

Cromarty Firth District Biosecurity Plan 2021 – 2025

Prepared by the Cromarty Firth Fishery Board 2021



What is Biosecurity?

Biosecurity refers to a way of working that minimises the risk of contamination and the spread of animal and plant pests and diseases, parasites and non-native species.

What are Invasive Non-Native Species?

Invasive non-native species are those that are transported outside of their natural range and that damage our environment, the economy, our health and the way we live.

Table of Contents

Table of Contentsi
Executive Summaryii
1. Scope and Purpose1
2. Background2
3. Context
3.1 Biosecurity: The Nature of the Problem3
3.2 Policy and Legislation4
4. Scope of the Plan
4.1 Cromarty Firth Fisheries District6
4.2 Land Use
4.3 Biosecurity: Current and Potential Threats9
4.3.1 Current Biosecurity Issues9
4.3.2 Potential Biosecurity Issues14
4.4 Stakeholders 17
4.5 Existing INNS control activities 19
5. Biosecurity Management Strategy 20
5.1 Objectives and Outputs of the Cromarty Firth District Biosecurity Plan
5.2 Actions and Timeframes
6. Monitoring

Executive Summary

This plan was developed by the Cromarty Firth Fishery Board with the assistance and funding of the Scottish Invasive Species Initiative (SISI), NatureScot, and National Lottery Heritage Fund. This plan follows on from the 2010 - 2015 Cromarty Firth District Biosecurity Plan. It describes the biosecurity issues of the Cromarty Firth fisheries district and presents actions that have been agreed with stakeholders for the prevention, early detection, control and mitigation of the introduction and spread of selected invasive non-native species (INNS), fish diseases and parasites. This updated plan reflects past action, lessons learned, and current best-practice.

The vision of this plan is:

To develop a sustainable framework to prevent, detect, control, and eradicate invasive non-native species within the Cromarty Firth fisheries district through the coordination of data collection, management, liaison, and education.

Objective 1: Prevent the introduction and spread of INNS within the Cromarty Firth fisheries district.

- Solution Output 1.1 All key stakeholders aware of:
 - i. The ecological and economic impacts of INNS.
 - ii. The potential pathways for introduction and spread of INNS.
 - iii. Management best-practices to prevent introduction and spread of INNS.

<u>Objective 2</u>: Maintain framework for the detection and surveillance of INNS to ensure a rapid management response.

- Solution Output 2.1 Improve strategic monitoring of INNS in district.
- Output 2.2 Continue rapid response mechanism for new INNS which pose significant threats to local biodiversity and economy.

Objective 3: Maintain and expand coordinated control and eradication programmes for INNS.

- Output 3.1 Coordinated control, eradication and habitat restoration programmes maintained throughout Cromarty Firth fisheries district.
- Output 3.2 Coordinate partnerships ensure sufficient funding and resources in place to continue prevention and control of INNS within the area.

The implementation of this biosecurity plan will bring many socio-economic and environmental benefits including:

- The prevention of the salmon parasite, *Gyrodactylus salaris*, from entering the Cromarty Firth district which would cause catastrophic economic and environmental loss.
- S A strategic, collaborative control programme of invasive non-native plants.
- Increased biodiversity and the conservation of important natural habitats for native species such as otter, Atlantic salmon, European eel, and freshwater pearl mussel.
- Solution The visual conservation and increased amenity value of local landscapes.
- Solution The endangered water vole from American mink.
- The prevention of spread of American signal crayfish from a nearby catchment will safeguard aquatic biodiversity and fisheries.

1. Scope and Purpose

This plan describes the biosecurity issues of the Cromarty Firth fisheries district and presents actions that have been agreed with stakeholders for the prevention, early detection, control and mitigation of the introduction and spread of selected invasive non-native invasive species (INNS), fish diseases and parasites. The vision of this plan is:

'To establish a sustainable framework which will prevent, detect, control, and eradicate invasive nonnative species within the Cromarty Firth fisheries district through appropriate management, data collection, liaison, and education'

This vision will be achieved through the realisation of three high-level objectives:

Objective 1: Prevent the introduction and spread of INNS within the Cromarty Firth fisheries district.

Objective 2: Maintain the framework for the detection and surveillance of INNS, linked to a protocol to ensure a rapid management response.

Objective 3: Maintain and expand coordinated control and eradication programmes for INNS.

These objectives are in accordance with established protocols for fish diseases and with the three key elements of the <u>GB Invasive Non-native Species Strategy</u>¹:

- Prevention
- Sarly detection, surveillance, monitoring, and rapid response
- Solution Nitigation, control, and eradication

The objectives of this plan will be achieved through a partnership approach to implement the agreed actions.

The ultimate key to the effectiveness of this plan is the building of local awareness, capacity, and partnerships to ensure the success and long-term sustainability of the presented actions.

¹ http://www.nonnativespecies.org/index.cfm?sectionid=55

2. Background

The Cromarty Firth District Biosecurity Plan is one of a set of biosecurity plans across Scotland that form a larger campaign of action against INNS. An earlier version of this plan was developed in 2010² by the Cromarty Fisheries Board with the Rivers and Fisheries Trusts of Scotland supported with funding from the Scottish Government (SG), Scottish Natural Heritage, Scottish Environment Protection Agency (SEPA) and the Esmeé Fairburn Foundation (EFF).

The need for ongoing action on biosecurity issues was identified in the Board's Fisheries Management Plan (<u>Cromarty Firth Fishery Management Plan</u>³) and in the <u>North Highland Area Management Plan</u>⁴ 2015-2027. This biosecurity plan provides a platform for local action to address those biosecurity issues. This updated plan has a lifespan of five years, and as part of an adaptive management cycle, the outcomes and impacts will be reviewed and incorporated in the next generation plan. Although this plan is not a legal instrument in itself, it utilises existing legal and regulatory instruments to support the implementation of its actions and the realisation of its objectives. As such, the successful implementation of this plan will rely on the continuation of strong local partnerships founded on solid legal and policy principles by a range of interested parties.

The 2010 plan was produced using a participatory planning process coordinated by the Cromarty Firth Fishery Board through which stakeholders identified and agreed the aims, outputs and actions presented in this plan. This plan will continue partnership working with stakeholders to implement the actions required to address the complex issues associated with biosecurity. This plan therefore represents an update to the agreed approach of the Cromarty Firth Fishery Board, stakeholders and appropriate local regulators for the prevention, early detection and control of invasive non-native species, fish diseases and parasites.

This document follows on from the first Biosecurity Plan produced in 2010 by Cromarty Fisheries Board and which covered the period 2010-2015. 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 the Cromarty Fisheries Board, this plan is one of a set of ten biosecurity plans being produced around the north of Scotland as part of a regional programme of action implemented through the Scottish Invasive Species Initiative with funding and support from the National Lottery Heritage Fund (NLHF) and 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 Cromarty Firth Fisheries Board - 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

² http://cromarty.dsfb.org.uk/files/2012/08/Cromarty-Firth-Biosecurity-Plan.pdf

³ http://cromarty.dsfb.org.uk/files/2012/08/cromarty-fishery-management-plan.pdf

⁴ https://www.sepa.org.uk/media/163445/the-river-basin-management-plan-for-the-scotland-river-basin-district-2015-2027.pdf

butterbur) and the American mink as well as raising public and community awareness of invasive nonnative species and biosecurity issues.

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

3. Context

3.1 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 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.

A 2012 <u>report</u> from the Centre for Ecology and Hydrology⁵ shows that there are nearly 2000 non-native species present in the United Kingdom, the majority of which exist in small populations with little impact on native flora and fauna. However, a small but significant proportion of these non-native species are invasive.

Invasive non-native species (INNS) are those that have been transported outside of their natural range and that damage our environment, the economy, our health and the way we live.

