

West Sutherland

Biosecurity Management Plan 2 2020 - 2029



WEST SUTHERLAND FISHERIES TRUST

REGISTERED CHARITY NUMBER SC24426

Gardeners Cottage, Scourie, IV27 4SX

Tel: 01971 502259

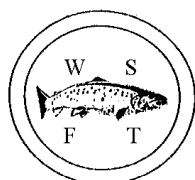
E-mail: wsft@btconnect.com; website: www.wsft.org.uk

Acknowledgements

West Sutherland Fisheries Trust developed this plan with the assistance and funding of Scottish Invasive Species Initiative, National Lottery Heritage Fund and Scottish Natural Heritage. We are grateful for the support received from these organisations and their commitment to the tackling of invasive species in West Sutherland.



LOTTERY FUNDED



Scottish Invasive Species Initiative

Abbreviations

Abbreviation	Organisation
ASSG	Association of Scottish Shellfish Growers
BTA	British Trout Association
DSFBs	District Salmon Fisheries Boards
FCS	Forestry Commission Scotland
FHI	Fish Health Inspectorate
HISF	Highland Invasive Species Forum
MS	Marine Scotland
NatureScot	Scotland's Nature Agency
NNSS	Non Native Species Secretariat
N&WDSB	North & West District Salmon Fishery Board
SEPA	Scottish Environment Protection Agency
SISI	Scottish Invasive Species Initiative
SFCC	Scottish Fisheries Co-ordination Centre
SG	Scottish Government
SSPO	Scottish Salmon Producers' Organisation

Contents

1. Introduction.....	1
2. The Context	2
2.1 Biosecurity: The Nature of the Problem.....	2
2.2 Policy and Legislation	3
3. Species of interest	4
3.1 Current biosecurity issues	5
3.2 Potential biosecurity issues	6
4. Existing INNS prevention and control activities	9
5. Biosecurity management strategy	10
6.2 Control and eradication.....	13
7 Monitoring.....	15

Cover pictures: *Top left – Himalayan Balsam; top right - Japanese knotweed; bottom left –American skunk cabbage; bottom right – Rhododendron. First 3 pictures courtesy of S. Marshall, bottom right courtesy of K. Wilkes*

This document follows on from the first Biosecurity Plan produced in 2009 by West Sutherland Fisheries Trust (WSFT) which covered the period 2009-2015. As with the preceding Plan, this document has been produced following a wide-ranging public consultation involving many of the interests in Sutherland, including proprietors, anglers, Government and non-Government Agencies. It details work that has been undertaken and recommends actions required to address biosecurity issues within the area. It will therefore remain active, being updated as a result of new research and findings.

Although prepared by WSFT, this plan is one of a set of 10 biosecurity plans being produced around the north of Scotland as part of a regional programme of action implemented through the Scottish Invasive Species Initiative (SISI) with backing and support from the National Lottery Heritage Fund (NLHF) and Scotland's Nature Agency (NatureScot).

SISI operates over approximately 29,500 km² of northern Scotland and is a partnership project led by NatureScot but with ten fishery trust and fishery board delivery partners – including WSFT - and one academic partner – the University of Aberdeen. The project runs from 2017-2021 and is delivering 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 and community awareness of invasive non-native species and biosecurity issues.

In SISI invasive species control is delivered by a combination of staff, contractor and community and volunteer-based control. Further information about the project can be found on its website - <https://www.invasivespecies.scot/>.

1. Introduction

The need for ongoing action on biosecurity issues has been identified in the Trust's Fisheries Management Plan ([The Third Fishery Management Plan for the area covered by the West Sutherland Fisheries Trust, 2019 – 2023](#))¹ and the [River Basin Management Plan for the Scotland river basin district: 2015–2027](#)².

This biosecurity plan has developed from the previous biosecurity plan, identifying the actions completed and the future actions required. As the spread of INNS is not isolated to West Sutherland this plan will also facilitate coordination and communication with the neighbouring Fisheries Trusts, Boards and other stakeholders of neighbouring areas e.g in Wester Ross and Kyle of Sutherland.

The plan provides a platform for local action to address those biosecurity issues. It has a lifespan of ten years 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

¹ https://www.wsft.org.uk/images/publications/RMP_2019.pdf

² <https://www.sepa.org.uk/media/163445/the-river-basin-management-plan-for-the-scotland-river-basin-district-2015-2027.pdf>

plan will rely on the formation of strong local partnerships founded on solid legal and policy principles by a range of interested parties.

