing at an increasing rate assisted by climate change, pollution and habitat disturbance with a correspondingly greater socio-economic, health and ecological cost. Many countries including Scotland are now facing complex and costly problems associated with invasive species, for example:

- It is estimated that INNS cost the UK economy at least £2 billion per year<sup>3</sup>.
- In the UK Japanese Knotweed is thought to affect an area roughly the size of London and the [Review of Non-Native Species Policy \(2003\)](#)<sup>4</sup> has estimated the total cost of its removal using current techniques at £1.56bn.
- A [Scottish Government report](#)<sup>5</sup> estimated the potential Net Economic Value loss to Scotland of the introduction of *Gyrodactylus salaris* at £633 million with severe consequences for rural communities.
- A [Forestry Research Report](#)<sup>6</sup> estimates the current cost of clearing the invasive *Rhododendron ponticum* from Argyll and Bute as £9.3m that could rise to £64m in the next 50 years.
- Invasive species have already changed the character of iconic landscapes and waterbodies in Scotland reducing the amenity value of those areas.

There is also a growing recognition of the impacts of ‘translocated’ species. **Translocated species** are native species that have been transported outside of their natural range and they can also have severe ecological impacts. Examples of translocated species that are impacting the ecology of Scotland’s rivers and lochs are the minnow (*Phoxinus phoxinus*) and ruffe (*Gymnocephalus cernuus*). The ruffe in particular has decimated the once significant and diverse population of the rare and protected Powan (*Coregonus lavaretus*) in Loch Lomond. In Wester Ross, the pike (*Esox lucius*) and minnow are regarded as translocated species and may have altered fish communities in the lochs they now inhabit.

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<sup>3</sup><https://publications.parliament.uk/pa/cm201919/cmselect/cmenvaud/88/8804.htm>

<sup>4</sup>[http://sciencesearch.defra.gov.uk/Document.aspx?Document=WP01001\\_1661\\_EXE.pdf](http://sciencesearch.defra.gov.uk/Document.aspx?Document=WP01001_1661_EXE.pdf)

<sup>5</sup>[www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/resource/doc/1062/0042434.pdf](http://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/resource/doc/1062/0042434.pdf)

<sup>6</sup><https://www.forestresearch.gov.uk/research/management-of-upland-native-woodlands/rhododendron-control/>

Without some form of coordinated and systematic approach to the prevention of introduction and control of the spread of INNS and fish diseases, it is likely that the ecological, social and economic impacts and the costs for mitigation, control and eradication of these species and diseases will continue to increase. This plan aims to set out and implement such an approach at a local level for selected species and diseases that significantly impact freshwater fisheries and the aquatic environment.

## 2.2 Policy and Legislation

The actions presented in this plan will conform to, and be supported by, UK and Scottish Government legislation associated with the prevention, management and treatment of INNS, fish diseases and parasites:

- Section 14 of The [Wildlife and Countryside Act \(1981\)](#)<sup>7</sup> (as amended in Scotland by the [Wildlife and Natural Environment \(Scotland\) Act 2011](#)<sup>8</sup>) makes it an offence to release an animal, allow an animal to escape from captivity or otherwise cause an animal not in the control of any person to be at a location outside its native range, or to plant or otherwise cause to grow a plant in the wild at a location outside its native range.
- [Code of Practice on Non-Native Species](#)<sup>9</sup> was issued in 2012 by the Scottish Government. The Code sets out guidance on how you should act responsibly within the law to ensure that non-native species
- Section 179 of the [Town and Country Planning \(Scotland\) Act 1997](#)<sup>10</sup> empowers local authorities to serve notice requiring an occupier to deal with any land whose condition is adversely affecting the amenity of the other land in their area.
- The [Possession of Pesticides \(Scotland\) Order 2005](#)<sup>11</sup> regulates the use of pesticides and herbicides for the control and eradication of INNS.
- [Environmental Protection Act 1990](#)<sup>12</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>13</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”.

<sup>7</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)

<sup>8</sup> <https://www.legislation.gov.uk/asp/2011/6/part/2/crossheading/nonnative-species-etc/enacted>

<sup>9</sup> <https://www.gov.scot/publications/non-native-species-code-practice/>

<sup>10</sup> [www.opsi.gov.uk/acts/acts1997/ukpga\\_19970008\\_en\\_1](http://www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1)

<sup>11</sup> [www.opsi.gov.uk/legislation/scotland/ssi2005/20050066.htm](http://www.opsi.gov.uk/legislation/scotland/ssi2005/20050066.htm)

<sup>12</sup> [www.opsi.gov.uk/acts/acts1990/ukpga\\_19900043\\_en\\_1](http://www.opsi.gov.uk/acts/acts1990/ukpga_19900043_en_1)