According to the Convention on Biological Diversity (<u>CBD; 2006</u>)⁶, INNS are the second greatest threat to biodiversity, being capable of rapidly colonising a wide range of habitats and excluding the native flora and fauna. Furthermore, over the last 400 years, INNS have contributed to approximately 40% of animal extinctions where the cause of extinction is known. As water is an excellent transport medium for the dispersal of many of these species, rivers and lochs and their banks and shorelines are amongst the most vulnerable areas to the introduction, spread and impact of these species. The ecological changes created by INNS can further threaten already endangered native species and reduce the natural productivity and amenity value of riverbanks, shorelines, and waterbodies.

The threat from INNS is growing at an increasing rate due in part to 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:

⁵ https://www.ceh.ac.uk/sites/default/files/2012_-_NNSIP_Final_report.pdf

⁶ http://www.cbd.int/gbo2

- DEFRA⁷ have estimated that INNS cost the UK economy £2bn per year
- In the UK, Japanese Knotweed is thought to affect an area roughly the size of London and the <u>Review of Non-Native Species Policy (2003)</u>⁸ has estimated the total cost of removal using current techniques at £1.56bn.
- A Scottish Government <u>report</u>⁹ estimated the potential Net Economic Value loss to Scotland of the introduction of *Gyrodactylus salaris* at £633 million, with severe consequences for rural communities.
- £25 million is the estimated cost of clearing the invasive *Rhododendron ponticum* from the Loch Lomond and Trossachs National Park.
- Invasive species have already changed the character of iconic landscapes and waterbodies in Scotland, greatly 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 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 has severely impacted on 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 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 maintain and expand on the approach implemented by the Cromarty Firth Fishery Board in 2010 at a local level for selected species and diseases that significantly impact freshwater fisheries and the aquatic environment. This local plan and its implementation is also part of a strategic and coordinated approach to INNS management being undertaken across Scotland.

3.2 Policy and Legislation

Given the high costs for the mitigation, control and eradication of INNS and fish diseases once they are established, this plan emphasises the need for the prevention and rapid response to the introduction of INNS **before** they become established. Furthermore, the host of pathways for entry and spread as well as the persistence of many of these species means that a partnership approach to prevent introductions involving a diverse range of stakeholders is essential. These approaches are consistent with the <u>GB Invasive</u> <u>Non-Native Species Framework Strategy</u>¹⁰ and the <u>Species Action Framework</u>¹¹, both of which are approved by the Scottish Government.

⁷ http://www.defra.gov.uk/wildlife-countryside/wildlife-manage/non-native/index.htm

⁸ http://sciencesearch.defra.gov.uk/Document.aspx?Document=WP01001_1661_EXE.pdf

⁹ www.scotland.gov.uk/resource/doc/1062/0042434.pdf

¹⁰ https://www.gov.uk/government/publications/the-great-britain-invasive-non-native-species-strategy

¹¹ https://www.nature.scot/species-action-framework-handbook

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

- Section 14 of <u>The Wildlife and Countryside Act (1981)</u>¹² makes it an offence to allow any animal (including hybrids) which is not ordinarily resident in the UK to: escape into the wild; release to the wild; release from or to allow escape from captivity, any animal that is 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.
- Local Authorities have powers to take action against giant hogweed and Japanese knotweed where it is a threat to the local amenity of an area or if it is considered a statutory nuisance.
- Section 179 of the <u>Town and Country Planning (Scotland) Act 1997¹³</u> 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 <u>Possession of Pesticides (Scotland) Order 2005</u>¹⁴ regulates the use of pesticides and herbicides for the control and eradication of INNS.
- Environmental Protection Act 1990¹⁵ contains 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 1994¹⁶ 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 1991¹⁷ and the Environmental Protection (Duty of Care) Regulations 1991¹⁸ provide guidance for the handling and transfer of controlled waste.
- The Aquaculture & Fisheries (Scotland) Act 2007¹⁹ regulates against the unauthorised introduction of fish to inland waters.

¹² http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1981/cukpga_19810069_en_1

¹³ http://www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1

¹⁴ http://www.opsi.gov.uk/legislation/scotland/ssi2005/20050066.htm

¹⁵ http://www.opsi.gov.uk/acts/acts1990/ukpga_19900043_en_1

¹⁶ https://www.legislation.gov.uk/uksi/1994/1056/contents/made

¹⁷ https://www.legislation.gov.uk/uksi/1991/1624/contents/made

¹⁸ https://www.legislation.gov.uk/uksi/1991/2839/contents/made

¹⁹ http://www.opsi.gov.uk/legislation/scotland/acts2007/asp_20070012_en_1

- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003, Section 33A²⁰ makes it an offence for any person to intentionally introduce any live fish or spawn of any fish into inland waters.
- Step 10 The <u>NetRegs</u>²¹ 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 a local level.

4. Scope of the Plan

4.1 Cromarty Firth Fisheries District

The Cromarty Firth Fisheries Biosecurity Plan overs the management area of the Cromarty Firth Fishery Board within the Highland Region. The Cromarty Firth Fisheries District contains seven main catchments that drain into the Cromarty Firth (Figure 1). Although each catchment contains stocks of migratory fish, the rivers Conon and Alness support the most significant fisheries. In addition to the main river systems, there are more than 160 still waters in the region. These range from large oligotrophic lochs and hydroelectric impoundments in the west, to smaller lochs and ponds in the coastal plain.

The characteristics of the rivers and lochs reflect the changing topography and geology of the region. The west of the region is mountainous and underlain by igneous geology, whilst the low-lying coastal plain is underlain by old red sandstone. This is described in detail in the Cromarty Firth Fishery Management Plan.

²⁰ https://www.legislation.gov.uk/asp/2003/15/part/1/crossheading/unauthorised-introduction-of-fish-into-inland-waters

²¹ http://www.netregs.gov.uk/netregs/default.aspx



Figure 1 Map of Cromarty Firth Fisheries District showing the major rivers and lochs.

4.2 Land Use

Land use within each of the river catchments is mapped and described in detail in the Cromarty Firth Fishery Management Plan. A summary of land use in the region is shown in Figure 2.

Land use reflects the topography and geology of the region with the west and north of the region dominated by expanses of open moorland and deer forest. This area has seen many hydroelectric developments and in recent years there has been increased windfarm development. During the 1950s and 60s the area was planted with conifers, with plantations largely following the main river corridors.

Agriculture is the main land use in the coastal plains surrounding the Cromarty Firth. Urban development is also centred on the shores of the Cromarty Firth and the north shore is the focus of industrial development linked to the oil industry, shipping and distilling.

Recreation and tourism are becoming increasingly important to the region's economy. In 2004, the Scottish Executive published a report on the Economic Impact of Game and Coarse Angling in Scotland. This report estimated that there are 9,100 angler rod-days per year on the River Conon.



Figure 2 Cromarty Firth land-use.

It also estimated that this generated an annual local expenditure of approximately £960,000.

There is little aquaculture within the Cromarty Firth region and no marine or freshwater cage farming of fish. There is a rainbow trout farm at Urray on the River Orrin which has in the past had escapes during flood events. The Cromarty Firth Fishery Board operates a salmon hatchery on the River Conon to mitigate the effects of hydropower development in the area.

There is also stocking of commercial trout fisheries in the region with stocks imported from elsewhere. There are rainbow trout fisheries at Tarvie Lochs, Stoneyfield Loch, Brahan and Loch Achilty. Brown trout are also stocked into Loch Meig and Loch Achonachie.

4.3 Biosecurity: Current and Potential Threats

This section identifies 41 INNS and fish diseases for inclusion in the CFFD Biosecurity Plan, where 15 are designated high-priority species that will be the main focus for action. The priority species were identified as those that:

- Already exist within the Cromarty 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.