2. The 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 activity holidays and 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 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 and the wider United Kingdom, are now facing complex and costly problems associated with invasive species, for example:

- 🌿 [DEFRA](#)³ have estimated that INNS cost the UK economy £2 billion per year
- 🌿 In the UK Japanese Knotweed is thought to affect an area roughly the size of London and the [Review of Non-Native Species Policy \(2003\)](#)⁴ has estimated the total cost of its removal using current techniques at £1.56bn.
- 🌿 A Scottish Government [report](#)⁵ 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](#)⁶ 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*

³ <http://www.defra.gov.uk/wildlife-countryside/wildlife-manage/non-native/index.htm>

⁴ <http://www.defra.gov.uk/wildlife-countryside/pdf/wildlife-manage/non-native/review-report.pdf>

⁵ www.scotland.gov.uk/resource/doc/1062/0042434.pdf

⁶ [http://www.forestryresearch.gov.uk/pdf/Argyll_Bute_rhododendron_2008_costs.pdf/\\$FILE/Argyll_Bute_rhododendron_2008_costs.pdf](http://www.forestryresearch.gov.uk/pdf/Argyll_Bute_rhododendron_2008_costs.pdf/$FILE/Argyll_Bute_rhododendron_2008_costs.pdf)

cernuus). The ruffe in particular has decimated the once significant and diverse population of the rare and protected Powan (*Coregonus lavaretus*) in Loch Lomond.

Without a coordinated and systematic approach to the prevention of introduction and control of the spread of INN species 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 invasive non-native species. SISI has added a summary to their website at www.invasivespecies.scot/law-non-native-species. INNS, and their control, is, however, covered by a range of legislative acts.

- 🌿 [Section 14 of The Wildlife and Countryside Act \(1981\)](#)⁷ (as amended in Scotland by the [Wildlife and Natural Environment \(Scotland\) Act 2011](#)⁸) 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](#)⁹ 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 under your ownership, care and management do not cause harm to our environment.
- 🌿 Section 179 of the [Town and Country Planning \(Scotland\) Act 1997](#)¹⁰ 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](#)¹¹ regulates the use of pesticides and herbicides for the control and eradication of INNS.
- 🌿 [Environmental Protection Act 1990](#)¹² 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.

⁷ www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1981/cukpga_19810069_en_1

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

⁹ <https://www2.gov.scot/Resource/0039/00398608>

¹⁰ www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1

¹¹ www.opsi.gov.uk/legislation/scotland/ssi2005/20050066.htm

¹² www.opsi.gov.uk/acts/acts1990/ukpga_19900043_en_1

- 🌿 [The Waste Management Licensing Regulations 1994](#)¹³ 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](#)¹⁴ and the [Environmental Protection \(Duty of Care\) Regulations 1991](#)¹⁵ provide guidance for the handling and transfer of controlled waste.
- 🌿 [The Aquaculture & Fisheries \(Scotland\) Act 2007](#)¹⁶ regulates against the unauthorised introduction of fish to inland waters.
- 🌿 The [Prohibition of Keeping or Release of Live Fish \(Specified Species\) Order 2003](#)¹⁷ requires that a licence be obtained for the keeping or release of species listed on Schedules 1 and 2.
- 🌿 The [NetRegs](#)¹⁸ 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 fisheries legislation. This stipulates that Marine Scotland acts on behalf of the Government in 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.

3. Species of interest

Twenty-seven INNS and fish diseases have been identified for inclusion in the Plan, of which 12 high priority species will be the main focus for action. The priority species were identified as those that:

- 🌿 Already exist within the WSFT area.
- 🌿 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.

