ARGYLL FISHERIES TRUST
www.argyllfisheriestrust.co.uk

Argyll & The Islands

Fisheries Biosecurity Management Plan

Photos subject to Crown Copyright. Courtesy of GB Non-Native Species Secretariat (www.nonnativespecies.org)

Version 1 - 2009

Cherry Park Inveraray Argyll PA32 8XE
Tel: 01499 302 322

(Biologist) Alan Kettle-White: ak@ argyllfisheriestrust.co.uk
Administration: admin@argyllfisheriestrust.co.uk Tel: 01499 302 859

Scottish Registered Charity No. SCO24181 Reg. 17th Nov. 1995 Company No: 295524, Inc. 16th Jan. 2006

Executive Summary

The Argyll & the Islands Biosecurity Management is one of a set of 20 biosecurity plans being produced throughout Scotland as part of a national programme of action implemented through the Rivers and Fisheries Trusts of Scotland with backing and support from the Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, and the Esmeé Fairburn Foundation.

The vision of this plan is:

'To establish a sustainable framework that will lead to the prevention, detection, control and eradication of invasive non-native species within the Argyll region. This will be undertaken through the application of appropriate management activities, data collection, liaison, education and legislation'

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

Objective 1: Prevent the introduction and spread of new invasive non-native species and fish diseases within the Argyll area;
Objective 2: Establish optimum surveillance, detection, monitoring and rapid response systems for the identified invasive non-native species and fish diseases which pose significant threats to local biodiversity and economy;
Objective 3: Ensure control and eradication programmes for existing invasive non-native species and fish diseases are operational, effective and sustainable.

These objectives are in accordance with established protocols for fish diseases and with the three key elements of the GB Invasive Non Native Species Framework Strategy: Prevention; Early detection, surveillance, monitoring and rapid response; Mitigation, control and eradication. The aims and objectives of this plan will be achieved through a partnership approach to implement agreed actions.

The need for action on biosecurity issues has been identified in the Argyll Fisheries Trust's Strategic Fisheries Management Plan and in the River Basin Management Plan for the Scotland River Basin District. This biosecurity plan is a platform for local action to address those biosecurity issues. This plan has a lifespan of six years and as part of an adaptive management cycle its outcomes and impacts will be reviewed and incorporated in the next generation plan. The plan builds partnerships of differing groups of stakeholders to implement the actions required to address the complex issues associated with biosecurity.

There are approximately 1000 non native species present in Scotland 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 are the second greatest threat to biodiversity, being capable of rapidly colonising a wide range of habitats and excluding the native flora and fauna. Within the Argyll & the Islands area, there are known to be 16 invasive non-native species, including Japanese knotweed, Giant hogweed, the American mink, and fish such as the minnow, roach and rainbow trout. There are potential threats which could have drastic effects on the biodiversity of the area, such as the parasite *Gyrodactylus salaris*, which could devastate salmonid fisheries, and the North American signal crayfish, which could colonise freshwaters, modifying the habitat and reducing the productivity of fisheries.

The objectives of this plan will be implemented through agreed actions. The **Key actions and timetables** are:

Objective 1 - *Prevention*:
A. Establish programme to raise awareness with stakeholders
B. Encourage use of good practice within key stakeholder groups
C. Establish and extend disinfection programme to cover likely pathways of entry

Timetable for implementation of plan

Action	Lead Partner	Partners	Timescale 2009	2010	2011	2012	2013	2014	2015
Objective 1 - Prevention									
Launch of AFT Biosecurity plan through national and local press – create press release	AFT	RAFTS, SG, NNSS, SEPA, SNH							
Produce leaflet on biosecurity risks and the reporting system	AFT								
Continue to promote and install disinfection facilities and signs for anglers at angling proprietors fishing huts/parking points	DSFB	AFT							
Expand disinfection facilities to include water sports	SCA	AFT							
Distribute codes and posters to relevant retail outlets and clubs at open days and events such as agricultural shows	ABC/NAC	AFT							
Engage with Landowners and angling clubs to promote awareness measures to tenants, resource –users, members and visitors	AFT								
Work with environmental groups of local schools to enhance awareness of INNS	ABC/NAC								
Expand Salmon in the Classroom to include INNS	AFT	RAFTS							

(see p24 of plan)

Objective 2 – *Detection and surveillance*:

A. Establish an 'early warning system' for detecting new threats

B. Develop rapid response protocols for new significant threats to local biodiversity and economy

Action	Lead Partner	Partners	Timescale 2009	2010	2011	2012	2013	2014	2015
Objective 2 – detection & surveillance									
A. Early Warning System									
Develop 'Early Warning System' protocol	AFT	RAFTS							
Train AFT personnel in identification of INNS	AFT	RAFTS, SNH							
Train AFT personnel as INNS identification trainers	AFT	RAFTS, SNH							
Work with stakeholder groups to identify and train 'eyes'	AFT	DSFBs, Landowners, TWG							
Produce database to record and manage INNS sightings	AFT	RAFTS, SNH							
Agree reporting mechanism for notification of introduction of non-native fish genotypes	AFT	MS							
Validate unsubstantiated INNS sightings in Argyll	AFT								

B. Rapid Response Protocols									
Formulate contingency plans for 'GB' and 'high priority local' INNS	AFT	RAFTS, NNSS, SNH, ABC/NAC							
Liaise with national stakeholders re. GB contingency plans	RAFTS								

(see p27 of plan)

Objective 3 – *Effective control and eradication*:

A. Collect data on distribution and abundance of existing threats;

B. Develop and initiate control and eradication programmes to tackle threats.

Action	Lead Partner	Partners	Timescale						
			2009	2010	2011	2012	2013	2014	2015
Objective 3 – control & eradication									
A. Collect data on distribution and abundance									
AFT habitat surveys to include INNS	AFT	SFCC, RAFTS							
Develop specific INNS survey protocols	AFT	SFCC, RAFTS, DSFBs, SNH							
Conduct INNS surveys in priority areas	AFT								
Create INNS GIS database	AFT								
B. Develop and initiate control and eradication programmes									
Develop and initiate control and eradication programmes for INNS	AFT	RAFTS, SNH, NNSS							
Continue development of Loch Awe Japanese knotweed programme	AFT	LAIA, ADRIA, SNH							
Continue American mink programme	FCS	SNH							
Continue rhododendron programme	FCS								
Monitor and evaluate efficacy of control and eradication programmes	AFT	ABC/NAC							

(see p29 ofplan)

To ensure the effective implementation of this plan, it is vital that the outcomes and impacts of the actions are monitored and reviewed to ensure that the objectives are being met. Thus a coordinated monitoring programme will established to ensure efficacy and sustainable treatment initiatives. Monitoring activities will be undertaken by AFT in conjunction with stakeholder representatives who will be aware of local initiatives and priorities for action. A timetable for monitoring the implementation of the plan will be agreed following the consultation period and launch of the plan.

Contents

Cover pictures: *Top left – American mink; top right – Australian swamp stonecrop; bottom right – North American Signal Crayfish; bottom left – Japanese knotweed. All pictures courtesy of GB Non-Native Species Secretariat. Subject to Crown Copyright.*

SECTION 1 - Purpose and Scope

This plan describes the biosecurity issues of the county of Argyll and the associated islands of the Inner Hebrides, 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 and fish diseases. The vision of this plan is:

'To establish a sustainable framework which will lead to the prevention, detection, control and eradication of invasive non-native species within the Argyll area through the application of appropriate management, data collection, liaison, education and legislation"

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

Objective 1: Prevent the introduction and spread of new invasive non-native species and fish diseases within the Argyll area.

Objective 2: Establish optimum surveillance, detection, monitoring and rapid response systems for the identified invasive non-native species and fish diseases which pose significant threats to local biodiversity and economy.

Objective 3: Ensure control and eradication programmes for existing invasive non-native species and fish diseases are operational, effective and sustainable.