4.3.1 Current Biosecurity Issues

Current biosecurity issues are associated with 11 INNS, three translocated native species and one fish parasite that are currently found in the Cromarty Firth District:

American mink (Mustela vison) are present in several Cromarty Firth catchments. Mink spread by migration and kill water fowl, small mammals and juvenile salmon and trout. Mink are linked to the decline of water voles which in recent years have only been recorded in upland areas to the West of the Cromarty Firth region where mink are scarce.



- Canadian pondweed (Elodea canadensis) has been recorded from one catchment in the Cromarty Firth region. 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. Canadian pondweed dominates native macrophyte communities which can lead to their extinction and thereby impacts local invertebrate communities. It can also increase metal loads within waterbodies that compounds its impact on native flora and fauna.
- Nuttall's Pond weed (*Elodea nuttallii*) has recently been recorded from one catchment in the Cromarty Firth region. Nuttall's pond weed dominates native macrophyte communities and this can lead to their local extinction. Impacts have also been recorded on invertebrate communities.

All *Elodea* species take up metals from the sediment and release them into the water. *E. nuttallii* is very tolerant of copper in particular.

Rhododendron (Rhododendron ponticum & hybrids) is present in several Cromarty Firth catchments. It is present on the banks of the Orrin, Conon, Balnagown, Ryefield Burn, Sgitheach, Alness, Rosskeen Burn, Peffery and Logie Burn. The main areas which are heavily impacted are on the Orrin, Conon and Balnagown. Its distribution in other catchments is much more localised. It spreads by natural seed and vegetative dispersal after intentional planting in gardens, parks and demesnes. 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.



Solution in six Cromarty Firth catchments. It is present in the Conon, Peffery, Allt Graad, Sgitheach, Balnagown and Ussie Burn catchments. Most of stands are less than 20m in length. There are some larger stands along the lower reaches of the River Peffery. It has spread along rivers by movement of plant fragments by water and is found in many 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.



Himalayan balsam (Impatiens glandulifera) is present in the lower reaches of several Cromarty Firth rivers and is locally dominant. It is present in the Conon, Orrin, Sgitheach, Contulich, Culcraggie, Alness, Peffery, Allt Graad and Rosskeen Burn catchments. 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 river banks of understory vegetation. Winter dieback of the plants exposes soil to erosion.



Giant hogweed (Hercaleum mantegazzianum) is relatively scarce in the region with an isolated population on the River Peffery, a more established population on the River Balnagown, and a dense mature stand between East Tarbet and Kilmuir. The Balnagown population originates from a dense stand along a ditch line but is confined to small clumps or individual plants downstream. It spreads through seed dispersal and the movement of soil contaminated by its seeds. It is a public health hazard due to the toxins in the sap reacting with UV light to blister

skin. Dense stands can hinder access. Giant hogweed out competes native vegetation for space and resources and can result in a loss of plant and invertebrate diversity. Winter dieback exposes soil to erosion with loss of riverbanks and increased sedimentation.



Skunk Cabbage (*Lysichiton americanus*) is present as isolated single plants on the main stem of the Conon probably originating from a pond on Brahan Estate. It is also present in a ditch line at Loch Luichart.



Rainbow trout (Oncorhynchus mykiss) are farmed at Orrin Fish Farm in the lower Orrin catchment. Rainbow trout have been introduced to ponds/fisheries throughout the area for angling. Farmed fish are a potential source of viral and bacterial diseases affecting wild salmonids and they also compete for resources with native species if allowed to escape.

Minnow (Phoxinus phoxinus) is a translocated species that has been introduced into the Cromarty Firth district by anglers and is now known to be resident in the river Conon and its tributaries. Minnows compete for food and territory with native species but they also provide another food resource for kingfishers, herons, sawbill ducks and other larger fish species.

- Anasakis spp. 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.
- Pike (*Esox lucius*) have been introduced to the loch systems of the rivers Blackwater and Bran. They are now present throughout these rivers as well as the main stem of the Conon. Pike have also been introduced to a number of still waters in the area. Pike are significant predators on native fish species and are likely to limit smolt production from some areas.
- Perch (*Perca fluviatilis*) have been introduced to the lochs of the river Bran, they are also significant predators on native fish species.
- Common Cord Grass (Spartina anglica) it is present within the Cromarty Firth close to Dingwall. It is a perennial salt marsh grass which has been planted widely to stabilise tidal mud flats. Its natural dispersal is by seed and expansion through the rhizomes, seeds can remain dormant for several years. Its invasion and spread creates monospecific stands in the upper intertidal areas often occupied by Zostera. This can reduce feeding areas for bird species such as Brent geese that depend on this habitat for food.
- Ruddy duck (Oxyura jamaicensis) has been recorded as a breeding bird close to Strathpeffer and in Loch Eye. Ruddy duck threatens the survival of the globally endangered White-headed duck (Oxyura leucocephala) with which it hybridises. The UK has 95% of feral Ruddy Ducks in Europe imported into the UK from North America as part of wildfowl collections.

Also present in the Cromarty Firth district are five invasive riparian plant species not on WFD invasive alien species list.

Cone Flower (*Rudbeckia* spp.) is present only in the tidal reaches of the River Conon below Conon Bridge.

Snowberry (*Symphoricarpos albus*) is present on the banks of the Conon, Peffery, Logie Burn, Sgitheach and Balanagown.



- Sycamore (*Acer pseudoplatanus*) is widespread throughout the region and eradication is unlikely. However localised clearance where it is heavily shading would be desirable.
- Ninebark (*Physocarpus* spp.) is present only in the lower reaches of the River Conon near Conon Bridge.

Solution (Mimulus spp.) is present in the lower reaches of the Peffery and Conon.

4.3.2 Potential Biosecurity Issues

The invasive non-native species listed below are <u>not currently present</u> within the Cromarty Firth District. 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 the Cromarty Firth district.

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 eleven 'High Threat' species that could be introduced into the Cromarty Firth district, including one fish parasite, three fish species, five invertebrates and two aquatic plant species (Table 3).

Table 3 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 and water sport enthusiasts through: Contaminated fish Clothing/equipment which has been in contact with infected water including canoes Ballast water 	 Projected catastrophic impact on salmon (Salmo salar) populations throughout Scotland. (It has largely exterminated S. salar in 41 Norwegian rivers)
North American signal crayfish (Pacifasticus leniusculus)	High – Through intentional / unintentional introduction from an existing population nearby. Accidental transfer with fish stocking	 Burrows into riverbanks causing destabilisation Diet include small fish, fish ova and invertebrates
Australian swamp stonecrop (Crassula helmsii)	 High – Through introduction from two existing populations nearby other pathways include: Garden trade²² Disposal of garden waste Spread by animals and human activity 	 Suited to a wide range of slow- moving freshwater systems. 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
Zebra mussel (Dreissena polymorpha) Freshwater Bivalve	Medium – Through unintentional introduction from contaminated boat/canoe hulls and engines and bilge water.	 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 (Eriocher sinensis) Resides in freshwater but migrates to the sea for breeding.	Medium – Through unintentional introduction from boat hulls and live food trade.	 Burrowing in high density populations damages riverbanks Concern over impacts on local species Intermediate host for the mammalian lung fluke <i>Paragonimus</i> <i>ringer</i>, known to infect humans
Ruffe (Gymnocephalus cernuus)	Medium – Growth of popularity of Pike angling increases the risk of transfer by visiting anglers.	 Ruffe populations have a minimum population doubling time of less than 15 months and the species is an aggressive predatory species of zooplankton and other food sources of native species of fish as well as fish eggs. The introduction of Ruffe to L. Lomond has had disastrous consequences for the Powan and has significantly altered the ecology of the loch

²² Note that although the sale of species that are or can become invasive is not illegal, garden centres should be made aware of the impacts of known or potential INNS if they are released into the wild.