¹³ http://www.opsi.gov.uk/si/si1994/uksi_19941056_en_1.htm

¹⁴ www.opsi.gov.uk/si/si1991/Uksi_19911624_en_1.htm

¹⁵ www.opsi.gov.uk/si/si1991/uksi_19912839_en_1.htm

¹⁶ http://www.opsi.gov.uk/legislation/scotland/acts2007/asp_20070012_en_1

¹⁷ <http://www.scotland.gov.uk/resource/doc/47133/0009766.pdf>

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

3.1 Current biosecurity issues

Current biosecurity issues are associated with 9 INNS, one translocated native species and one fish parasite that are currently found in the West Sutherland area:

- 🌿 Himalayan balsam (*Impatiens glandulifera*) is present in 2 known places, both within Assynt, at Clashnessie and Nedd. 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 low level 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 located in 26 known small satellite populations within the area, primarily within gardens. It does not appear to be spreading at present, although it can spread 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 5 known locations within the area but is not a significant threat to rivers at this time. It spreads by natural seed and berry dispersal after intentional planting in gardens. The large leaves outcompete smaller plants and can adversely affect native vegetation. Control is undertaken with Glycophosphate.



- 🌿 Rhododendron (*Rhododendron ponticum* & hybrids) is present in several locations throughout the area but is not a significant threat to rivers and does not appear to be showing significant spread. Most stands are found around Lodges. 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.



- 🌿 Giant rhubarb (*Gunnera tinctoria*), a large leaved plant growing up to 2 m in height, is present at many locations within the area. It can



spread from rhizomes or seeds and its spread has recently been identified as increasing and a potential threat to native species. Control is manual removal or treatment with Glyphosphate.

- Canadian pondweed (*Elodea Canadensis*) is present in various locations throughout the area but is not seen as a significant threat at the present time. It has not currently been mapped within West Sutherland. 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.



- American mink (*Mustela vison*) have been found intermittently within the area, although no breeding population has been found. Currently within the area monitoring is the main activity, with trap and despatch implemented where signs are observed.



- Minnow (*Phoxinus phoxinus*) is a translocated species that has been introduced into the area and is now known to be resident in a large number of catchments. Minnows compete for food and territory with native species but they also provide another food resource for herons, sawbill ducks and larger fish species. Monitoring is undertaken, but no control implemented.



- Pink salmon (*Oncorhynchus gorbuscha*) has spread naturally to the area, appearing initially in 2017. The impacts of a spawning pink salmon population on the native species within our waters are currently unknown but may include competition for resources both in freshwater and marine areas. Where animals are caught during routine activities they are dispatched.



- Rainbow trout (*Oncorhynchus mykiss*) have been stocked into the Lagg Fishery, near Drumbeg. There are also historical records of stocking in lochs. However, with the exception of Lagg, there does not appear to be any rainbow trout currently within the area. Where animals are caught elsewhere during routine activities they are dispatched.

- 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 for example sushi. Sightings are reported to the central database.

3.2 Potential biosecurity issues

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

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

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

There are five High Threat level species that could be introduced into the West Sutherland area and they include one fish parasite and three freshwater invertebrates (Table 1).

Table 1 High threat level species their impacts and risk of introduction







SPECIES	RISK OF INTRODUCTION	LOCAL IMPACTS
<i>Gyrodactylus salaris</i> (Freshwater external parasite of salmon)	High- Through unintentional introduction from anglers, fish farmers and water sport enthusiasts through: <ul style="list-style-type: none"> ▪ Contaminated fish ▪ Clothing/equipment which has been in contact with infected water including canoes ▪ Ballast water 	<ul style="list-style-type: none"> ▪ Projected catastrophic impact on salmon (<i>Salmo salar</i>) populations throughout Scotland. (It has largely exterminated <i>S. salar</i> in 41 Norwegian rivers)
North American signal crayfish (<i>Pacifasticus leniusculus</i>)	Medium- Through natural spread or intentional/ unintentional introduction from an existing population nearby.	<ul style="list-style-type: none"> ▪ Burrows into riverbanks causing destabilisation ▪ Diet include small fish, fish ova and invertebrates
Giant hogweed (<i>Heracleum mantegazzianum</i>)	Medium- Through intentional/ unintentional introduction.	<ul style="list-style-type: none"> ▪ Causes overshadowing of riparian vegetation and denuded banks following die-back, with increased risk of erosion ▪ Contact with the sap causes severe burning of the skin when exposed to sunlight
Zebra mussel (<i>Dreissena polymorpha</i>) Freshwater Bivalve	Medium- through unintentional introduction from contaminated boat/canoe hulls and engines and bilge water.	<ul style="list-style-type: none"> ▪ Major economic impact on all subsurface water structures e.g. blocking pipes and impacting upon hydro-electric schemes ▪ Varied and unpredictable ecological impacts including changes to freshwater nutrient cycles, extinction of local mussels and changes to stream substrate affecting spawning areas
Chinese mitten crab (<i>Eriocheir sinensis</i>) Resides in freshwater but migrates to the sea for breeding.	Medium- through unintentional introduction from boat hulls and live food trade.	<ul style="list-style-type: none"> ▪ 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

There are also 13 Medium Threat level species of which there is a high risk of introduction for 2 species, a medium risk for five species and a low risk for six species (Table 2).