<sup>13</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)

- [Controlled Waste \(Registration of Carriers and Seizure of Vehicles\) Regulations 1991](#)<sup>14</sup> and the [Environmental Protection \(Duty of Care\) Regulations 1991](#)<sup>15</sup> provide guidance for the handling and transfer of controlled waste.
- [The Aquaculture & Fisheries \(Scotland\) Act 2007](#)<sup>16</sup> that regulates against the unauthorised introduction of fish to inland waters.
- The [Prohibition of Keeping or Release of Live Fish \(Specified Species\) Order 2003](#)<sup>17</sup> requires that a licence be obtained for the keeping or release of species listed on Schedules 1 and 2.
- The [NetRegs](#)<sup>18</sup> website contains useful guidance on INNS and their control

The procedures for the detection, notification and control of fish diseases are already well defined by the fisheries legislation. This stipulates that Marine Scotland acts on behalf of the Government with respect to the suspicion of the presence of notifiable fish diseases and organises and coordinates the response to that outbreak. As such the actions in this plan will raise awareness and provide mechanisms for the realisation of those procedures at the local level.

There is a short summary of the relevant legislation and responsibilities in respect in INNS in Scotland on the SISI website <https://www.invasivespecies.scot/law-non-native-species>.

### **3. Biosecurity: Current and Potential Threats**

This section identifies INNS and fish diseases for inclusion in the Biosecurity Plan. The priority species as those that:

- Already exist within Wester Ross and Lochalsh,
- If introduced would have severe consequences for local biodiversity and economy, and /or
- Have a high risk of introduction due to nature of the pathways for their introduction and their current geographic proximity.

<sup>14</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>15</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>16</sup>[http://www.opsi.gov.uk/legislation/scotland/acts2007/asp\\_20070012\\_en\\_1](http://www.opsi.gov.uk/legislation/scotland/acts2007/asp_20070012_en_1)

<sup>17</sup><https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/resource/doc/47133/0009766.pdf>

<sup>18</sup><http://www.netregs.gov.uk/netregs/default.aspx>

### 3.1 Current biosecurity issues

Current biosecurity issues are associated with 5 INNS, two translocated native species and one fish parasite that are presently found in the area. The first 4 listed are target species for SISI.

- American mink (*Mustela vison*) spread by migration and kill juvenile salmon and trout, waterfowl and small mammals. A recent increase in effort in the local mink control programme led to the dispatch of 52 mink in 2020, showing that mink presence remains an ongoing issue in the area.
- Himalayan balsam (*Impatiens glandulifera*) is spreading rapidly in Badcaul, Laide and Aultbea. It is also present in Balmacara. It spreads through natural dispersion by wind or water from areas in which it has been planted or introduced through the transport of contaminated soil. It forms thick monospecific stands that can shade out native plants reducing biodiversity and denuding riverbanks of understory vegetation. Winter dieback of the plants exposes soil to erosion. Control involves the hand pulling of plants.
- Japanese knotweed (*Fallopia japonica*) is present in a number of small satellite populations within the area and more significantly on the River Broom. It spreads along rivers by movement of plant fragments by water and into other areas through the movement of plant debris in soil and on vehicles. It forms dense thickets which can exclude native plants and prohibits regeneration. Dense growth of Japanese knotweed can also hinder access, reduce biodiversity and alter the habitat for wildlife. Control is chemical, involving stem injection or spraying with Glycophosphate.
- American skunk cabbage (*Lysichiton americanus*) is present in 4 known locations within the area, most notably on the Duirinish and Tournai. It spreads by natural seed and berry dispersal after intentional planting and outcompetes native vegetation. Control is undertaken with Glycophosphate, and, although challenging, small plants can be removed manually.
- Rhododendron (*Rhododendron ponticum* & hybrids) is present in most catchments to some degree and is a significant problem in many. It spreads by natural seed and vegetative dispersal after intentional planting. It forms dense thickets and out-competes native plants for space and resources with impacts on fish and invertebrate communities as well as preventing site access. Control involves the removal of the plants and poisoning of the stump.
- Pike (*Esox lucius*) have been introduced to two river systems. They are significant predators on native fish species and are likely to limit smolt production from some areas.





- Minnow (*Phoxinus phoxinus*) is a translocated species introduced by anglers as live bait. It has spread rapidly over the last 15 years and is now known to be resident in most major lochs. Minnows compete for food and territory with native species. Monitoring is undertaken, but no control implemented.



- *Anasakis* sp is a nematode worm that causes Red Vent Syndrome (RVS). RVS has been found in salmon in over 50 Scottish rivers since June 2007. It can cause varying degrees of bleeding and swelling to salmon vents and may also affect humans who become infected from eating raw meat.