These objectives are in accordance with established protocols for fish diseases and with the three key elements of the GB Invasive Non Native Species Framework Strategy[1]:

- Prevention,
- Early detection, surveillance, monitoring and rapid response,
- Mitigation, control and eradication

The aims and 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.

The implementation of this plan will bring many broad benefits to the Argyll & the Islands area:

- Conservation and enhancement of biodiversity
- The increased contribution of fisheries to the local economy
- The protection of genetically distinct native fish.
- The restoration and improvement of riverine habitats for a wide range of flora and fauna

[1] http://www.nonnativespecies.org/documents/Invasive_NNS_Framework_Strategy_GB_E.pdf

SECTION 2 - Introduction

Although prepared by the Argyll Fisheries Trust (AFT), this plan is one of a set of 20 biosecurity plans being produced throughout Scotland as part of a national programme of action implemented through the Rivers and Fisheries Trusts of Scotland[2] with backing and support from the Scottish Government[3], Scottish Natural Heritage[4] (SNH), Scottish Environment Protection Agency[5] (SEPA) and the Esmeé Fairburn Foundation[6].

The AFT is a registered Scottish charity, with the main objectives of the trust being:

- Understand the composition of all fish populations, distribution and trends in abundance.
- Identify, protect and improve wild fish populations throughout the Argyll area and the islands.
- Understand, protect and enhance the physical environment for fish.
- Educate all sectors of the community on their role in caring for the freshwater environment.

The AFT considers the preparation and implementation of this biosecurity management plan as an essential component in the protection and enhancement of the physical environment, which will help to conserve biodiversity in the area and, ultimately, improve the environment for fish. It is recognised that the spread of INNS is not confined within the Argyll area and that coordination and communication with neighbouring local authorities, fisheries organisations and other stakeholders are required to effectively tackle the threat of INNS.

The need for action on biosecurity issues has been identified in the Argyll Fisheries Trust's Fisheries Management Plan[7] and in the River Basin Management Plan for the Scotland River Basin District. The Argyll & Lochaber and Clyde River Basin Management Plans[8], which provide the local focus on measures to address river basin planning issues, also refer to the importance of addressing biosecurity issues. As such, the Argyll and the Islands Fisheries Biosecurity Management Plan provides a platform for local action to address biosecurity issues and will contribute towards Scotland meeting the requirements of the Water Framework Directive and achieving good status for our water bodies. This plan has a lifespan of six years and as part of an adaptive management cycle its 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 in pursuance of the realisation of its objectives.

The plan was produced using a participatory planning process coordinated by the Argyll Fisheries Trust through which stakeholders identified and agreed the aims, outputs and actions presented in this plan. The plan builds partnerships of differing groups of stakeholders to implement the actions required to address the complex issues associated with biosecurity. This plan therefore represents the agreed approach of the Argyll Fisheries Trust, stakeholders and appropriate regulatory agencies in the Argyll area for the prevention, early detection and control of non native invasive species, fish diseases and parasites.

[2] http://www.rafts.org.uk/home/home.asp
[3] http://www.scotland.gov.uk/Home
[4] http://www.snh.org.uk/
[5] http://www.sepa.org.uk/default.aspx
[6] http://www.esmeefairbairn.org.uk/
[7] http://www.rafts.org.uk/projects/fisheriesmanagementplanning.asp
[8] http://www.sepa.org.uk/water/river_basin_planning.aspx

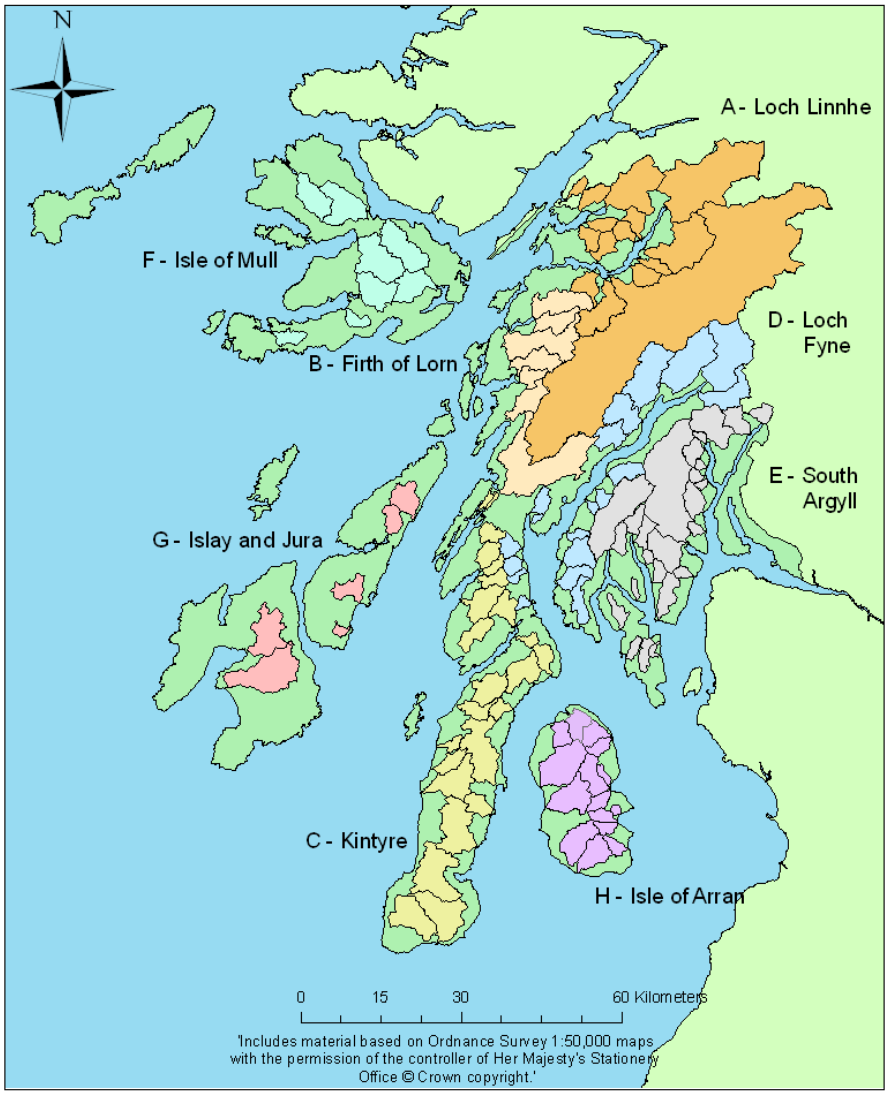

Figure 1. Map of major catchments within the Argyll & the Islands area covered under the Biosecurity Plan.

SECTION 3 - The 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 we all as intentional introduction, establishment and spread of invasive non native species, parasites and diseases in Scotland and the UK. In the context of this first plan, biosecurity issues in the rivers and lochs of Scotland are associated with the introduction and spread of invasive non native species and fish diseases.

According to a survey[9] commissioned by Scottish Natural Heritage in 2000, there are approximately 1000 non native species present in Scotland 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 CBD[10] (2006), **invasive non native species (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 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 wrought by INNS can further threaten already endangered native species and reduce the natural productivity and amenity value of riverbanks, shorelines and their waterbodies.

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

- DEFRA[11] have estimated that INNS cost the UK economy at least £2 billion per year
- In the UK Japanese Knotweed is thought to affect an area roughly the size of London and report of the Review of Non-Native Species Policy (2003)[12] has estimated the total cost of its removal using current techniques at £1.56bn.
- A Scottish Government report[13] 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 [14] 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 .

[9] http://www.snh.org.uk/pdfs/publications/review/139.pdf
[10] http://www.cbd.int/
[11] http://www.defra.gov.uk/wildlife-countryside/wildlife-manage/non-native/index.htm
[12] http://www.defra.gov.uk/wildlife-countryside/pdf/wildlife-manage/non-native/review-report.pdf
[13] www.scotland.gov.uk/resource/doc/1062/0042434.pdf

- 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 translocational species that are impacting the ecology of Scotland's rivers and lochs are the minnow (*Phoxinus phoxinus)* and ruffe (*Gymnocephalus cernuus*). The ruffe in particular has decimated the once significant and diverse population of the rare and protected Powan (*Coregonus lavaretus*) in Loch Lomond.