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

SPECIES		RISK OF INTRODUCTION
Didemnum Tunicates / sea squirts (<i>Didemnum vexillum</i>)	High	Unintentional introduction from marine fishing boat hulls
Wireweed (<i>Sargassum muticum</i>)	High	Through unintentional introduction
Ruddy duck (<i>Oxyura jamaicensis</i>)	Medium	Could migrate from a number of locations in eastern Scotland
Water primrose (<i>Ludwigia grandiflora</i>)	Medium	Unintentional introduction from boat hulls and ponds
Slipper limpet (<i>Crepidula fornicate</i>)	Medium	Through unintentional introduction
Ruffe (<i>Gymnocephalus cernuus</i>)	Medium	Currently recorded in central Scotland and could be introduced as live bait
Bullhead (<i>Cottus gobio</i>)	Medium	Translocated species recorded in central Scotland that could be introduced deliberately or as live bait
Killer and Demon shrimp (<i>Dikerogammarus spp.</i>)	Low	Through unintentional introduction from its current small number of locations in England and Wales
Large flowered waterweed (<i>Egeria densa</i>)	Low	Only found to date in East Lothian. Possible introduction from ponds
Floating pennywort (<i>Hydrocotyle ranunculoides</i>)	Low	Currently only in England up to the midlands. Possible introduction from ponds
Parrot's feather (<i>Myriophyllum aquaticum</i>)	Low	Through intentional/unintentional introduction from two existing populations in the south of Scotland
Fanwort (<i>Cabomba caroliniana</i>)	Low	Only found in one location in southern Scotland possible introduction from ponds
Asian topmouth gudgeon (<i>Pseudorasbora parva</i>)	Low	Currently only recorded from 5 locations in England. Could be introduced as live bait or as releases from aquaria
Curly waterweed (<i>Lagarosiphon major</i>)	Low	Currently found in a small number of locations throughout Scotland especially in the central belt area. Could be spread through disposal of garden waste, angling equipment and possibly waterfowl

From Tables 1 and 2, the main pathways or means of introduction of both High and Medium Threat level species into the west Sutherland area are:

-  Intentional introduction or planting
-  Fouling and ballast water of marine vessels
-  Escapes from garden ponds
-  Contaminated water sports equipment (e.g. from anglers, canoeists)
-  Movement of contaminated soils or vehicles
-  Improper control and disposal measures e.g. cutting and dumping without treatment.

3.3 Fish Health and Genetic Issues

The introduction of non-native genotypes of species already present may also 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](#)¹⁹ 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 success²⁰. 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.

4. Existing INNS prevention and control activities

There have been a number of prevention and control activities concerning INNS within the area, many of which are on-going. Much of the current work is overseen by WSFT as part of the SISI project, with funding from NLHF and NatureScot. Landowners and communities are also involved in monitoring and eradication activities, with Giant rhubarb and Rhododendron control undertaken exclusively by landowners.

-  WSFT and the NWDSFB, promote 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*) has been controlled since 2012 through hand pulling by WSFT, riparian owners and volunteers. By 2020, of the 2 populations identified in the previous plan, 1 had been reduced to a small pocket within 1 garden and the other had been reduced by approximately 80%.

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

²⁰ 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)

🌿 Japanese knotweed (*Fallopia japonica*) is currently being controlled at 12 sites. Of these, no plants were found at 3 sites during monitoring in 2019, with a major reduction noted in the other populations. In addition, a further 2 populations on Reay Forest Estate are now considered eradicated.

🌿 American skunk cabbage (*Lysichiton americanus*) is currently being treated at one site in Kinlochbervie. This is the largest known population within the area, with no notable impact of the actions seen.