The following species could potentially be present:

- Giant hogweed (*Heracleum mantegazzianum*) was recorded in several locations the area but appears to have been successfully removed. It spreads through seed dispersal and the movement of contaminated soil. It out competes native vegetation for space and resources. Winter dieback exposes soil to erosion with loss of riverbanks and increased sedimentation.
- Canadian pondweed (*Elodea Canadensis*) has not been recorded but is likely to be present. It is spread by disposal of plants or plant fragments near waterways, escapes from garden ponds during flood episodes and possibly by birds and other animals.
- Pink salmon (*Oncorhynchus gorbuscha*) were recorded on Skye and West Sutherland in 2017. The impacts of a spawning pink salmon population on the native species are currently unknown but may include competition for resources both in freshwater and marine areas.



Other invasive species known to be present on watercourses within the area include Himalayan knotweed (*Persicaria wallichii*), Montbretia (*Crocasmia x crocosmiflora*) and Giant rhubarb (*Gunnera* sp.). New Zealand flatworms (*Arthurdendyus triangularis*) are present throughout the area.



Further information on these and other INNS species can be found at:

<http://www.nonnativespecies.org/index.cfm?sectionid=47>

### 3.2 Potential Biosecurity Issues

The invasive non-native species listed below are not currently present within Wester Ross and Lochalsh. They have been classified as High or Medium level threats depending on the likely impact on the local economy and biodiversity in combination with the likelihood of introduction. The level of

risk of introduction was based on the pathways for the introduction of INNS, their current geographic proximity, and the uses within Wester Ross.

**High Threat:** Species with Severe consequences for local biodiversity and economy with a Medium to High risk of introduction.

**Medium Threat:** Species with Moderate consequences for local biodiversity and economy with a Low to High risk of introduction.

INNS that pose a high threat to Wester Ross and Lochalsh are presented in **Table 1** and medium threat INNS are presented in **Table 2**.



Check, clean, dry message presented by pupils at local angling event.

**Table 1** High Threat level species, the risk of introduction and their potential impacts

Species	Risk of Introduction	Impact
<b>Wireweed</b> ( <i>Sargassum muticum</i> )	<b>High</b> Already present in the West of Scotland to the south of the isle of Skye	Can out-compete native sea weeds and choke structures. Possible impact on aquaculture.
<i>Gyrodactylus salaris</i> (Freshwater external parasite of salmon)	<b>Medium/High</b> Through unintentional introduction from anglers and water sport enthusiasts through: <ul style="list-style-type: none"> <li>Contaminated fish</li> <li>Clothing/equipment which has been in contact with infected water including canoes</li> <li>Ballast water</li> </ul>	Projected catastrophic impact on salmon ( <i>Salmo salar</i> ) populations throughout Scotland. (It has largely exterminated <i>S. salar</i> in 41 Norwegian rivers).
<b>North American signal crayfish</b> ( <i>Pacifasticus leniusculus</i> )	<b>High</b> Through intentional / unintentional introduction from an existing Highland population.	Burrows into riverbanks causing destabilisation. Diet include small fish, fish ova and invertebrates.
<b>Australian swamp stonecrop</b> ( <i>Crassula helmsii</i> )	<b>High</b> Through introduction from existing Highland populations. Other pathways include: <ul style="list-style-type: none"> <li>Disposal of garden waste</li> </ul> Spread by animals and human activity	Out-competes native species. Forms dense carpets choking ponds and ditches. Reduced light levels below dense growths can cause die-off of waterweeds and algae and reduce water oxygen levels.
<b>Zebra mussel</b> ( <i>Dreissena polymorpha</i> )	<b>High</b> Through unintentional introduction from contaminated boat/canoe hulls and engines and bilge water. Has been recorded, but is not considered established, in Scotland.	Major economic impact on subsurface water structures e.g. blocking pipes and impacting upon hydro-electric schemes. Ecological impacts including changes to freshwater nutrient cycles, extinction of local mussels and changes to stream substrate affecting spawning areas.
<b>Didemnum Tunicates</b> (Sea Squirts)	<b>High</b> Present in Ireland and Wales, can be transferred by boat hulls.	Overgrows seaweeds, and shellfish beds, fouls underwater structures. Would have significant impact on Aquaculture.
<b>Perch</b> ( <i>Perca fluviatilis</i> )	<b>High</b> Present in the Conon system.	May have significant impact on juvenile fish populations.
<b>Chinese mitten crab</b> ( <i>Eriocheir sinensis</i> ) Resides in freshwater but migrates to the sea for breeding.	<b>Medium</b> Through unintentional introduction from boat hulls and live food trade. Now recorded in the River Clyde.	Burrowing in high density populations damages riverbanks. Concern over impacts on local species. Intermediate host for the mammalian lung fluke <i>Paragonimus ringer</i> , known to infect humans.
<b>Ruffe</b> ( <i>Gymnocephalus cernuus</i> )	<b>Medium</b> Present in Loch Lomond and could be introduced as discarded live bait, this is now illegal.	Will have impact on juvenile fish populations, perhaps especially in sea trout systems.
<b>Asian topmouth gudgeon</b> ( <i>Pseudorasbora parva</i> )	<b>Medium</b> Currently only recorded from 5 locations in England but could be introduced as live bait, in contaminated water for aquaculture trade.	Severely impacts other aquatic species.