Without some form of coordinated and systematic approach to the prevention of introduction and control of the spread of INNS and fish diseases, it is likely that the ecological, social and economic impacts and the costs for mitigation, control and eradication of these species and diseases will continue to increase. This plan is a first attempt 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. This local plan and its implementation is also a part of a strategic and coordinated approach to INNS management being undertaken across Scotland by RAFTS members.

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 prevention and rapid response to the introduction of INNS species 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 involving diverse stakeholders is essential. The partnership approach encapsulated in this plan is a key requirement for increased public awareness and engagement, optimisation of the use of resources and the provision of clear guidance for inter-agency working necessary to address the biosecurity issues of the Argyll area. These approaches are consistent with the GB Invasive Non Native Species Framework Strategy[15] and the Species Action Framework[16] both of which have been approved by the Scottish Government.

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 INNS, fish diseases and parasites:

- Section 14 of The Wildlife and Countryside Act (1981)[17] makes it illegal to allow any animal which is not ordinarily resident in Great Britain, or that is listed on Schedule 9 to the Act, to escape into the wild, or to release it into the wild. It is also illegal to plant or otherwise cause to grow in the wild any plant listed on Schedule 9 of the Act. All the INNS to be addressed by this plan are included on Schedule 9 of the Act.
- Local Authorities have powers to take action against giant hogweed (*Hercaleum mantegazzianum*) and Japanese knotweed (*Fallopia japonica*) where it is a threat to the local amenity of an area or if it is considered a statutory nuisance.

---

[14] http://www.forestresearch.gov.uk/pdf/Argyll_Bute_rhododendron_2008_costs.pdf/$FILE/Argyll_Bute_rhododendron_2008_costs.pdf

[15] www.nonnativespecies.org

[16] www.sng.org.uk/speciesactionframework

[17] www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1981/cukpga_19810069_en_1

- Section 179 of the Town and Country Planning (Scotland) Act 1997[18] that 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[19] regulates the use of pesticides and herbicides for the control and eradication of INNS.
- Environmental Protection Act 1990[20] contains a number of legal provisions concerning "controlled waste", which are set out in Part II. Any Japanese knotweed or giant hogweed contaminated soil or plant material discarded is likely to be classified as controlled waste. This means that offences exist with the deposit, treating, keeping or disposing of controlled waste without a licence.
- The Waste Management Licensing Regulations 1994[21] 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 and the Environmental Protection (Duty of Care) Regulations 1991[22] provide guidance for the handling and transfer of controlled waste.
- The Aquaculture & Fisheries (Scotland) Act 2007[23] has provisions relating to the unauthorised release of fish into inland waters.

Additionally, the new draft Wildlife and Natural Environment Bill is expected to be introduced to the Scottish Parliament in 2010.

The procedures for the detection, notification and control of fish diseases are already well defined by the fisheries legislation. This stipulates that Marine Scotland[24] acts on behalf of the Government with respect to the suspicion of the presence of notifiable fish diseases and organises and coordinates the response to that outbreak. As such the actions in this plan will raise awareness and provide mechanisms for the realisation of those procedures at the local level.

3.3 Existing Planning Framework

This Biosecurity Plan links Government led policy, legislation and strategic action with local actions and reflects, implements and/or supports the provisions and requirements of the following existing plans (Table 1):

[18] www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1
[19] www.opsi.gov.uk/legislation/scotland/ssi2005/20050066.htm
[20] www.opsi.gov.uk/acts/acts1990/ukpga_19900043_en_1
[21] www.opsi.gov.uk/si/si1994/uksi_19941056_en_1.htm
[22] www.opsi.gov.uk/si/si1991/Uksi_19911624_en_1.htm
[23] www.opsi.gov.uk/legislation/scotland/acts2007/pdf/asp_20070012_en.pdf
[24] www.scotland.gov.uk/About/Directorates/Wealthier-and-Fairer/marine-scotland

Table 1. Identified Actions in the Argyll & the Islands Fisheries Biosecurity Management Plan supporting provisions or requirements of other relevant plans

Provision or Requirement of Existing Plan	Action in This Biosecurity Plan
The Argyll & Lochaber and **Clyde Area River Basin Management Plans (RBMPs) and the RBMP for the Scotland River Basin District.** The final classification results for water bodies will be available when the River Basin Management Plan for the Scotland River Basin District is published in late 2009. These classification results will include information about INNS distribution. The RBMP for the Scotland River Basin District contain the following measures relating to biosecurity: • identification of appropriate actions to manage species that threaten high and good status sites, together with identification of potential sources of re-infestation in the surrounding area • establishment of detection/surveillance/control strategies for problem species • risk assessment of pathways for problem species into the Scoland River Basin District • development of biosecurity plans to prevent movement of species between catchments and respond quickly to new infestations	RBMPs are likely to provide a framework and cross-sector approach to biosecurity planning through Area Advisory Groups (AAGs). This will assist and facilitate a coordinated and widespread response to biosecurity issues: • Raising awareness of biosecurity issues • Act as a conduit for national initiatives into the local management sphere • Develop catchment-based approach to control and eradication • Ensure control methods do not impact on the water environment • Classification of water bodies in Argyll will allow actions in this plan to be put into context in terms of their potential contribution to the aims of the WFD
The Argyll & the Islands Fisheries Management Plan aims to prescribe activities identified as being beneficial to the performance of fisheries and that promote biodiversity while delivering economic benefit to the wider community. It recognises that "there is an increasing influence on fisheries and biodiversity from non-native invasive plants and other changes due to climate change". Objective 5 of the plan includes the development of a broad-based biosecurity management plan for Argyll fisheries as well as other specific actions to be addressed by that plan.	This biosecurity plan has been formulated as part of the implementation of the Argyll & the Islands Fisheries Management Plan and addresses the specific elements of: • Raising awareness of biosecurity issues • Implementing effective mechanisms to prevent introduction of *Gyrodactylus salaris* • Assisting government agencies to monitor presence of diseases and parasites • Developing and supporting plans for control and eradication of alien flora and fauna • Working with fish farmers to prevent escapes of farmed fish • Preventing stocking of fish likely to affect or threaten productivity of native fish • Prevention/detection/rapid response INNS
Argyll & Bute Biodiversity Action Plan[25]	This plan specifically addresses the issues associated with the effect of INNS on many native species within the Argyll & the Islands area.
Conservation objectives of Special Areas of Conservation and Special Protection Areas (SACs and SPAs) and targets for Sites of Special Scientific Interest (SSSIs). Scotland's Biodiversity: A strategy for the conservation and enhancement of biodiversity in Scotland. [26]	Supports the conservation objectives and the 30 designated conservation areas[27] in the Argyll area.
Gyrodactylus salaris (Gs) Contingency Plan[28] A strategy to rapidly contain and eradicate Gs if introduced to Scotland	This plan will establish a local surveillance system that will feed into the national response protocols .

[25] www.argyll-bute.gov.uk/biodiversity/LBAP/Index.htm
[26] www.scotland.gov.uk/Publications/2004/05/19366/37239
[27] www.jncc.gov.uk/protectedsites/SACselection/SAC_LIST_unitary.asp?Unitary=Argyll+and+Bute&InterestGroup=
[28] www.scotland.gov.uk/Topics/Fisheries/Fish-Shellfish/18610/diseases/g-salaris/GsCGrev

SECTION 4 - Scope of the Plan

4.1 The Natural Resources of Argyll & the Islands

Argyll has some of the richest biodiversity in Scotland, providing a wide range of terrestrial, freshwater, coastal and marine habitats that support a unique assemblage of flora and fauna. These resources support a diverse fishery for native fish species.