🌿 Rhododendron (*Rhododendron ponticum* & hybrids) is being controlled by the different Estates. Control of the largest population at Achfary has been undertaken with considerable success, although regeneration is noticeable, and monitoring and control required to continue.



🌿 Giant rhubarb (*Gunnera tinctoria*) has been identified as an emerging issue within the area. Treatment has started by some landowners, primarily with manual removal.

🌿 American mink (*Mustela vison*) presence is being monitored throughout the area by a network of volunteers, currently under the direction of SISI. Sightings continue to be reported occasionally but there has been only 1 animal dispatched since 2010. The work of the neighbouring Trusts (in Wester Ross and the Kyle of Sutherland) in controlling mink is vital to the efforts to maintain the current status within west Sutherland.

5. Biosecurity management strategy

Prevention of the introduction and spread of INNS remains the local priority. Table 3 details the key groups involved in this, their perceived role and possible actions to take. The roles and actions of key government agencies and non government bodies in promoting awareness of INNS issues is presented in Table 4.

This plan seeks to engage and involve a wide range of decision makers operating at the local, regional and national scales, most of which have their own policies and plans that influence or cross-over with fishery management issues:

Policy & legislation

- Scottish Government, *Edinburgh*
- Scottish Natural Heritage, *Golspie; Ullapool*
- Scottish Environment Protection Agency, *Dingwall; Thurso*
- Marine Scotland

Land resources

- Crofters Union
- Landowners Association

Water resources

- North Highland and West Highland Area Advisory Groups (River Basin Plan)
- Scottish Water

Fisheries

- West Sutherland Fisheries Trust
- The North & West District Salmon Fishery Board
- Fishery Management Scotland

Aquaculture

- Scottish Salmon Producers' Organisation
- Loch Duart Ltd
- Scottish Sea Farms

Conservation & biodiversity

- Scottish Wildlife Trust

Table 3 Pathways and stakeholder groups in the West Sutherland 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)	N&WDSFB, 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

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

Table 4 Priority areas for awareness and delivery mechanisms according to stakeholder group

Stakeholder Group	Priority Area	Mechanism of Delivery
Aquaculture (SSPO) and local fish farm companies	<ul style="list-style-type: none"> - Impact of INNS - Use of sufficient screens and other biosecurity measures - Dangers of importing stock from contaminated areas - Controls on movement of stock and water 	<ul style="list-style-type: none"> -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 - Enforcement agencies (FHI & NWDSFB) to undertake site visits to discuss and advise on issues involving INNS - Incorporation of INNS codes of good practice into SSPO industry codes of practice
Port Authorities	<ul style="list-style-type: none"> - Avoid pumping out of non sterilised ballast water in harbour - Role of hull fouling in the introduction and spread of INNS 	<ul style="list-style-type: none"> -Promote implementation of code of practice requiring non-sterilised ballast water to be discharged away from harbour
Water User associations (canoeists, sailing clubs)	<ul style="list-style-type: none"> -Promote awareness to clubs and participants of the dangers arising from INNS 	<ul style="list-style-type: none"> -WSFT to work with associations to promote disinfection of equipment -FACT campaign and web site
Landowners	<ul style="list-style-type: none"> - Promote knowledge of biosecurity issues amongst all tenants and resource users - Identification of suitable persons to act as “eyes” for the WSFT 	<ul style="list-style-type: none"> -Work with WSFT to ensure dissemination of best practices and appropriate signage to reduce threats from INNS -WSFT to offer training for “eyes”
Angling clubs	<ul style="list-style-type: none"> - Promote knowledge of biosecurity issues amongst all members and visiting anglers - Promote the distribution of information and erection of signage in recognised car parks -Recommend suitable members to act as “eyes” 	<ul style="list-style-type: none"> -Work with WSFT to ensure dissemination of best practices and appropriate signage to reduce threats from INNS -Promote Check, Clean, Dry²¹ to members and visiting anglers -WSFT to offer training for “eyes”
NWDSFB and WSFT	<ul style="list-style-type: none"> -Continue to promote awareness to anglers and angling clubs of the dangers arising from INNS. 	<ul style="list-style-type: none"> -Continue to promote the use of Check, Clean, Dry by all stakeholders -Assist with monitoring and prioritisation of INNS removal