**Table 2** The risk of introduction of Medium Threat level INNS.

Species	Risk of Introduction	
<b>Slipper limpet</b> ( <i>Crepidula fornicate</i> )	<b>Medium</b>	Through unintentional introduction, hull fouling and contaminated oyster spat.
<b>Water primrose</b> ( <i>Ludwigia grandiflora</i> )	<b>Medium</b>	Unintentional introduction from boat hulls.
<b>Stone loach</b> ( <i>Barbatula barbatula</i> )	<b>Medium</b>	Stone loach have been introduced to the Kyle of Sutherland district probably by visiting anglers. High densities of loach sampled alongside juvenile salmonids in the Awe catchment indicate that they compete for resources with native fish.
<b>Roach</b> ( <i>Rutilus rutilus</i> )	<b>Medium</b>	One of several species of cyprinid that may be introduced into the area, spreading elsewhere in Scotland (e.g. Argyll).  Concern that they may compete with vulnerable native species such as charr.
<b>Orfe</b> ( <i>Leuciscus idus</i> )	<b>Medium</b>	Through intentional/unintentional introduction from an existing population.
<b>Ruddy duck</b> ( <i>Oxyura jamaicensis</i> )	<b>Medium</b>	Could migrate from a number of locations in eastern Scotland.
<b>Bullhead</b> ( <i>Cottus gobio</i> )	<b>Medium</b>	Translocated species recorded in central Scotland that could be introduced deliberately or as live bait.
<b>Common cord grass</b> ( <i>Spartina anglica</i> )	<b>Medium</b>	Present at a number of locations on the Cromarty Firth. Creates monospecific stands in the upper intertidal areas often occupied by <i>Zostera</i>
<b>Nuttall's Pond weed</b> ( <i>Elodea nuttallii</i> )	<b>Medium</b>	Has recently been recorded from one catchment in the Cromarty Firth region. Dominates native macrophyte communities and this can lead to their local extinction.
<b>Curly waterweed</b> ( <i>Lagarosiphon major</i> )	<b>Medium</b>	Present in a number of Highland locations. Spreads by fragmentation via wind dispersal, boat movement, angling equipment and possibly waterfowl. Also sold in Garden Centres and aquarium trade.
<b>Killer and Demon shrimp</b> ( <i>Dikerogammarus spp.</i> )	<b>Low</b>	Through unintentional introduction from its current locations in England and Wales.
<b>Water fern</b> ( <i>Azolla filiculoides</i> )	<b>Low</b>	Through intentional/ unintentional introduction from locations throughout Scotland, especially central belt.
<b>Parrot's feather</b> ( <i>Myriophyllum aquaticum</i> )	<b>Low</b>	Through intentional/ unintentional introduction from two existing populations in the south of Scotland.
<b>Large-flowered waterweed</b> ( <i>Egeria densa</i> )	<b>Low</b>	Only found to date in East Lothian Possible introduction from garden and/or pond trade.
<b>Floating pennywort</b> ( <i>Hydrocotyle ranunculoides</i> )	<b>Low</b>	Currently only in England up to the midlands possible introduction from garden and/or pond trade.
<b>Fanwort</b> ( <i>Cabomba caroliniana</i> )	<b>Low</b>	Only found in one location in southern Scotland possible introduction from ponds.



### 3.3 Fish Health and genetic issues

There are a number of diseases and parasites that have potential to cause catastrophic or significant impacts on fish health and affect the fishery resource. Similarly, the introduction of non-native genotypes of species already present may undermine productivity of native species and act as a vector for the spread of fish diseases. The influence of fishery management and aquaculture activities on the productivity of native fish communities and fisheries is of growing concern as the potential biological and ecological impacts are becoming better understood.

The [Fish Health Inspectorate](https://www.gov.scot/policies/fish-health-inspectorate/)<sup>19</sup> is responsible for the monitoring and control of fish disease within aquaculture and wild fish populations. In addition, they are the notified authority in the case of fish escapes.