Terrestrial resources

Land coverage in Argyll consists of a complex mosaic of mountains, moorland, peatland, forests and improved or semi-improved farm grassland;

Land cover type	Coverage (%)
Heather moorland/peatland, grasses and bracken scrub	50
Commercial forestry	21
Farming, crofting and estate – grasslands & mixed woodland	26
Native broadleaf forest	3

Terrestrial habitats support a number of important species including red squirrel (*Scirus vulgaris*), golden eagle (*Aquila chrysaetos*) and black grouse (*Tetrao tetrix*).

Freshwater resources

There are over 100 significant river catchments (>5km²) in Argyll and 1,000 stillwaters ranging from small lochans to the longest freshwater body in the UK, Loch Awe. There are significant conservation interests in a number of species including freshwater pearl mussel (*Margaritifera margaritifera*), Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), Arctic charr (*Salvelinus alpinus*) and Powan (*Coregonus lavaretus*).

Marine and coastal habitats

The convoluted nature of Argyll's coastline extends to over 3,000 miles (more than the coastline of France) which supports a wide diversity of coastal habitats including 14% of Scotland's machair habitats. Marine resources include unique Serpulid reefs and many seals, whales and dolphins.

4.2 Use of Land and Water Resources

Due to the rugged landscape of Argyll there is a limited range of land use practices within the region that provide economic benefits to the local economy.

Land resources

Argyll has a mix of land uses including forestry, agriculture, natural woodland and urban development.

Forestry

Commercial forestry is a significant land uses in Argyll (21%) and is managed by both public (Forestry Commission) and private sectors. Forestry interests have a mix of objectives including commercial, recreational and conservation and therefore have a significant role in biosecurity, particularly in the control of non-native invasive plants.

Agriculture

Rough pasture for upland livestock farming is the most significant form of agriculture due to the relatively low production of large areas of land. Stocking densities are significantly lower in the uplands compared to the more productive lower lying areas of improved or semi-improved grassland. There are also smaller areas of dairy farming on productive pasture while there is relatively little or no active arable farming undertaken in the county.

Natural woodland

There are small areas of native broadleaf and semi-natural woodland. This type of woodland is highly valuable from a biodiversity perspective as it can support a comprehensive array of native flora and fauna. Some of these woodlands have been given extra protection due to their international importance in terms of species diversity and are therefore a priority for consideration for the control of NNI species.

Urban development

Argyll sustains a number of larger conurbations, including Oban, Lochgilphead, Inveraray and Dunoon and many more smaller settlements. While covering relatively small areas of land the concentration of human activities such as gardening provides significant potential for the translocation of INN plants.

A number of forests have significant Rhododendron infestation

Urban centres are a common source of INN plants from gardens

Water resources

Argyll has significant water resources which are utilised for fisheries, aquaculture, hydroelectric generation and domestic water supply;

Fisheries

Argyll & the Islands host a diverse range of freshwater habitats and a mixture of native and introduced fish fauna. There are significant fisheries for native species including migratory Atlantic salmon (*Salmo salar)*and sea trout (*Salmo trutta*) that utilise both marine and freshwater habitats. There are many fisheries for brown trout in the numerous lochs in the region. Some lochs support fisheries for translocated species such as pike (*Esox lucius*), perch (*Perca fluviatilis*) and roach (*Rutilis rutilis*).

Angling activity has distributed translocated minnow (*Phoxinus phoxinus*) and stone loach (*Noemacheilus barbatulus*) species into a number of freshwater catchments in the region.

Aquaculture

There is significant activity in both marine and freshwaters, including cage and tank-based culture of Atlantic salmon and rainbow trout (*Oncorhynchus mykiss*) in Argyll. There is a growing interest in marine species such as halibut (*Hippoglossus hippoglossus*) and cod (*Gadus morhua*). There are several commercial companies currently involved in Area Management Agreements with wild fish interests and Scottish Government through the Tripartite Working Group. This initiative has focused on addressing fish health issues of both wild and farmed fish.

Atlantic salmon are a priority species supporting fisheries

Sea trout are the focus of many fishery management activities

Hydroelectric generation schemes

There are both large and small-scale hydroelectric generation schemes active across the region. There are a number of older schemes that transfer water between catchments, which potentially has implications for translocation of biosecurity threats, such as fish diseases and parasites.

4.3 Biosecurity: Current and Potential Threats

This subsection presents the current and potential threats from INNS and fish diseases.

4.3.1. Current Threats from INNS

Terrestrial species

Five species, one mammal and four plants, are firmly established over large areas in a relatively large number of catchments. Control of the size of existing populations, prevention of spread within and out of catchments and prevention of re-infection of controlled or cleared areas are key strategic elements.

- **American Mink** *(Mustela vison)* spread by migration and kill water fowl, small mammals and juvenile salmon and trout. They are linked to the decline of water voles in the Cairngorms National Park area with 94% of sites occupied by water voles in the 1950s now empty.

Invasive non-native terrestrial plants displace native vegetation on riverbanks reducing productivity and biodiversity and as they die back in winter can increase erosion of riverbanks and consequential siltation and compaction of the riverbed. The spread of these riparian plants is a growing concern and is exacerbated by climate change.

- **Rhododendron** *(Rhododendron ponticum)* 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, especially sunlight with impacts on fish and invertebrate communities as well as preventing site access.

- **Japanese knotweed** *(Fallopia japonica)* has spread along rivers and the coast 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 excluding native plants and prohibiting regeneration and

access reducing biodiversity and altering the habitat for wildlife. It can also cause damage to building structures and has been known to penetrate concrete.

- **Himalayan balsam** *(Impatiens glandulifera)* is present in scattered populations and 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 and shades out low level native plants reducing biodiversity and denuding river banks of understory vegetation. Winter dieback of the plants exposes soil to erosion and so promotes spread.

- **Giant hogweed** (*Hercaleum mantegazzianum)* 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 and can block rights of access. Giant hogweed out competes native vegetation for space and resources, shading out desirable vegetation that results in a loss of plant and invertebrate diversity. Its annual winter dieback increases bare soil to direct rainfall and floods which predisposes areas to erosion, resulting in loss of river banks

Rhododendron ponticum has been a common feature of riparian habitats in Argyll for many years

New non-native invasive plants such as Japanese knotweed are a growing threat to habitat productivity

Aquatic species

Four INN aquatic plant species, one algae and six non native or translocated fish species are found in small populations and/or few areas. The key strategies for these species are containment in areas where established, prevention of spread to other catchments, rapid response to contain and eradicate new incidences in previously unaffected catchments and containment and/or eradication where they currently occur.

Little is known of the current distribution of **invasive non native aquatic plants** but it is known from other areas that they form dense mats that can reduce productivity and biodiversity as well as blocking channels where water is slow moving.

Freshwater Species

- **Canadian pondweed** *(Elodea canadensis)* and **Nutall's pondweed** (*Elodea nutallii*) are spread by disposal of plants or plant fragments near waterways, escapes from garden ponds during flood episodes and possibly by birds and other animals. These pondweeds dominate native macrophyte communities which can lead to their extinction and thereby impacts local invertebrate communities. Canadian pondweed can also increase metal loads within waterbodies that compounds its impacts on native flora and fauna.

- **Australian swamp stonecrop** (*Crassula helmsii*) has been reported from a few locations in Argyll and is suited to a wide range of slow moving freshwater systems. It out competes native species and forms dense carpets choking ponds and ditches. Reduced light levels below the carpets can cause die off of waterweeds and algae and reduce water oxygenation levels. It can spread from an infested site to new sites by animal and human activity. Introductions are usually from trade for garden ponds and/or disposal or escape into the wild from private gardens.

Marine Species

- **Wireweed** (*Sargassum muticum*) has spread rapidly along the coast in the last 2-3 years. It has a rapid growth rate of up to 10 cm per day with a long life span of 3-4 years and reproduces both sexually and via floating fragments. Sexual reproduction releases thousands of "germlings" that settle rapidly. These can form dense monospecific mats very quickly that exclude other species and reduce available light for understory species, dampen water flow, increase sedimentation rates and reduce ambient nutrient concentrations available for native species.