SPECIES	RISK OF INTRODUCTION	LOCAL IMPACTS
Roach (<i>Rutilus Rutilus)</i>	Medium – Roach have become established in several large Scottish still waters. Movement by Anglers is the most likely means of introduction.	 The introduction of Roach would significantly alter the ecology of a water body.
Stone Loach (Barbatula barbatulus)	Medium – Stone loach have been introduced to the neighbouring Kyle of Sutherland district probably by visiting Trout anglers.	 Stone loach occur in very high densities and are likely to compete for habitat and food with native Salmonids.
Slipper limpet (<i>Crepidula fornicata</i>)	Medium – The presence of a deep-water port at Invergordon increases the risk of introduction to the Cromarty Firth district. The likely pathways of introduction are by hull fouling and in ballast water.	 Inhabits shallow subtidal area below low water mark often attached to oysters and mussels In France has altered benthic habitat through smothering of sediment beds with densities of 000's/m² that trap suspended silt, faeces and pseudofaeces Exclude other bivalves including oysters to whose beds they are a serious threat. Also a major threat to other protected species
Didemnum Tunicates / Sea Squirts (<i>Didemnum vexillum</i>)	 Medium – Vectors for introduction are uncertain but fouling of ocean-going vessels and/or contamination of aquaculture produce are possibilities. The presence of a deep-water port at Invergordon increases the risk of introduction to the Cromarty Firth district. Once established, it can spread rapidly by both sexual reproduction and asexually by fragmentation of the colonies. 	 Marine habitat changes through overgrowth of sedentary benthic organisms such as seaweed, scallops, mussels, and oysters. Produces chemicals that deter most fish and other animals. Increases fouling of underwater structures such as docks, moorings, and boat hulls.
Curly waterweed (Lagarosiphon major)	 Medium – found in a small number of locations throughout Scotland especially in the central belt area and spread through: Disposal of garden waste Animals and human activity Fragmentation by wind dispersal, boat movement, angling equipment and possibly water fowl 	 Capable of forming very dense infestations in suitable habitats and occupying the full water column in waters up to 6m deep with significant impacts on native plants, insects and fish. It is a serious threat to tourism, angling, boating and other recreational pursuits as well as conservation goals

There are also ten 'Medium Threat' level species of which there are five species with a medium risk of introduction and five species with a low risk of introduction (see Table 4 below). The <u>UK TAG website</u> lists other alien species which may also be at risk of introduction.

Table 4 The risk of introduction of Medium Threat level INNS.

SDECIES		
Orfe (Leuciscus idus)	Medium	Through intentional/unintentional introduction from an existing population nearby.
Water primrose (Ludwigia grandiflora)	Medium	Unintentional introduction from boat hulls and ponds
Water fern (Azolla filiculoides)	Medium	Through intentional/unintentional introduction from
		numerous locations throughout Scotland, especially
		central belt
Wireweed (Sargassum muticum)	Medium	Through unintentional introduction
Bullhead (Cottus gobio)	Medium	Translocated species recorded in central Scotland that
		could be introduced deliberately or as live bait
Large flowered waterweed (Egeria densa)	Low	Only found to date in East Lothian. Possible introduction
		from ponds
Floating pennywort (Hydrocotyle	Low	Currently only in England up to the midlands. Possible
ranunculoides)		introduction from ponds
Parrot's feather (Myriophyllum aquaticum)	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 (Pseudorasbora	Low	Currently only recorded from 5 locations in England.
parva)		Could be introduced as live bait, in ballast water or as
		releases from aquaria

From Tables 3 and 4, the main pathways or means of introduction of both High and Medium Threat level species into the Cromarty Firth district are:

- Intentional introduction or planting
- Souling and ballast water of marine vessels
- Souling and ballast water of freshwater vessels
- Secapes from garden ponds
- Scontaminated water sports equipment (e.g. from anglers, canoeists)
- Solution Movement of contaminated soils or vehicles
- Improper control and disposal measures e.g. cutting and dumping without treatment, fish factory waste
- Solution of live fish, contamination of water used to transport live fish

These pathways need to be restricted to prevent the spread of INNS and diseases, and where feasible, existing populations controlled or eradicated and their impacts mitigated.

4.4 Stakeholders

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 5.

Table 5 Regulatory agencies and other bodies with an interest in INNS

Policy and Legislation	Land Resources	Water Resources
 Scottish Government Edinburgh Scottish Natural Heritage Scottish Environment Protection Agency Marine Scotland Fisheries Management Scotland 	 Forestry and Land Scotland Highland Council National Farmers Union Highland Invasive Species Forum Landowners Association 	 North Highland Area Advisory Group Scottish Water Scottish and Southern Energy British Waterways
Fisheries Management	Recreation	Conservation and Biodiversity
 Cromarty Firth Fishery Board Marine Scotland Science (regulation of fish movements and introductions) Association of Still Water Fisheries 	 Inverness Canoe Club Ramblers Association Aquaculture / commercial fisheries Local Angling Associations Royal Yachting Association 	 Northern Constabulary wildlife crime unit Scottish Wildlife Trust Royal Society for the Protection of Birds Ross and Cromarty East Local Biodiversity Action Group Plant Life Highland Biological Recording Group Dingwall Environment Group British Trust for Conservation Volunteers Dingwall Field Club Tain Field Club

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 6.

Table 6 Pathway	s and stakeholder	groups in the	Cromarty Firt	h district
		A	•••••••••••••••••••••••••••••••••••••••	

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 / SEPA
Fouling and ballast water of freshwater vessels	Port Authority / SEPA / UK Government; local canoe
	and water sports organisations
Sale from garden or pond centres	Horticultural Trade Association / Ornamental Fish
	Producers
Contaminated water sports equipment (e.g. from	Cromarty Firth Fishery Board, local canoe / water
anglers, canoeists	sports organisations, anglers, angling associations,
	fishing agents and tackle shops.
Escapes from fish farms, ponds, gardens, and	Marine Scotland / SEPA / Planning Authorities /
demesnes	Plantlife / riparian owners / members of the public
Movement of contaminated soils or vehicles	Local Councils / SEPA / quarries / building contractors
Peffery fish factory waste	SEPA / Scottish Water
Introduction of live fish, contamination of water used	Cromarty Firth Fishery Board / Marine Scotland / Still
to transport live fish	Water Fisheries / Angling Associations
Improper control and disposal measures e.g. cutting	Local councils / SEPA / environmental health /
and dumping without treatment	Plantlife / riparian owners / members of the public

This plan identifies key actions required to change the behaviour and practices of the above groups so as to reduce the opportunities for the introduction and spread of INNS and fish diseases.

4.5 Existing INNS control activities

The Cromarty Firth Fishery Board is a partner of the Scottish Invasive Species Initiative (SISI). SISI is an exciting and ambitious 4-year partnership project set up to tackle invasive non-native species alongside rivers and watercourses in northern Scotland. The SISI project is bringing partners together and supporting the establishment of volunteering, training and provision of equipment to enable INNS work to be done, and to facilitate it being done at a significantly larger, all-encompassing scale.

Existing INNS control activies in the Cromarty district carried out under the SISI project include:

- Solution Monitoring and eradication of American mink
- Spraying and mechanical removal of giant hogweed on the Peffery and Balnagown rivers
- Injecting and removal of Japanese knotweed on the River Orrin
- Spraying and removal of Himalayan balsam on the River Orrin and Peffery
- Removal of American skunk cabbage on the River Conon

In addition to the INNS work funded by SISI, the Cromarty Firth Fishery Board are also actively working to prevent the spread of *Gyrodactylus salaris* and control rhododendron growth in the district.