#### Non-native genotypes

Fishery and aquaculture activities utilise non-native genotypes of Atlantic salmon, brown trout and the non-native species rainbow trout for angling amenity and production of fish for the table market. It is now well understood that as well as being a potential vector for disease, stocking of fish from non-native sources can undermine the short and long-term productivity of fisheries. Breeding and competitive interaction between native and introduced fish is likely to produce offspring that have reduced survival and lower reproductive success<sup>20</sup>. Preventing release of non-native genotypes likely to interact with wild populations is essential to avoid biosecurity issues and short- and long- term biological (genetic) and ecological (competition) impacts on wild fish populations.

### 3.4 INNS and Fish Diseases Pathways

From **Tables 1** and **2** and **section 3.3**, the main pathways or means of introduction of both high and medium level threat species into the Wester Ross and Lochalsh area catchments are:

- Intentional introduction or planting
- Fouling and ballast water of marine or freshwater vessels
- Escapes from ponds, gardens, demesnes
- Fish from the aquaculture industry as disease vectors
- Escapes from the aquaculture and stocked fisheries industries
- Contaminated aquaculture equipment
- Contaminated water sports equipment (e.g. from angling and canoeists)
- Movement of contaminated soils or vehicles
- Improper control and disposal measures e.g. cutting and dumping without treatment.

<sup>19</sup> <https://www.gov.scot/policies/fish-health-inspectorate/>

<sup>20</sup> McGinnity *et al.* 2003. Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon. *Proc Biol. Sci.* 270 (1532).

#### 4. Existing INNS control activities

In recent years SWRFT secured funding for three major control INNS programmes on the Broom, Loch Maree and River Kerry. In 2019 and 2020, SWRFT awareness, monitoring and control of some INNS species was carried out through SISI, funded by NLHF and NatureScot. Local landowners, including the National Trust for Scotland (NTS) have also undertaken action to eradicate problem species within their grounds. In detail:

- American mink (*Mustela vison*) presence is being monitored and controlled throughout the area by a network of volunteers, currently under the direction of SISI. A campaign to re-enthuse volunteers increased the dispatch rates from 10 in 2019 to 52 in 2020. Increased monitoring and control in the southern SISI area is planned for 2021.
- Through SISI, Trust staff have promoted and advise on biosecurity and the prevention of introduction and spread of INNS. This has taken the form of talks, displays at outreach events, discussion with landowners, local businesses and anglers, the use of social media, on the website and through printed materials.
- Himalayan balsam (*Impatiens glandulifera*) control by the SISI project officer and volunteers commenced in 2020 at one site and control is planned for two further sites in 2021. NTS have almost completely eradicated balsam from their southern properties.
- Japanese knotweed (*Fallopia japonica*) control commenced in 2015 on the River Broom through the Landfill Communities Fund, managed by Trust staff. This was successful with a major reduction in density. Through SISI, contractors controlled remaining plants in 2020 and will revisit in 2021.
- American skunk cabbage (*Lysichiton americanus*) is currently being removed from NTS Inverewe gardens and their bank of the boundary stream at Tournaig. NTS staff have also been active both on their own and neighbouring properties on the Duirinish Burn.
- Rhododendron (*Rhododendron ponticum* & hybrids) control is being undertaken at Loch Kerrysdale by Manta Ecology through SWRFT funding from EB Scotland (The Scottish Landfill Communities Fund) & SSE. Control is also carried out by estate owners, most notably Ben Damp Estate.

#### 5. Biosecurity management strategy

The engagement of key stakeholders is imperative for the success of this plan. Regulatory agencies and bodies associated with other relevant management plans are shown in **Table 3**. Other groups that are also important for the prevention of introduction and spread of INNS were identified from an analysis of the pathways presented in **Table 4**.

**Table 3** Regulatory agencies and other bodies with an interest in INNS

Policy and Legislation	Land Resources	Water Resources
Scottish Government NatureScot Scottish Environment Protection Agency Marine Scotland Fisheries Management Scotland	Forestry and Land Scotland Highland Council National Farmers Union Scottish Land and Estates Crofting Foundation National Trust for Scotland	Scottish Environment Protection Agency West Highland Area Advisory Group Scottish Water Scottish and Southern Energy Ullapool Harbour Trust Local harbour offices
Fisheries Management	Aquaculture	Conservation and Biodiversity
Skye and Lochalsh Rivers Trust Wester Ross District Salmon Fishery Board Marine Scotland Science (regulation of fish movements and introductions) Fishery Management Scotland	Scottish Salmon Producers' Organisation Scottish Shellfish Growers' Association	Highland Invasive Species Forum Scottish Wildlife Trust Royal Society for the Protection of Birds Wester Ross Biosphere Highland Biological Recording Group Skye and Lochalsh Environment Forum Local field clubs