- **Common cord grass** (*Spartina anglica*) is an established species at one known location in Argyll, at An t'Sailean Estuary. It is present throughout much of England and Wales, where it is found in sheltered, estuarine conditions, however there are only two known populations in Scotland (the other being St Andrews). It is highly fecund, grows rapidly and is an aggressive coloniser.

Invasive non-native fish consist of a mixture of both non native and translocated fish species. Six species have been identified to date in surveys in Argyll, but there may be other species present not yet detected. The concerns highlighted by conservation and fishery interests are justifiable given the documented rapid spread of these species over the last 30 years or so through introductions by anglers and potential escapees from the development of commercial fisheries.

There are limited resources to support native fish communities and **non-native fish** species can compete directly with native species for food and habitat. Some introduced species may also predate directly on other fish or their eggs. While it is difficult to establish their impact on the performance of fisheries there is a significant threat to vulnerable native species such as char and Powan.

- **Minnow** (*Phoxinus phoxinus*) is not native to Scotland, but has spread rapidly northward from the South-East of England, particularly by anglers as discarded 'livebait' and through deliberate introductions as a food fish for trout. Research undertaken elsewhere indicates that minnow compete for habitat and food to the detriment of native species, particularly juvenile salmonid fish.

- **Stone loach** (*Barbatula barbatula*) is not native to Scotland, but has recently been detected in Awe and Loch an Losgainn Mhor catchments. While there is little data to establish their impact, high densities of loach sampled alongside juvenile salmonids in the Awe catchment indicate that they compete for limited resources with native fish.

- **Roach** (*Rutlus rutilus*) has recently been detected in the Awe catchment, which is likely to have been introduced by pike anglers as discarded livebait. While there is little data to establish their impact, there is concern that they may compete with vulnerable native species such as charr and Powan. Charr and Powan coexist uniquely in the Special Area of Conservation of Loch Eck.

- **Perch** (*Perca fluviatilis*) is a long established species in the Awe catchment. While there is little data to establish their impact, there is concern that they may compete and predate on vulnerable native species such as charr and Powan.

- **Pike** (*Esox lucius*) is a long established species in the Awe catchment, which is thought to have been introduced in the early 1800's into Loch Tulla. Pike are also present in a number of smaller lochs on the mainland and Lochs Fad and Ascog on the Isle of Bute. As a top predator they can reduce abundance of native species and are therefore a threat to vulnerable native species such as charr and Powan.

- **Brook charr** (*Salvelinus fontinalis*) is also a relatively long established species, but has remained isolated in small hill lochs on the Isle of Mull.

- **Rainbow trout** (*Oncorhynchus mykiss*) are utilised for culture of table fish and stocked for fishery amenity. While not known to reproduce in Argyllshire waters, escapes from fish farms and inappropriate stocking can potentially increase competition for limited resources. Can be farmed in freshwater or marine sites.

4.3.2 Potential Threats from INNS

Potential threats of introduction of INNS into Argyll come from those species that are not currently found in Scotland but are present in neighbouring countries and could have access through one or more pathways to Scotland, and those species that are already present in Scotland but not in Argyll. There are a number of INNS that are not known to be present in Argyll, but their current distribution indicates that they may soon become a threat.

Signal crayfish are present in neighbouring regions but are not yet known to be in Argyll

Gyrodactylus salaris is not present in Scotland but has devastated Atlantic salmon in many Norwegian rivers

Two levels of **threat** have been defined depending on the impact each of the new species pose to the local economy and biodiversity, in combination with the risk of their introduction.

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

The risk of introduction was assessed using the proximity of the INNS, its pathways of spread and whether the uses of the area enable those pathways and the susceptibility of the Argyll area to their possible establishment.

There are six high risk INNS for introduction into the Argyll area and they include one fish parasite, three freshwater invertebrates and two aquatic plant species (Table 2).

Table 2 INNS that are a high threat to the biodiversity of Argyll & the Islands area

SPECIES	RISK OF INTRODUCTION	LOCAL IMPACTS
Gyrodactylus salaris (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	▪ Potential catastrophic impact on salmon *(Salmo salar)* populations throughout Scotland ▪ Has largely exterminated *S. salar* in 41 Norwegian rivers
Zebra mussel (*Dreissena polymorpha)* Freshwater Bivalve	**High-**Present in Ireland. Possible introduction 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 hydro-electric schemes ▪ Varied and unpredictable ecological impacts including changes to freshwater nutrient cycles, extinction of local mussels, changes to stream substrate affecting spawning areas
North American signal crayfish *(Pacifasticus leniusculus)*	**High**- Through intentional/ unintentional introduction from an existing nearby population, e.g. Clyde, or from contaminated source of fish supply	▪ Burrows into river banks causing destabilisation ▪ Diet includes small fish, fish ova and invertebrates ▪ Once established, extremely difficult to eradicate
Chinese mitten crab *(Eriocher sinensis)* Resides in freshwater but migrates to the sea for breeding.	**Medium-**Present in NE England. Possibility of unintentional introduction from boat hulls and intentional introduction for live food trade.	▪ Burrowing in high density populations damages river banks ▪ Concern over impacts on local species ▪ Intermediate host for the mammalian lung fluke *Paragonimus ringer,* known to infect humans
Didemnum Tunicates **(Sea Squirts)** *Didemnum vexillum, Didemnum spp*	**High-**Present in Ireland and Wales. Possibility of unintentional introduction from marine fishing boat hulls or contaminated aquaculture equipment	▪ Marine habitat changes through overgrowth of sedentary benthic organisms such 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. ▪ Increased fouling also interferes with fishing, aquaculture, and other coastal and offshore activities.
Asian topmouth gudgeon (*Pseudorasbora parva)*	**Medium-** Currently only recorded from 5 locations in England but could be introduced as live bait, in contaminated water for aquaculture trade	▪ Severely impacts other fish species through egg predation and their vast consumption of plant life and invertebrates which alters natural ecosystem processes ▪ Carries a parasite, similar to, or possibly the same as, the disease called the 'rosette agent' that is a threat to salmonids and cyprinids

SPECIES	RISK OF INTRODUCTION	LOCAL IMPACTS
Ruffe *(Gymnocephalus cernuus)*	**High-** Present in L. Lomond and could be introduced as live bait or in ballast water	▪ 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.
Orfe *(Leuciscus idus)*	**High-**Through intentional/unintentional introduction from an existing population nearby.	▪ The introduced Golden Orfe now widespread in England and Wales. ▪ Impacts are not recorded and so the species is classified as medium impact by the UKTAG.
Slipper limpet *(Crepidula fornicate)*	**High**- Through unintentional introduction, hull fouling and contaminated oyster spat	▪ 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/m^2 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

There are also a total of 9 medium threat level species of which there is a medium risk of introduction for four species and a low risk for the remaining six species (see Table 3 below).

Table 3 Medium threat level INNS and their risk of introduction.