5. Biosecurity Management Strategy

The objectives of this plan will be achieved through a partnership approach to implement the following crucial actions:

- Prevention,
- Serly detection, surveillance, monitoring and rapid response,
- Solution Mitigation, control, and eradication.

5.1 Objectives and Outputs of the Cromarty Firth District Biosecurity Plan

This section describes the expected outputs from implementation of the three plan objectives and the actions required for their realisation. Agreed actions for prevention are focussed on the disruption of the pathways for the introduction and spread of INNS, translocated species and fish diseases and include a mixture of awareness raising and practical measures. Awareness activities take note of the GB Awareness and Communication Strategy. Increased probability of early detection of the introduction or spread of INNS is realised through surveys to establish the location of existing populations, establishment of a coordinated local surveillance and reporting system supported by routine monitoring of established populations or sites vulnerable to the introduction and spread of these species.

Objective 1: Prevent the introduction and spread of INNS within the Cromarty Firth fisheries district.

- Solution Output 1.1 All key stakeholders aware of:
 - 1. The ecological and economic impacts of INNS
 - 2. The potential pathways for introduction and spread
 - 3. Management best practices to prevent introduction and spread

Awareness activities will be focussed on addressing the identified local priorities as well as supporting the GB Awareness and Communication strategy and its key messages to the public:

- INNS are any non-native animal or plant that can spread causing damage to the environment, the economy, or health and the way we live
- We require the support of stakeholders to increase awareness and improve understanding of INNS issues and impacts
- Invasive non-native species:
 - Threaten our native plants, animals, and habitats
 - Cost the British economy between £2 and £6 billion pounds each year
 - $\circ \quad \text{Can threaten our health} \\$

The local priorities for awareness will focus on disrupting the pathways for the introduction and spread of INNS in the Cromarty Firth district. The key stakeholders, the identified areas of priority and the proposed mechanisms for delivery are presented in Table 7 below. The roles and actions of key government agencies and non-government bodies in promoting awareness of INNS issues is presented in Table 8.

Table 7 Priority areas for awareness and delivery mechanisms according to stakeholder group

Stakeholder Group	Priority Area	Mechanism of Delivery
Local Fish Farms	- Impact of INNS	- Cromarty Board to work with local industry
	- Use of sufficient screens and other	and trade associations to advise members
	biosecurity measures	regularly of best practice in respect of INNS
	- Dangers of importing stock from	- Enforcement agencies (Marine Scotland &
	contaminated areas	Cromarty Board) to undertake site visits to
	- Controls on movement of stock and water	discuss and advise on issues involving INNS
		e.g. rainbow trout
Local Garden Centres	- Promote existing codes of practice	- Cromarty Board to work with garden centres
	covering the security and disposal of INNS	to encourage distribution of codes of practice
	to all garden centres	and posters (available from Plantlife).
	- Target gardeners to dispose plant material	
	and / or soils in a responsible manner.	
Highland Council /	- Promote appropriate working practices	- Promote codes of practice
contract workers	and waste disposal to avoid spread of INNS	
Local Aquarium and	- Promote code of practice to all pet shops	- Cromarty Board to work with retailers to
Pond stockists	and suppliers of ornamental fish	encourage distribution of codes and posters
		(available from Plantlife)
Water User	- Promote awareness to clubs and	- Cromarty Board to work with associations to
	participants of the dangers arising from	promote disinfection of equipment and
(Canoeists, Saining		rick of accidental transfor of INNS (oncure
clubsj		disinfectant is freshly prepared and active)
		- RVA campaign
		- FACT campaign and web site
		- Scottish Invasive Species Initiative website
Landowners	- Promote knowledge of biosecurity issues	- Work with Cromarty Board to ensure
	amongst all tenants and resource users	dissemination of best practices and
		appropriate signage to reduce threats from
	- Determine local point-of-contact to act as	INNS
	a monitor to identify and record presence	- Cromarty Board to offer training for INNS
	of INNS	identification
		- Scottish Invasive Species Initiative website
Angling clubs	- Promote knowledge of biosecurity issues	- Work with Cromarty Board to ensure
	amongst all members and visiting anglers	dissemination of best practices and
	- Promote the distribution of information	appropriate signage to reduce threats from
	and erection of signage in fishing huts and	INNS
	recognised car parks	- Cromarty Board to offer training for INNS
	- Recommend suitable members to act as	Identification
	local point-of-contact to act as a monitor to	- <u>Scottish Invasive Species Initiative</u> website
Canaval Dublia		
General Public	-General awareness of Impacts and	- Local media campaigns
	Promoto the Piececurity Plan to all rotail	- cromaticy board to develop a featier to
	outlets who deal with NNS e.g. net shops	arising from INNS and the reporting system
	garden shons	- Scottish Invasive Species Initiative website
Schools	- General awareness of impacts and	- School visits
	measures to prevent/control INNS	- Field trips
		- Scottish Invasive Species Initiative website
		and specifically Scottish Invasive Species
		"Alien Detectives" education materials

Table 8 Roles and /	or actions of key government and non-government agencies in promoting	awareness
of INNS issues		

Organisation	Role and/or action	Delivery Mechanisms
Cromarty Firth	- Promote awareness to anglers and water	-Continue to promote disinfection of equipment and
Fishery Board	users, highlighting the Biosecurity Plan and	provide appropriate facilities
	the dangers from INNS	- Promote reporting system
		- Distribute information leaflets to stakeholders and the
		public
		- Holding of open days, field visits and demonstrations
Marine Scotland	- Regulation of movement and introduction	- Licensing system for fish movements.
Science	of fish	
Highland Council	- Promote use of codes of best practice for	- Councils to promote codes of best practice at every
	construction, haulage, horticulture,	opportunity e.g. including them with planning
	aquaculture amongst local business and	applications and building warrants
	relevant departments particularly	 Production (by Council's legal department) and
	construction, garden, and pet trade	distribution of information leaflets on all relevant
	 Promote awareness of planning, waste 	legislation relevant to INNS
	disposal and transport regulations amongst	 Holding of awareness event/open days to promote
	local business	biosecurity issues
	- Promote awareness of the GB	 Distribute leaflets with council tax bills
	communications strategy to the public	
SEPA	- Clarify SEPA responsibilities for INNS to	- maintain page on website with links to relevant SEPA
	both staff and customers	information and other sites e.g. Non-Native Species
	 Incorporate INNS issues into relevant 	Secretariat
	authorisation and guidance documents (as	- Ensure relevant documents available for download on
	they are developed or updated)	SEPA website
NatureScot	 Promotion of good practice in the 	- Holding of NatureScot Sharing Good Practice events.
	prevention, control, and eradication of	 Grant funding may be available for some projects
	INNS	- Funding support and lead partner of Scottish invasive
	- Provision of funding for local INNS	Species Initiative
	initiatives	

The delivery mechanisms form the basis for the actions required to promote awareness amongst the key stakeholders of the Cromarty Firth District. These are presented in Section 5.2 along with the responsible agency and a timeframe for their implementation.

<u>Objective 2:</u> Maintain framework for the detection and surveillance of INNS to ensure a rapid management response

Solution Output 2.1 – Improve strategic monitoring of INNS in district

The Cromarty Firth Fishery Board work to agreed national protocols for INNS surveying and monitoring. Data on occurrence and distribution of INNS are stored in a format which can readily be shared using GIS. Standardised recording sheets and data storage protocol would ensure compatibility with existing Scottish Fisheries Coordination Centre habitat data. Updates to methodologies should allow for changes and improvements in INNS treatment and control procedures, and regular training of staff will ensure that high quality data are collected, stored, and shared between agencies.