**Table 4** Pathways and stakeholder groups in the Wester Ross and Lochalsh area.

Pathway	Stakeholders
Intentional introduction or planting	Plantlife, riparian landowners, members of the public, Marine Scotland, local councils
Fouling and ballast water of marine vessels	Local harbour authorities, Marine Scotland
Fouling and ballast water of freshwater vessels	SEPA, UK Government, canoe and water sports organisations
Sale from garden or pond centres	Horticultural Trade Association, Ornamental Fish Producers
Contaminated water sports equipment (e.g. from anglers, canoeists)	WRDSFB, canoe and water sports organisations, riparian owners, anglers, angling associations and fishing agents.
Escapes from fish farms, ponds, gardens, and desmesnes.	Marine Scotland, SEPA, Planning Authority, Plantlife, riparian owners, members of the public, Aquaculture Companies
Movement of contaminated soils or vehicles	Local Councils, SEPA, quarries, building contractors
Improper control and disposal measures e.g. cutting and dumping without treatment	Local councils, SEPA, environmental health, Plantlife, riparian owners, members of the public
Introduction of live fish, contamination of water used to transport live fish	WRDSFB, Marine Scotland, Angling Associations

## 6 Actions

### 6.1 Prevention

This will require the various stakeholders to implement biosecurity protocols and promote their use. Prevention of INNS introduction and spread requires vigilance from all stakeholders and their clients.

**Table 5** lists many of the activities that can be undertaken by the different stakeholders within the area, although should not be considered exclusive.

**Table 5** Proposed priority areas for awareness and delivery mechanisms for target stakeholder groups.

Stakeholders	Suggested Priority areas	Suggested Mechanisms of Delivery
<b>Aquaculture (SSPO) and local fish farmers</b>	<ul style="list-style-type: none"> <li>- Impact of INNS</li> <li>- Use of biosecurity measures</li> <li>- Dangers of importing from contaminated areas</li> <li>- Controls on movement of stock and water</li> </ul>	<ul style="list-style-type: none"> <li>- Participation in the Area Management Agreement process and the requirements to follow the Industry Code of Good Practice with respect to INNS, e.g. escapes and sourcing of stock</li> <li>- Enforcement agencies (Fish Health Inspectorate FHI &amp; WRDSFB) to undertake site visits to advise on issues involving INNS</li> <li>- Incorporation of INNS codes of good practice into SSPO industry codes of practice</li> </ul>
<b>Port authorities</b>	<ul style="list-style-type: none"> <li>- Avoid pumping out of non-sterilised ballast water in harbour</li> <li>- Role of hull fouling in the introduction and spread of INNS</li> </ul>	<ul style="list-style-type: none"> <li>- Promote implementation of code of practice requiring non-sterilised ballast water to be discharged away from harbour</li> </ul>
<b>Local Garden Centres</b>	<ul style="list-style-type: none"> <li>- Promote existing codes of practice covering the security and disposal of NNS to all garden centres</li> <li>- Target gardeners specifically</li> </ul>	<ul style="list-style-type: none"> <li>- SISI officer to work with garden centres to encourage distribution of codes and posters (available from Plantlife) and to advise the general public of INNS issues</li> </ul>
<b>Water User associations (canoeists, sailing clubs)</b>	<ul style="list-style-type: none"> <li>- Promote awareness to clubs and participants of the dangers arising from INNS</li> </ul>	<ul style="list-style-type: none"> <li>- SISI officer to work with associations to promote disinfection of equipment</li> <li>- Promote <a href="https://www.invasivespecies.scot/biosecurity">Check, Clean, Dry</a><sup>21</sup> to members</li> </ul>
<b>Local loch and river improvement associations</b>	<ul style="list-style-type: none"> <li>- Continue to promote awareness of the threat of INNS through improved communication</li> </ul>	<ul style="list-style-type: none"> <li>- Both Trusts to work with associations to promote best practice and provide appropriate guidance</li> </ul>
<b>Landowners and Fishery Proprietors</b>	<ul style="list-style-type: none"> <li>- Ensure that all tenants and resource-users are aware of biosecurity issues</li> <li>- Determine local point-of-contact to act as a monitor of INNS</li> </ul>	<ul style="list-style-type: none"> <li>- Both Trusts and the WRDSFB to ensure dissemination of good practice and appropriate signage to reduce threats from INNS and offer training for point of contact</li> </ul>