SPECIES	RISK OF INTRODUCTION	
Water primrose *(Ludwigia grandiflora)*	**Medium**	Unintentional introduction from boat hulls and from sales from pond and garden trade
Water fern *(Azolla filiculoides)*	**Medium**	Through intentional/unintentional introduction from numerous locations throughout Scotland, especially central belt
Bullhead *(Cotus gobio)*	**Medium**	Translocated species recorded in central Scotland that could be introduced deliberately or as live bait
Curly waterweed (*Lagarosiphon major)*	**Medium**	Present in southern and central Scotland and spreads by fragmentation via wind dispersal, boat movement, angling equipment and, possibly waterfowl. Also sold in Garden Centres and aquarium trade.
Large flowered waterweed *(Egeria densa)*	**Low**	Only found to date in East Lothian possible introduction from garden and/or pond trade
Floating pennywort *(Hydrocotyle ranunculoides)*	**Low**	Currently only in England up to the midlands possible introduction from garden and/or pond trade
Parrot's feather *(Myriophyllum aquaticum)*	**Low**	Through intentional/unintentional introduction from two existing populations in the south of Scotland
Fanwort *(Cabomba caroliniana)*	**Low**	Only found in one location in southern Scotland possible introduction from garden and/or pond trade
Ruddy duck *(Oxyura jamaicensis)*	**Low**	Could migrate from a number of locations in Eastern Scotland

4.3.3 Fish Health and Genetic Issues

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

Fish diseases and parasites have potential to impact on the productivity of fish populations by reducing growth and survival of infected fish to the point where fishery performance is affected. The introduction and spread of **non-native genotypes, diseases and parasites** from aquaculture and fishery activities are understood to be the most significant factors.

Parasites & diseases

Restrictions on the import into the UK of live fish have played a major part in preventing the introduction and spread of serious fish diseases. Health conditions of aquaculture animals are today governed by the Fish Health Regulations 1997 legislation that have three categories of Notifiable [29]Diseases in Fish depending on their potential impact on the Scottish aquaculture industry and wild fish stocks.

List I diseases are those which have a serious economic impact and are exotic to the EU, including:

Infectious Salmon Anaemia (ISA)

List II diseases are those which are present in the EU, but approved zones and approved farms in non-approved zones can be distinguished. These include:

Viral Haemorrhagic Septicaemia (VHS)
Infectious Haematopoetic Necrosis (IHN)

List III diseases are those for which individual Member States can decide whether to put control measures in place or not, including:

Infectious Pancreatic Necrosis (IPN)
Bacterial Kidney Disease (BKD)
Furunculosis
Spring Viraemia of Carp (SVC)
Gyrodactylus salaris (Gs)
Enteric Redmouth Disease (ERM)

The biggest current threat to Atlantic salmon populations and the fisheries they support is the parasite ***Gyrodactylus salaris*** **(Gs).** The potentially catastrophic consequences of its introduction mean that it is a priority for fisheries and aquaculture industries to identify and mitigate potential vectors.

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

29

http://www.marlab.ac.uk/Delivery/Information_resources/information_resources_view_document.aspx?resourceId=23697&documentId=1922

native and introduced fish is likely to produce offspring that have reduced survival and lower reproductive success[30]. 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. Currently, there is no provision for AFT to be notified of the release of non-native genotypes into stocked fisheries.

4.3.4 INNS and Fish Diseases Pathways

From Tables 2 and 3 and section 4.3.3, the main pathways or means of introduction of both high and medium level threat species into the Argyll & the Islands catchments are:

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

To prevent the spread of these INNS and diseases these pathways need to be restricted. Where possible and feasible existing populations must be controlled or eradicated and their impacts mitigated**.**

4.4 The Stakeholders

It will be important to ensure that the actions recommended are well informed and the progress of the plan assessed and adapted accordingly. Steerage and effective implementation of the plan will require a wider ownership and participation by interested parties.

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, Lochgilphead; Oban; Bowmore, Isle of Islay; Dunoon; Ayr
- Scottish Environment Protection Agency, Lochgilphead; Ayr
- Marine Scotland

Land resources

- Forestry Commission, Oban
- Argyll Agriculture Forum

[30] 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)

- National Farmers Union
- Argyll and Bute Council
- North Ayrshire Council
- Landowners Association

Water resources

- Argyll & Lochaber and Clyde Area Advisory Groups (River Basin Plans)
- Scottish Water
- Scottish & Southern Energy Plc
- British Waterways

Fisheries

- Argyll Fisheries Trust
- The Argyll District Salmon Fishery Board
- Eachaig District Salmon Fishery Board
- Mull District Salmon Fishery Board
- Laggan & Sorn District Salmon Fishery Board
- River & Loch Improvement Associations
- Scottish Sea Angling Conservation Network
- Scottish Federation of Sea Anglers

Aquaculture

- Tripartite Working Group
- Scottish Salmon Producers' Organisation
- British Trout Association
- Association of Scottish Shellfish Growers

Conservation & biodiversity

- Scottish Wildlife Trust, Lorn and Mid Argyll; Clyde Area
- Royal Society for the Protection of Birds
- Scottish Native Woods
- Argyll & Bute Local Biodiversity Partnership
- Plantlife

The plan also seeks to engage with all members of the community who have an interest and/or a role to play in preventing the introduction or spread of INNS. These include: local garden centres; landowners, local water sport organisations; local angling clubs; local quarries; terrestrial and fish farmers and members of the public.

SECTION 5 - Delivery of Objectives

This section describes the proposed implementation of the plan and the actions required for their realisation. Actions for **prevention** are focused 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. 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.

The delivery mechanisms form the basis of the activities required to realise the objectives of this biosecurity management plan. Timetables for the activities relating to all objectives are provided in Section 5.5, tables 9, 10 and 11.

5.1 Objective 1 - Prevent the Introduction and Spread of Biosecurity Threats

Key Actions
A. Establish programme to raise awareness with stakeholders
B. Encourage use of good practice within key stakeholder groups
C. Establish and extend disinfection programme to cover likely pathways of entry

Awareness activities will be focused on addressing the identified local priorities as well as supporting the GB Awareness and Communication strategy and its key messages to the general public. The local priorities are associated with disrupting the pathways for the introduction and spread of INNS in the Argyll area and activities should be focused on the stakeholders involved. Priority areas and mechanisms for delivery for the key target stakeholders are presented in table 5, while table 6 presents the proposed delivery stakeholders for the priority areas and their roles in the prevention programme.

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

Stakeholders	Priority Areas	Mechanism of Delivery
Aquaculture (SSPO, BTA, TWG, ASSG) and local fish farmers	- Impact of INNS - Use of biosecurity measures - Dangers of importing from contaminated areas - Controls on movement of stock and water	- AFT to liaise with local industry and trade associations to advise members regularly of good practice of INNS - Incorporation of INNS codes of good practice into TWG agreement - Incorporation of INNS codes of good practice into SSPO/BTA industry codes of practice
Port Authorities / British Waterways	- Need to avoid pumping out of non sterilised ballast water in harbour - Hull fouling	-Formulate and implement an interim code of practice requiring non-sterilised ballast water to be discharged on the ebb tide and away from harbour - Promote best practice through The Green Blue http://www.thegreenblue.org.uk/
Local garden centres	-Promote existing codes of practice covering the security and disposal of NNS to all garden centres -Target gardeners specifically	- AFT to work with garden centres to encourage distribution of codes and posters (available from Plantlife) and to advise the general public of INNS issues
Ornamental Fish Trade and Pond Alert	-Promote code of practice to all pet shops and suppliers of ornamental fish	- AFT to work with retailers to encourage distribution of codes and posters (available from Plantlife) and advise the general public of INNS issues

Stakeholders	Priority Areas	Mechanism of Delivery
Water user associations (canoeists, sailing clubs)	-Promote awareness to clubs and participants of the dangers arising from INNS	- AFT to work with associations to promote disinfection of equipment and provide appropriate facilities to eliminate the risk of accidental transfer of INNS -Codes of best practice to reduce risk of accidental spread of INNS
Local loch and river improvement associations	- Continue to promote awareness of the threat of INNS through improved communication	- AFT to work with associations to promote best practice and provide appropriate guidance
Landowners	- Ensure that all tenants and resource-users are aware of biosecurity issues - Recommend suitable persons to act as "eyes" for the AFT	- AFT to ensure dissemination of good practice and appropriate signage to reduce threats from INNS -AFT to offer training for "eyes"
Angling clubs	- Ensure all anglers are aware of biosecurity issues - Ensure the distribution of information and signage in fishing huts and recognised car parks -Recommend suitable members to act as "eyes"	- AFT to ensure dissemination of good practice and appropriate signage to reduce threats from INNS -AFT to offer training for "eyes"
General Public	-General awareness of impacts and measures to prevent/control INNS -Promote the Biosecurity Plan to all retail outlets who deal with NNS e.g. pet shops, garden shops	-Local Media Campaigns -Use of websites (RAFTS, NNSS, Argyll & Bute Invasive Species Forum) -AFT to develop a leaflet to promote Biosecurity dangers and reporting system
Schools	- General awareness of impacts and measures to prevent/control INNS	-School visits focusing on ecological clubs and encouraging appropriate field trips Extend Salmon in the Classroom to include threats from INNS