Output 2.2 – Continue rapid response mechanism for new INNS which pose significant threats to local biodiversity and economy

The type of response will depend on the severity of the species detected and is proportionate to the threat posed (Table 9). There are three levels of response:

- GB level response that will be undertaken by national governmental institutions as part of the GB INNS strategy
- Solution High-priority local rapid response
- Priority local rapid response

 Table 9 Response level for 31 INNS

GB Response	High Priority Local Response	Priority Local 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
	Large flowered waterweed	Minnow
	Curly waterweed	Red vent syndrome (RVS)
		Orfe
		Nuttal's pondweed
		Water fern
		Common cord grass
		Fanwort
		Floating pennywort
		Parrot's feather

There are likely to be some species which will not qualify for a GB rapid response which are considered priorities at a Scottish level and action may therefore be instigated by Scottish agencies or the Scottish Government.

A confirmed sighting of a GB priority species will trigger the GB contingency plan for that species e.g. *Gyrodactylus salaris*. However, there is still a need for local level protocols to link with the GB response as well as for local level contingency plans for local priority species. The elements to be included in the response to detection of a GB priority species or the contingency plans for local priority species are outlined in Table 10. The actions required to establish and maintain the rapid response mechanism are presented in Section 5.2

Table 10 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	- Report to local and GB	- Report to local and GB
institutions	institutions	institutions
- Determine the extent of	- Determine the extent of	- Determination of the extent of
infestation	infestation	infestation
- Isolation of area where	- Isolation of area where	- Surveys in course of normal
practicable	practicable	work to establish and map
	- Establish source and check	distribution
	related sites	- Inclusion of new areas in
	 Closure of all pathways 	existing eradication/control
	- Decision on appropriate action	programmes
	eradication/containment.	

 Approved eradication methodology Monitor 	 Identification and closure all pathways Monitor as part of planned
	catchment monitoring programme

Objective 3: Maintain and expand coordinated control and eradication programmes for INNS

Output 3.1 – Coordinated control, eradication and habitat restoration programmes maintained throughout Cromarty Firth fisheries district

Surveys have largely identified INNS distributions within the Cromarty Firth area (Figure 3). Survey information has been entered onto GIS and analysed to target upstream extent of populations of INNS that are potential sources of spread and re-infestation. Control and eradication programmes will be phased with treatment commencing at the upstream point of distribution and then systematically progressing downstream. A combination of specialist contractors, volunteers and Cromarty Firth Fishery Board staff will be used depending on the management requirements of the area involved. Envisaged mitigation, eradication and control measures for the INNS present in the Cromarty Firth catchments are presented in Table 11. The actions required to establish the proposed control/eradication programme are presented in Section 5.2.

Fishery Board staff are trained in spraying techniques and equipped to assist with spraying of rhododendron regrowth, Japanese knotweed and giant hogweed. Annual monitoring by Board staff identifies the requirement for further treatment (Figure 3).



Figure 3 Flow chart detailing INNS programme structure

	ACTION	
SPECIES	ACTION Control/Enablication	IREATIVENT/POST TREATIVENT ACTIONS
Japanese	Control/Eradication	- Leaf spraying with Giyphosate for existing populations with
knotweed (JK)	Identify and close	follow up of stem injection treatment to maintain control if
	pathways.	required
		- Map and record new and existing locations in Cromarty
		district
		- Clear and maintain buffer strips where road and rail
		pathways for reinfection intersect with watercourses
		- Assess requirements for riparian habitat restoration after
		eradication
Himalayan balsam	Control/Eradication	- Map and record locations in Cromarty district
(HB)	Identify pathways	- Clear riparian zone of HB in district
	and close	-Monitor catchment for activation of dormant sources of
		infestation
		-Habitat restoration if required
Giant hogweed	Control/Eradication	- Leaf spraying with Glyphosate for populations of giant
(GH)	Identify pathways	hogweed in the Peffery and Balnagown catchments
	and close	- Spraying to take place spring and autumn until GH not
		observed for 3 consecutive years
		- Follow up monitoring required
		- Monitor catchment for activation of dormant sources of
		infestation
		- Habitat restoration if required
American mink	Control/Eradication	- Co-ordinated monitoring and trapping through SISI
		- Liaise with volunteers, store and deliver equipment
		- Use fishery officers to help with trapping and dispatch
		- Identify local licensed contacts for dispatch network
Rhododenron (R)	Control / Eradication	- Monitor regrowth in River Orrin catchment and spray /
		remove where necessary
		- Clear small isolated population on the River Peffery to
		achieve eradication in Peffery catchment.
		- Plan clearance programmes for Alness and Balnagown
		catchments followed by Sgitheach, Logie, Ryefield, and
		Rosskeen burns
Canadian pond	Monitor distribution	
weed		
Minnow / pike /	Restrict to present	
perch	distribution	

Table 11 INNS control and eradication in the Cromarty Firth district

Output 3.2 Coordinate partnerships to ensure sufficient funding and resources in place to continue prevention and control of INNS within the area

The delivery of the aims of this plan must be assisted by the coordination of activities with NatureScot (currently through SISI), the Highland Invasive Species Forum, and SEPA. Any progress made in the control of INNS can be quickly undermined and resources wasted if continued, long-term commitment is not present. The Cromarty Firth Fishery Board will maintain partnerships with these organisations and neighbouring fisheries trusts and boards including Kyle of Sutherland and Beauly District Salmon Fishery Boards to identify funding sources and potential projects that ensure sustainable control of INNS in the Cromarty district. Such partnership working will be essential to bring about large-scale, resource-intensive projects.

5.2 Actions and Timeframes

The table below presents the actions required to realise the objectives and outputs described in Section 5.1 along with the lead agency, key partners and timeframe required for their implementation.

Table 12 The actions required to realise INNS objectives and outputs along with the lead agency, keypartners and timeframe required for their implementation.

Key: Solid line indicates continuous action, --- Dotted line indicates ongoing / wide timescale effort

	TIMEFRAME											
Action	Lead	Partners	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Objective 1: Pre	vent the intro	duction and sp	read of	INN sp	becies v	within	the Cro	marty	Firth fi	sheries	distric	t
Launch of 2021 – 2025 Cromarty Firth Biosecurity plan through local press release	Cromarty Firth Fishery Board	NatureScot (SISI)										
Update leaflet on biosecurity risks and the reporting system	Cromarty Firth Fishery Board											
Produce posters on biosecurity risks and distribute to the general public	NatureScot	Cromarty Firth Fishery Board	•••••	•••••		•••••						
Continue to promote and install disinfection facilities for anglers at all angling proprietors fishing huts/parking points	Cromarty Firth Fishery Board											
Distribute Codes and posters to relevant retail outlets and clubs at open days and events such as agricultural shows	NatureScot, Highland Council	Cromarty Firth Fishery Board		•••••								
Engage with Landowners and angling clubs to promote awareness of measures to tenants, resource –users, members and visitors	Cromarty Firth Fishery Board											