<sup>21</sup> <https://www.invasivespecies.scot/biosecurity>



**Table 5** Continued.

Stakeholders	Suggested Priority areas	Suggested Mechanisms of Delivery
Angling Clubs (Ullapool, Gairloch, Kinlochewe, Shieldaig, Glenelg)	<ul style="list-style-type: none"> <li>- Promote knowledge of biosecurity issues amongst all members and visiting anglers</li> <li>- Promote the distribution of information and erection of signage</li> <li>- Recommend suitable members to act as a monitor to identify presence of INNS</li> </ul>	<ul style="list-style-type: none"> <li>- Trust staff to ensure dissemination of good practice and appropriate signage to reduce threats from INNS.</li> <li>- Promote <a href="#">Check, Clean, Dry</a><sup>21</sup> to members and visiting anglers</li> <li>- Offer training for point of contact</li> </ul>
General Public	<ul style="list-style-type: none"> <li>- General awareness of impacts and measures to prevent/control INNS. Promote the Biosecurity Plan to all retail outlets who deal with NNS</li> </ul>	<ul style="list-style-type: none"> <li>- Local Media Campaigns.</li> <li>- Use of websites</li> <li>- SISI officer to offer public events</li> </ul>
Schools	<ul style="list-style-type: none"> <li>-General awareness of impacts and measures to prevent/control INNS</li> </ul>	<ul style="list-style-type: none"> <li>- SISI officer to offer school visits and/or field trips</li> <li>- Promote Scottish Invasive Species <a href="#">Alien Detectives</a><sup>22</sup></li> </ul>

The roles and actions of key government agencies and non-government bodies in promoting awareness of INNS issues is presented in **Table 6**.



Posters made by local pupils are used at SISI public events.

<sup>22</sup> <https://www.invasivespecies.scot/alien-detectives>

**Table 6** Roles and / or actions of key government and non-government agencies in promoting awareness of INNS issues

Stakeholders	Priority areas	Mechanisms of Delivery
<b>The Highland Council</b>	<ul style="list-style-type: none"> <li>- Promote use of codes of good practice for construction, haulage, horticulture, aquaculture amongst local business and relevant departments particularly construction, garden and pet trade.</li> <li>- Promote awareness of planning, waste disposal and transport regulations amongst local business.</li> <li>- Promote awareness of INNS to the general public.</li> </ul>	<ul style="list-style-type: none"> <li>- Councils to promote codes of good practice, e.g. including them with appropriate planning applications and building warrants.</li> <li>- Production (by Council's legal department) and distribution of information leaflets on all relevant legislation relevant to INNS.</li> <li>- Holding of awareness event/open days to promote biosecurity issues.</li> </ul>
<b>WRFT WRDSFB SLRT</b>	<ul style="list-style-type: none"> <li>- Promote awareness to anglers and water users, highlighting the Biosecurity Plan and the dangers from INNS</li> </ul>	<ul style="list-style-type: none"> <li>- Continue to promote <a href="#">Check, Clean, Dry</a><sup>21</sup> and distribute information leaflets to stakeholders and the public</li> <li>- Promote invasive species reporting systems</li> <li>- Holding of open days, field visits and demonstrations for anglers and the public</li> </ul>
<b>SEPA</b>	<ul style="list-style-type: none"> <li>- SEPA has <b>Habitat Responsibilities for Freshwater</b> (still and flowing waters) as referenced in The River Basin Management Plans (RBMP), including species found within the water body itself including emergent plants. More information can be found at: <a href="https://www.gov.scot/publications/non-native-species-code-practice/pages/10/">https://www.gov.scot/publications/non-native-species-code-practice/pages/10/</a></li> <li>- SEPA has moved to a sector approach to improve how businesses are regulated. <a href="https://sectors.sepa.org.uk/">https://sectors.sepa.org.uk/</a></li> <li>- INNS work is an area of work that cuts across all sectors.</li> </ul>	<ul style="list-style-type: none"> <li>- Information and relevant links can be found here: <a href="https://www.sepa.org.uk/environment/biodiversity/invasive-non-native-species/">https://www.sepa.org.uk/environment/biodiversity/invasive-non-native-species/</a></li> <li>- Work in collaborative partnership with other agencies to tackle INNS across Scotland's Environment</li> <li>- Digital documents available for download on SEPA Website.</li> <li>- INNS issues to be incorporated into all relevant guidance documents, sector plans and placemaking projects as appropriate</li> </ul>
<b>NatureScot</b>	<ul style="list-style-type: none"> <li>- National: Promotion of good practice in the prevention, control and eradication of INNS</li> <li>- Local: Implementation of good practice measures for local contractors and promotion of the Biosecurity Plan.</li> </ul>	<ul style="list-style-type: none"> <li>- Holding of NatureScot Sharing Good Practice events.</li> <li>- NatureScot will continue to support and advise the Trusts</li> <li>- Grant funding may be available for some projects</li> </ul>
<b>Marine Scotland Science</b>	<ul style="list-style-type: none"> <li>- Regulation of movement and introduction of fish</li> </ul>	<ul style="list-style-type: none"> <li>- Licensing system for fish movements.</li> </ul>

Over its duration the SISI project can support some of the invasive species awareness-raising and promotional activities for and with water users, angling clubs, the general public and school groups. This role will return to both Fisheries Trusts on the completion of the SISI project.