Table 6 Proposed priority areas for awareness and delivery mechanisms by delivery stakeholder groups

Stakeholders	Priority Areas	Mechanism of Delivery
Argyll & Bute Council North Ayrshire Council (Arran)	- Promote use of codes of good practice for construction, haulage, horticulture, aquaculture amongst local business and relevant departments particularly construction, garden and pet trade - Promote awareness of planning, waste disposal and transport regulations amongst local business - Promote awareness of the GB communications strategy to the general public	- Councils to promote codes of best practice ,e.g. including them with appropriate planning applications and building warrants -Holding of awareness event/open days to promote biosecurity issues - Councils to display relevant legislation on websites - Display posters (produced by RAFTS) in council offices, libraries and other public places
DSFB	-Continue to promote awareness to anglers and angling clubs of the dangers arising from INNS through open days, field visits and demonstrations - Signage & disinfection	- Continue to promote disinfection of equipment and provide appropriate facilities
AFT	- Promote awareness to general water users promoting the Biosecurity Plan and highlighting the dangers from INNS	- Promote and launch Biosecurity Plan -Develop a leaflet to promote the Biosecurity plan, the dangers arising from INNS and the reporting system and ensure appropriate distribution to stakeholders - Assist with formulation of code of good practice for INNS (RAFTS) - AFT will regularly liaise with neighbouring fisheries trusts to establish the latest INNS threats to Argyll & the Islands area and close pathways -See actions for AFT in table 5 - AFT to promote INNS good practice - AFT to promote RAFTS INNS website http://www.invasivespeciesscotland.org.uk
SEPA	- Clarify SEPA responsibilities for INNS to both staff and customers - Incorporate INNS issues into relevant guidance documents (as they are developed or updated)	- Page on website with links to relevant SEPA information and other sites e.g. Non-Native Species Secretariat, RAFTS, Scottish Canoe Association. - Digital documents available for download on SEPA Website
SNH	- Promotion of good practice in the prevention, control and eradication of INNS.	- Holding of SNH Sharing Good Practice events.

5.2 Objective 2 – Ensure Optimum Detection and Surveillance of New Biosecurity Threats

Key Actions
A. Establish an 'early warning system' for detecting new threats
B. Develop rapid response protocols for new significant threats to local biodiversity and economy

A. Early Warning System

The "eyes" of the early warning system will be trained members of the public, fish farmers, bailiffs, ghillies, canoeists and walkers, with reported sightings verified by trained personnel. The 'eyes' can report a suspected INNS sighting to AFT or direct to the RAFTS INNS website (http://www.invasivespeciesscotland.org.uk). A sighting of a GB or local high priority species (Table 7) will be verified by appropriate personnel. If confirmed, it will initiate the appropriate GB or local high priority response. Reports of priority species will be verified as time permits. All verified sightings will also be entered onto the AFT Geographic Information System (GIS) database to monitor INNS distributions within the Argyll & the Islands area.

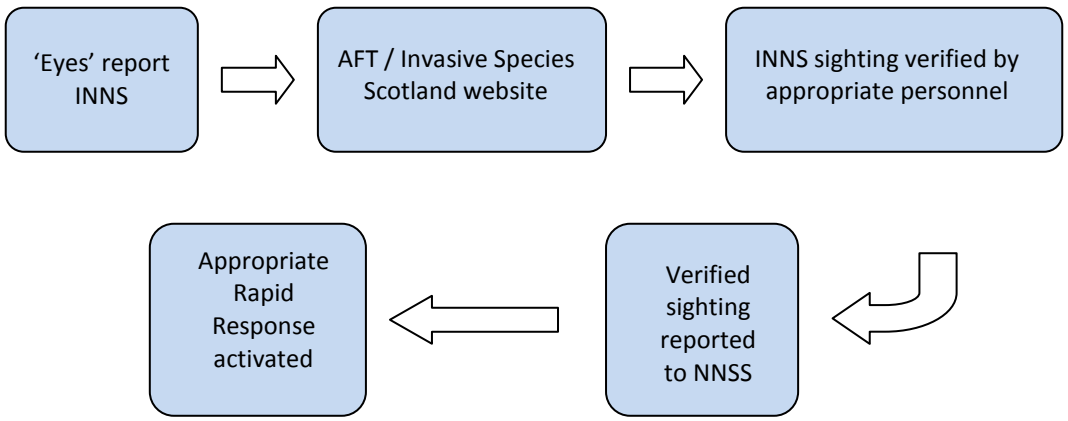

Figure 2. Pictorial representation of Early Warning System.

B. Rapid Response Protocols

The type of response will depend on the severity of the species detected (Table 7) and is proportionate to the threat posed. There are three levels of response:

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

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. There is no agreed species list at present; this work is being taken forward by the Scottish Working Group on Invasive Non-Native Species and once agreed, will be circulated to all interests.

Table 7 Response level for the invasive non native species

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

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 8.

Table 8 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 -Determine the extent of infestation -Isolate area where practicable	- Report to local and GB institutions -Determine the extent of infestation - Isolate area where practicable - Establish source and check related sites - Closure of all pathways -Decide on appropriate action eradication/containment. - Approve eradication methodology -Monitor	-Report to local and GB institutions -Determine the extent of infestation -Survey in course of normal work to establish and map distribution -Include new areas in existing eradication/control programmes - Identify and close all pathways - Monitor as part of planned catchment monitoring programme

5.3 Objective 3 – Ensure Control and Eradication Programmes for Threats are Operational, Effective and Sustainable

Key Actions
A. Collect data on distribution and abundance of existing threats
B. Develop and initiate control and eradication programmes to tackle threats

A. Collect data on distribution and abundance
For effective INNS control and eradication programmes, it is essential that the current distribution and abundance of INNS is known. To collect accurate and up-to-date on INNS distribution, the following actions are required:

- AFT to modify existing habitat surveys to include presence and abundance of INNS;
- Specific INNS surveys for INNS are developed to fully address the question of INNS within the Argyll & the Islands area;

All collected and collated data will be entered into the AFT GIS INNS database.

B. Develop and initiate control and eradication programmes
Control and eradication programmes will be developed in conjunction with key stakeholders using up-to-date NNSS advice on good practice for each INNS present. The AFT will liaise with the NNSS for current good practice and with other RAFTS members on their practical experiences with control and eradication programmes. Control and eradication programmes will depend upon the nature of the INNS threat. Different stakeholders will be involved in and lead different programmes contingent upon which INNS are present. A combination of specialist contractors, volunteers, loch and river improvement associations, AFT/DSFB staff will be used depending on the management requirements of the area involved. SEPA Environmental Protection and Improvement staff will be contacted for comment on any proposed INNS control and eradication programme that may impact on the water environment to ensure appropriate mitigation measures are taken. Similarly, Scottish Water will be contacted for comment on any INNS control and eradication programmes that might impact on waters which are used for drinking water supplies.

A programme for the control of Japanese knotweed is being developed for the banks of Loch Awe with the AFT, Loch Awe Improvement Association, Awe District River Improvement Association and SNH. The distribution of the known populations of Japanese knotweed have been identified on Loch Awe (figure 3) although new reports are being made all the time. Actions for the control and eradication of these populations are being agreed between partners. Additionally, American mink control is carried out on Mull in conjunction with FCS, SNH and the community.