Action Lead Partners 2021 2022 2023 2025 2026 2027 2028 2029 2030 Work with environmental groups and local schools to enhance awareness of INNS NatureScot Cromarty Firth Fishery Board Cromarty Firth Fishery Board Cromarty Firth Fishery Board Interesting Schools to enhance Interesting Schools to enha		TIMEFRAME											
Work with environmental groups and local schools to enhance awareness of INNS NatureScot Cromarty Firth Fishery Board	Action	Lead	Partners	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
avareness NatureScot Cromarty Firth Objective 2: Establish framework for the detection and surveillance of INN species, linked to a protocol to ensure a rapid management response Output 2.1 – Improve strategic monitoring of INNS in district Produce database to manage INNS NatureScot	Work with environmental groups and local												
enhance awareness of INNS Prishery Board Prishery Board Image of the second of t	schools to	NatureScot	Cromarty Firth										••••
awareness of INNS Objective 2: Establish framework for the detection and surveillance of INN species, linked to a protocol to ensure a rapid management response Output 2.1 – Improve strategic monitoring of INNS in district Produce database to manage INNS NatureScot, Cromarty Firth Fishery Board Identification of Cromarty Board Identification of Cromarty Firth Fishery Board Identification of Cromart	enhance		Fishery Board										
INNS	awareness of												
Objective 2: Establish framework for the detection and surveillance of INN species, linked to a protocol to ensure a rapid management response Output 2:1 - Improve strategic monitoring of INNS in district Produe database to manage INNS survey data Training of staff and volunteers in monitoring nonitoring Pishery Board Output 2:2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response to marky personse mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of formarty Pirth Fishery Board NatureScot, contingency plans Board NatureScot, during firth Fishery NatureScot, during firth Fishery Identification of formarty Firth Fishery Board NatureScot, during firth Fishery Board NatureScot, during council, SEPA Board Notification of personary Firth Fishery Board NatureScot, during council, SEPA Board Notification of personary Firth Fishery Board Board <tr< td=""><td>INNS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	INNS												
a rapid management response Output 2.1 - Improve strategic monitoring of INNS in district Produce database to manage INNS survey data NatureScot Training of staff monitoring methods NatureScot, Cromarty Firth Fishery Board Image: Comarty Highland Council, SEPA Output 2.2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of execute Cromarty Firth Fishery Board NatureScot, Highland Council, SEPA NatureScot, funding resources Highland Council, SEPA Image: Council, SEPA Acquisition of equipment Cromarty Firth Fishery Board Highland Council, SEPA Image: Council, SEPA Refresher training Cromarty Firth Fishery Board Highland Council, SEPA Image: Council, SEPA Monitor populations / Firth Fishery Board NatureScot, Cromarty Firth Fishery Board Highland Council, SEPA Image: Council, SEPA Monitor populations / Firth Fishery Board NatureScot, Cromarty Firth Fishery Board NatureScot, Cromarty Firth Fishery Board Image: Council, SEPA Monitor populations / treated areas Board Image: Council, SEPA Image: Council, SEPA Monitor Council, SEPA Image: Council, SEPA Image: Council, SEPA Image: Council, SEPA <t< td=""><td>Objective 2: Esta</td><td colspan="11">Objective 2: Establish framework for the detection and surveillance of INN species, linked to a protocol to ensure</td></t<>	Objective 2: Esta	Objective 2: Establish framework for the detection and surveillance of INN species, linked to a protocol to ensure											
Output 2.1 - Improve strategic monitoring of INNS in district Produce database to manage INNS survey data NatureScot Training of staff and volunteers in monitoring methods NatureScot, Cromarty Firth Fishery Board NatureScot, Cromarty Firth Fishery Board NatureScot, Cromarty Firth Fishery Board Output 2.2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response teams Cromarty Firth Fishery Board NatureScot, Cromarty Highland Council Image: Council Council NatureScot, contingency plans NatureScot, Cromarty Firth Fishery Board Highland Council Image: Council Council Image: Council Council Acquisition of equipment Cromarty Firth Fishery Board Highland Council, SEPA Image: Council Council, SEPA Image: Council Council, SEPA Refresher training Cromarty Firth Fishery Board Highland Council, SEPA Image: Council Council, SEPA Image: Council Council, SEPA Monitor populations / Firth Fishery Board NatureScot, SEPA Image: Council Council, SEPA Image: Council SEPA Image: Council SEPA Monitor populations / Firth Fishery Board NatureScot, SEPA Image: Council SEPA Image: Council SEPA Image: Council SEPA Image: Council SEPA Image: Council SEPA <td colspan="11">a rapid management response</td>	a rapid management response												
Produce database to manage INNS survey data NatureScot Image INNS Image	Output 2.1 – Im	prove strategio	c monitoring of	f INNS i	in distri	ict							
to manage INNS survey data Training of staff and volunteers in monitoring methods NatureScot, Cromarty Firth Fishery Board Dutput 2.2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Udentification of personnel for Firth Fishery Board Training of NatureScot, Cromarty execute contingency plans Board NatureScot, Identification of funding resources Firth Fishery Board NatureScot, Cromarty Highland Cromarty Firth Fishery Board NatureScot, Cromarty Firth Fishery Board NatureScot, Cromarty Firth Fishery Board Acquisition of equipment Firth Fishery Board Refresher Firth Fishery Board Monitor Populations / Firth Fishery Board Council, SEPA Board Monitor Firth Fishery Board Monitor Firth Fishery Board	Produce database												
Training of staff and volunteers in monitoring methods NatureScot, Cromarty Firth Fishery Board NatureScot, Fishery Board NatureScot, Fishery Board NatureScot, Fishery Board Output 2.2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response teams Cromarty Board NatureScot, Council Image: Council Image: Council Identification of personnel to contingency plans NatureScot, Council Image: Council Image: Council Image: Council Identification of funding resources NatureScot, Firth Fishery Board Highland Council Image: Council Image: Council Image: Council Identification of funding resources Cromarty Firth Fishery Board Highland Council, SEPA Image: Council Image: Council Image: Council Refresher training Cromarty Firth Fishery Board Highland Council, SEPA Image: Council, SE	to manage INNS survey data	NatureScot											
and volunteers in monitoring methods Cromarty Firth Fishery Board Dutput 2.2 – Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response teams Board Training of NatureScot, contingency plans Board NatureScot, Identification of funding resources Refresher training Monitor populations / Firth Fishery Board Monitor Populations / Firth Fishery Board MatureScot, Cromarty Highland Council, SEPA Board MatureScot, Cromarty Highland Council, SEPA Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board MatureScot, Cromarty Firth Fishery Board Monitor Cromarty Firth Fishery Board Control and eradication programmes for INN species	Training of staff	NatureScot											
monitoring methods Fishery Board ishery Board Output 2.2 - Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response teams Cromarty Firth Fishery Board NatureScot	and volunteers in	Cromarty Firth				• • • • • • • •					• • • • • • • •		•••
Output 2.2 – Continue rapid response mechanism established for new INN species which pose significant threats to local biodiversity and economy Identification of personnel for response teams Cromarty Firth Fishery NatureScot Board MatureScot, Comigency plans Board NatureScot, contingency plans Firth Fishery MatureScot, contingency plans NatureScot, MatureScot, contingency plans NatureScot, MatureScot, contingency plans NatureScot, MatureScot, contingency plans NatureScot, Munification of funding resources Firth Fishery Board Council, SEPA Board NatureScot, Cromarty Highland Council, SEPA SEPA Board Council, SEPA Board	monitoring	Fishery Board											
to local biodiversity and economy identification of personnel for response teams Cromarty Board NatureScot		ntinue ranid re	snonse mecha	nism o	stablick	l Ned for	now IN	IN spec	ios wh	ich nos	o signif	ficant t	hroats
Identification of personnel for response teams Cromarty Board NatureScot	to local biodiver	sity and econo	my	manne.	51001151	ieu ioi	new n	in spec	1C3 W11	ich pos	e sigini		in cats
Personnel for Firth Fishery Board NatureScot, Highland Council SEPA NatureScot, Board NatureScot, Firth Fishery Board NatureScot, Highland Council SEPA NatureScot, Board NatureScot, Highland Council, SEPA NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Board NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, Board NatureScot, Cromarty Highland Council, SEPA NatureScot, Board NatureScot, SEPA N	Identification of	Cromarty					[[
response teams Board Image: Construct of the state of the sta	personnel for	Firth Fishery	NatureScot										
Training of personnel to execute NatureScot, Firth Fishery Highland Council MatureScot, Identification of funding resources NatureScot, Firth Fishery Board Highland Council, SEPA Acquisition of equipment NatureScot, Firth Fishery Board Highland Council, SEPA Refresher training Cromarty Firth Fishery Board Highland Council, SEPA Monitor populations / treated areas Cromarty Board Highland Council, SEPA Monitor Cromarty Firth Fishery Board NatureScot, Council, SEPA Monitor Cromarty Firth Fishery Board NatureScot, SEPA Dejective 3: Develop coordinated control and eradication programmes for INN species	response teams	Board											
personnel to execute Cromarty Highland execute Firth Fishery Council Board NatureScot, Identification of funding resources Cromarty Highland Commarty Highland NatureScot, Council, SEPA Board NatureScot, Acquisition of equipment Cromarty Firth Fishery Council, SEPA Board NatureScot, Cromarty Highland Cromarty Highland Cromarty Highland Cromarty Highland Cromarty Highland Cromarty Highland Council, SEPA Image: Council, SEPA Board Image: Council, SEPA Monitor Cromarty Board Image: Council, SEPA Board Image: Council,	Training of	NatureScot,											
execute Firth Fishery Council Council Image: Council Counci	personnel to	Cromarty	Highland										
Contingency plans Board Image: Contingency plans Board Image: Contingency plans Image: Contingency p	execute	Firth Fishery	Council										
Identification of funding resources Cromarty Firth Fishery Board Highland Council, SEPA Acquisition of equipment NatureScot, Cromarty Firth Fishery Board Highland Council, SEPA Refresher training Cromarty Firth Fishery Board Highland Council, SEPA Monitor populations / treated areas Cromarty Firth Fishery Board NatureScot, SEPA Monitor populations / treated areas NatureScot, SEPA Image: Council And Council	contingency plans	Board											
funding resources Firth Fishery Board Council, SEPA Acquisition of equipment NatureScot, Cromarty Highland Firth Fishery Board Council, SEPA Image: Council, SEPA Refresher training Cromarty Highland Monitor populations / treated areas Cromarty Firth Fishery Board NatureScot, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery Board NatureScot, SEPA Image: Council, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery Board NatureScot, SEPA Image: Council, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery Board NatureScot, SEPA Image: Council, SEPA Image: Council, SEPA Objective 3: Develop coordinated control and eradication programmes for INN species Image: Council, SEPA	Identification of	Cromarty	Highland										
Board Image: Second control and eradication programmes for INN species Acquisition of equipment NatureScot, Cromarty Highland Council, SEPA Image: Second control and eradication programmes for INN species Refresher training Cromarty Board NatureScot, Cromarty Image: Second control and eradication programmes for INN species Image: Second control and eradication programmes for INN species	funding resources	Firth Fishery	Council, SEPA	•••••								• • • • • • • •	
Acquisition of equipment NatureScot, Cromarty Highland Image: Council, SEPA Image:		Board											
Acquisition of equipment Cromarty Highland Firth Fishery Board Council, SEPA Image: Council, SEPA Refresher training Cromarty Image: Council, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery Image: Council, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery Image: Council, SEPA Image: Council, SEPA Monitor Cromarty Firth Fishery NatureScot, SEPA Image: Council, SEPA Image: Council, SEPA Objective 3: Develop coordinated control and eradication programmes for INN species Image: Council, SEPA Image: Council, SEPA		NatureScot,											
equipment Firth Fishery Board Council, SEPA Image: Council, SEPA Refresher training Cromarty Firth Fishery Board Image: Council, SEPA Image: Council, SEPA Monitor populations / treated areas Cromarty Board Image: Council, SEPA Image: Council, SEPA Monitor populations / treated areas Cromarty Firth Fishery Board NatureScot, SEPA Image: Council, SepA Objective 3: Develop coordinated control and eradication programmes for INN species	Acquisition of	Cromarty	Highland										
Refresher training Cromarty Firth Fishery Board MatureScot, SEPA Image: Construct of the second seco	equipment	Firth Fishery Board	Council, SEPA										
Refresher training Firth Fishery Board Firth Fishery Board NatureScot, SEPA Image: Comparison of the second		Cromarty											
Board Board Monitor Cromarty populations / Firth Fishery treated areas Board Objective 3: Develop coordinated control and eradication programmes for INN species	Refresher	Firth Fishery			_				—		_		_
Monitor Cromarty NatureScot, populations / Firth Fishery Board Board Board SEPA Objective 3: Develop coordinated control and eradication programmes for INN species	training	Board											
populations / treated areas Firth Fishery Board SEPA Objective 3: Develop coordinated control and eradication programmes for INN species	Monitor	Cromarty	NatureScot,										
Objective 3: Develop coordinated control and eradication programmes for INN species Output 2.1 Coordinated control and eradication programmes for INN species	populations /	Firth Fishery	SEPA			•••••		•••••					••••
Output 2.1. Coordinated control and isotion and habitst restantion programmes output listed and the list of the second sector list of the second second sector list of the second second second sector list of the second second sector list of the second s	Objective 3. De	velon coordin	ated control ar	nd erad	ication	nrogra	ammes	for INP	Isneci	<u>م</u> ر	1		
-1000003 $-1000000000000000000000000000000000000$	Output $3.1 - Co$	ordinated cont		n and h	ahitat	restora	ation n	rogram	mes es	tahlish	ed and	lonera	tional
Initiate and	Initiate and				Ιαυπαί				mes es			Горега	tional
complete Cromarty	complete	Cromarty											
catchment wide Firth Fishery NatureScot	catchment wide	Firth Fishery	NatureScot										
surveys by Board	surveys by	Board							_				
trained personnel	trained personnel												
Continuation of Cromarty Neighbouring Neighbouring	Continuation of	Cromarty	Neighbouring										
Mink eradication Board Trusts / Trusts /	Mink eradication	FITTE FISHERY	Trusts /			• • • • • • •	• • • • • • • •						••••
programme NatureScot Boards	programme	NatureScot	Boards										
Continue habitat	Continue habitat												
restoration NatureScot	restoration		NatureScot										
scheme within Cromarty SEPA,	scheme within	Cromarty	SEPA.										
successful control Firth Fishery Highland	successful control	Firth Fishery	Highland										
areas taking into Board council	areas taking into	воага	council										
relevant species	relevant species												