²¹ <http://www.nonnativespecies.org/checkcleandry/index.cfm>

Stakeholder Group	Priority Area	Mechanism of Delivery
Highland Council	<ul style="list-style-type: none"> - 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 INNS to the general public 	<ul style="list-style-type: none"> - 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 INNS -Holding of awareness event/open days to promote biosecurity issues -Distribute leaflets with council tax bills
SEPA	<p>- SEPA has Habitat Responsibilities for Freshwater (still and flowing waters) as referenced in The River Basin Management Plans (RBMP), including species found within the water body itself including emergent plants.</p> <p>More information can be found at: https://www.gov.scot/publications/non-native-species-code-practice/pages/10/</p> <p>- SEPA has moved to a sector approach to improve how businesses are regulated. https://sectors.sepa.org.uk/</p> <p>INNS work is an area of work that cuts across all sectors.</p>	<p>- Information and relevant links can be found here: https://www.sepa.org.uk/environment/biodiversity/invasive-non-native-species/</p> <p>Work in collaborative partnership with other agencies to tackle INNS across Scotland's Environment</p> <ul style="list-style-type: none"> - Digital documents available for download on SEPA Website. - INNS issues to be incorporated into all relevant guidance documents, sector plans and placemaking projects as appropriate
NatureScot	<ul style="list-style-type: none"> -National: Promotion of good practice in the prevention, control and eradication of INNS -Local: Implementation of good practice measures for local contractors and promotion of the Biosecurity Plan. 	<ul style="list-style-type: none"> - Holding of NatureScot Sharing Good Practice events. - NatureScot will continue to support and advise the WSFT - Grant funding may be available for some projects.
Marine Scotland	<ul style="list-style-type: none"> -Fish Health Inspectorate part of Marine Scotland is lead body with respect to fish diseases and escapes 	<ul style="list-style-type: none"> - Undertake site visits to discuss and advise on issues involving INNS - Promote disinfection of equipment and provide appropriate facilities to eliminate the risk of accidental transfer of INNS

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 5) and the appropriate reporting protocol should be followed (Table 6).

Table 5 Response level for 31 invasive non-native species

GB Response	Local High Priority Response	Local Priority Response
Gyrodactylus salaris	American signal crayfish	American mink
Asian topmouth gudgeon	Ruffe	Canadian pond weed
Ruddy duck	Bullhead	Japanese knotweed
Didemnum spp	Mitten crab	Himalayan balsam
Wireweed	Slipper limpet	Giant hogweed
Water primrose	Zebra mussel	Rhododendron
	Australian swamp stonecrop	Rainbow trout
		Minnnow
		Red vent syndrome (RVS)
		Orfe
		Nuttal's pondweed
		Water fern
		Common cord grass
		Fanwort
		Large flowered waterweed
		Floating pennywort
		Parrot's feather
		Curly waterweed

Table 6 Elements of contingency plans or protocols for response to GB priority, local high priority and priority species

GB Response	Local High Priority Response	Local Priority Response
-Report to local and GB institutions	- Report to local and GB institutions	-Report to local and GB institutions
-Determine the extent of infestation	- Determine the extent of infestation	-Determination of the extent of infestation
-Isolation of area where practicable	- Isolation of area where practicable	-Surveys to establish and map distribution
	- Establish source and check related sites	-Inclusion of new areas in existing eradication/control programmes
	- Closure of all pathways	- Identification and closure all pathways
	- Decision on appropriate action eradication/containment.	- Monitor as part of planned catchment monitoring programme
	- Approved eradication methodology	
	- Monitor	

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 actioned to prevent further spread.

7 Monitoring

Biosecurity promotion and measures are being initiated within the West Sutherland area by the WSFT. However, the continuation of this, for example after the end of the SISI programme, will be dependent on available resources and uptake by other stakeholders and partners. Any work completed will, however, be monitored and the results evaluated particularly in the light of changing circumstances e.g. climate change.

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 fully coordinated monitoring programme has been established to ensure efficacy and sustainable treatment initiatives and includes:

- 🌿 Assessment of efficacy of surveillance and rapid response systems
- 🌿 Occurrence and distribution of the selected INNS within the 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 the area 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 WSFT staff in conjunction with stakeholder representatives who by virtue of their work are out in the catchment on a regular basis e.g roads department and access officers employed by local councils.