## 6.2 Control and eradication

Where INNS have been identified within the area, control and eradication is the next step. There is a response level for many INNS within Britain (**Table 7**) and the appropriate reporting protocol should be followed (**Table 8**).

**Table 7** Proposed Response level for the invasive non-native species

GB Response	High Priority Local Response	Priority Local Response
<i>Gyrodactylus salaris</i> Asian topmouth gudgeon Ruddy duck <i>Didemnum</i> spp Water primrose Wireweed	Australian swamp stonecrop North American signal crayfish Mitten crab Slipper limpet Zebra mussel Ruffe Bullhead Pike Perch	American mink Canadian pond weed Nuttall's pond weed Japanese knotweed Himalayan balsam Giant hogweed Rainbow trout Orfe Minnow New Zealand Flatworm Common cord grass Water fern Curly waterweed Parrot's feather <i>R. ponticum</i> Fanwort Large-flowered waterweed Floating pennywort Red vent syndrome (RVS)

**Table 8** Elements of contingency plans or protocols for response to GB priority, local high priority and priority species.

GB Response	High Priority Local Response	Priority Local Response
<ul style="list-style-type: none"> <li>- Report to local and GB institutions.</li> <li>- Determine the extent of infestation.</li> <li>- Isolate area where practicable.</li> <li>- Subsequent action led by Government agencies.</li> </ul>	<ul style="list-style-type: none"> <li>- Report to local and GB institutions.</li> <li>- Determine the extent of infestation.</li> <li>- Isolate area where practicable.</li> <li>- Establish source and check related sites.</li> <li>- Closure of all pathways.</li> <li>- Decide on appropriate action eradication/containment.</li> <li>- Approve eradication methodology.</li> <li>- Monitor.</li> </ul>	<ul style="list-style-type: none"> <li>- Report to local and GB institutions.</li> <li>- Determine the extent of infestation.</li> <li>- Survey in course of normal work to establish and map distribution.</li> <li>- Include new areas in existing eradication/control programmes.</li> <li>- Identify and close all pathways.</li> <li>- Monitor as part of planned catchment monitoring programme.</li> </ul>

Where INNS have been identified, the control and eradication of the species should be implemented. This has started for a number of populations within the area (see **Section 4**) and it is recommended that these actions continue and are expanded to additional populations as they are identified. While eradication is recognised as the ultimate aim of any actions, it is recognised that for some species this will not be possible and, therefore, the containment of the population should be the priority to prevent further spread.

## **7. Monitoring and Review**

To ensure the effective implementation of this plan, it is vital that the outcomes and impacts of the actions are monitored and reviewed to ensure that the objectives are being met. Thus, a coordinated monitoring programme must be established to ensure efficacy and sustainable treatment initiatives and include:

- Assessment of efficacy of surveillance and rapid response systems
- Occurrence and distribution of the selected INNS within the Wester Ross and Lochalsh area
- Effectiveness of control/eradication programme including:
- Application/delivery of effective concentrations of biocides.
  - Checking that treatments have been effective.
  - Re-treating immediately where there is doubt.
  - Monitoring any apparent resistance to treatments and investigate.
  - Surveying priority areas for signs of dormant plants becoming activated.
- Assessment of the ability to close established pathways of transmission.
- Monitoring the effectiveness of all legislation and codes of practice especially those which are aimed at restricting/closing pathways.
- Monitoring general activities within the district and assessing them in terms of risk for the introduction of INNS.

Monitoring activities will be undertaken by Trust staff in conjunction with stakeholder representatives who will be aware of local initiatives and priorities for action.

This plan has an operational period of 2021 to 2030 but progress will be reviewed on an ongoing basis by Trust staff. An overall plan review is intended in 2025 – the mid-point of plan delivery.



## Acknowledgements

This plan has been developed with the assistance and funding of Scottish Invasive Species Initiative, National Lottery Heritage Fund and NatureScot. We are grateful for the support received from these organisations and their commitment to the tackling of invasive species in Wester Ross. Thank you to Rob Dewar of National Trust for Scotland for current INNS information for National Trust properties.