			TIMEFRAME									
Action	Lead	Partners	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Monitor the effectiveness of control	Cromarty Firth Fishery Board		•••••						•••••			••••
Output 3.2 Cool	rdinate partne	rships to ensu	re suffi	cient fi	unding	and re	source	s in pla	ice to c	continu	e preve	ention
and control of IN	NNS within the	area										
Represent Cromarty Firth INNS issues at Highland Invasive Species Forum and SEPA Area Advisory Group	Cromarty Firth Fishery Board	Highland Invasive Species Forum, SEPA										
Identify and develop opportunities for future funding of eradication projects	Cromarty Firth Fishery Board, NatureScot											

6. Monitoring

Biosecurity promotion and measures are being initiated and implemented within the Cromarty Firth district by the Cromarty Firth Fishery Board. However, the continuation of these actions, for example after the end of the Scottish Invasive Species Initiative, will be dependent on available resources and uptake and support by other stakeholders and partners. However, all work completed by the Cromarty Firth Fishery Board will be monitored and the results evaluated, particularly in the light of changing circumstances e.g. climate change. In this respect, the Board will endeavor to evaluate its work and strategies on a 5-year basis.

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. The current monitoring programme ensures effective and sustainable treatment initiatives by including:

- Search Assessment of efficacy of surveillance and rapid response systems
- Socurrence and distribution of the selected INNS within the district
- Seffectiveness 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
- Science 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 Cromarty Firth Fishery Board 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.