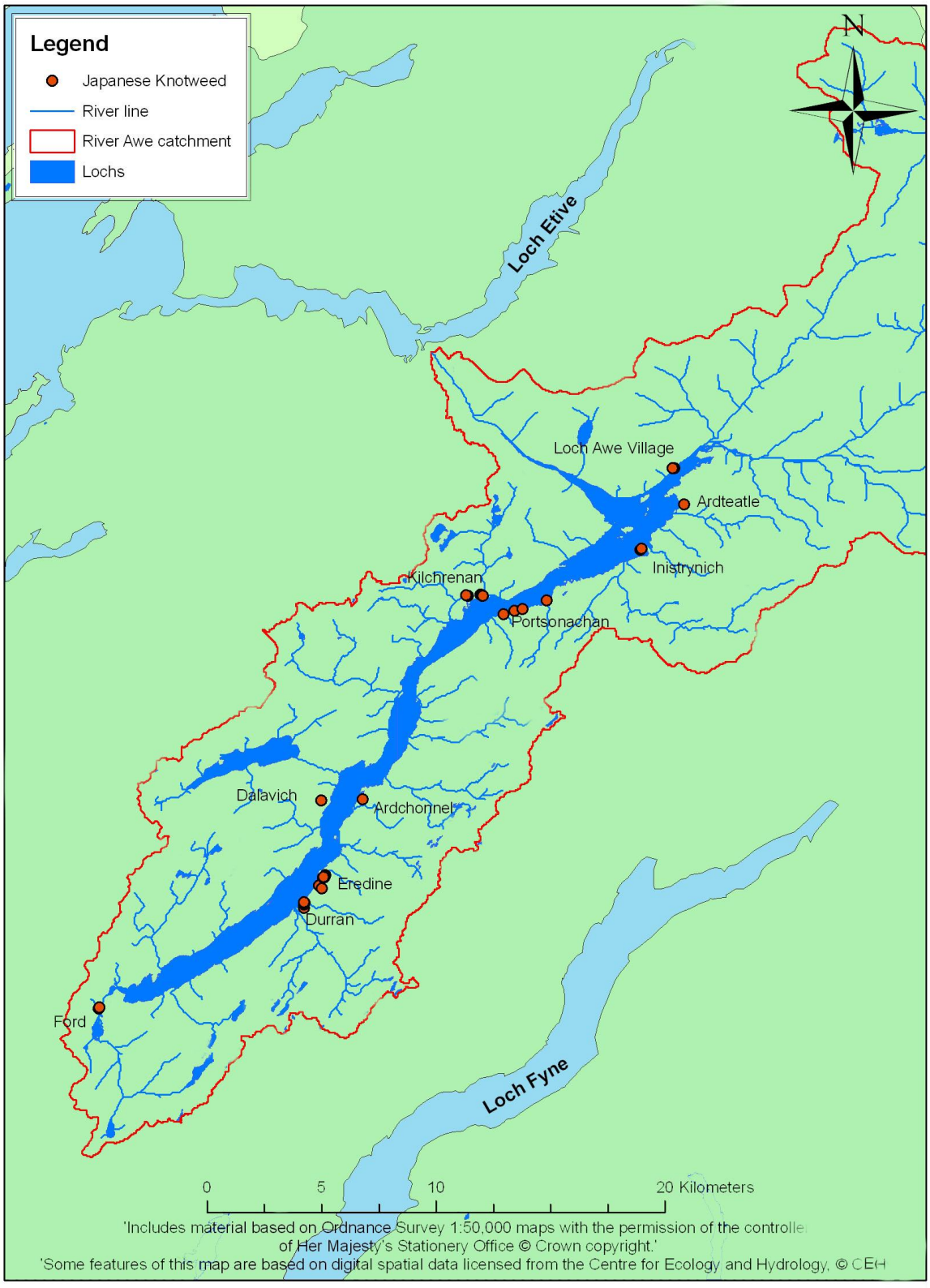

Figure 3 Map of Loch Awe catchment showing location of known Japanese knotweed populations.

5.4 Monitoring

Progress in the implementation of this plan will be determined by the level of engagement, support and commitment of the stakeholders and partners to deliver actions for shared priorities. That is now the challenge for all parties as we seek to deliver the objectives this plan.

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

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

Monitoring activities will be undertaken by AFT in conjunction with stakeholder representatives who will be aware of local initiatives and priorities for action. A timetable for monitoring the implementation of the plan will be agreed following the consultation period and launch of the plan.

5.5 Timetable for Activities

Table 9 Timetable for prevention activities

Action	Lead Partner	Partners	Timescale						
			2009	2010	2011	2012	2013	2014	2015
Objective 1 - Prevention									
Launch of AFT Biosecurity plan through national and local press – create press release	AFT	RAFTS, SG, NNSS, SEPA, SNH	—						
Produce leaflet on biosecurity risks and the reporting system	AFT			—					
Continue to promote and install disinfection facilities and signs for anglers at angling proprietors fishing huts/parking points	DSFB	AFT	—	—	—	—	—	—	—
Expand disinfection facilities to include water sports	SCA	AFT		—	—	—	—	—	—
Distribute codes and posters to relevant retail outlets and clubs at open days and events such as agricultural shows	ABC/NAC	AFT		—	—	—	—	—	—
Engage with Landowners and angling clubs to promote awareness measures to tenants, resource –users, members and visitors	AFT			—	—	—	—	—	—
Work with environmental groups of local schools to enhance awareness of INNS	ABC/NAC			—	—	—	—	—	—
Expand Salmon in the Classroom to include INNS	AFT	RAFTS		—	—	—	—	—	—

Table 10 Timetable for detection and surveillance activities

Action	Lead Partner	Partners	Timescale						
			2009	2010	2011	2012	2013	2014	2015
Objective 2 – detection & surveillance									
A. Early Warning System									
Develop 'Early Warning System' protocol	AFT	RAFTS							
Train AFT personnel in identification of INNS	AFT	RAFTS, SNH							
Train AFT personnel as INNS identification trainers	AFT	RAFTS, SNH							
Work with stakeholder groups to identify and train 'eyes'	AFT	DSFBs, Landowners, TWG							
Produce database to record and manage INNS sightings	AFT	RAFTS, SNH							
Agree reporting mechanism for notification of introduction of non-native fish genotypes	AFT	MS							
Validate unsubstantiated INNS sightings in Argyll	AFT								
B. Rapid Response Protocols									
Formulate contingency plans for 'GB' and 'high priority local' INNS	AFT	RAFTS, NNSS, SNH, ABC/NAC							
Liaise with national stakeholders re. GB contingency plans	RAFTS								

Table 11 Timetable for control and eradication activities

Action	Lead Partner	Partners	Timescale						
			2009	2010	2011	2012	2013	2014	2015
Objective 3 – control & eradication									
A. Collect data on distribution and abundance									
AFT habitat surveys to include INNS	AFT	SFCC, RAFTS							
Develop specific INNS survey protocols	AFT	SFCC, RAFTS, DSFBs, SNH							
Conduct INNS surveys in priority areas	AFT								
Create INNS GIS database	AFT								
B. Develop and initiate control and eradication programmes									
Develop and initiate control and eradication programmes for INNS	AFT	RAFTS, SNH, NNSS							
Continue development of Loch Awe Japanese knotweed programme	AFT	LAIA, ADRIA, SNH							
Continue American mink programme	FCS	SNH							
Continue rhododendron programme	FCS								
Monitor and evaluate efficacy of control and eradication programmes	AFT	ABC/NAC							

Table 12 List of abbreviations

Abbreviation	Organisation	Abbreviation	Organisation
ABC	Argyll & Bute Council	NAC	North Ayrshire Council
ADRIA	Awe District River Improvement Association	NNSS	Non Native Species Secretariat
AFT	Argyll Fisheries Trust	RAFTS	Rivers and Fisheries Trusts of Scotland
ASSG	Association of Scottish Shellfish Growers	SEPA	Scottish Environment Protection Agency
BTA	British Trout Association	SFCC	Scottish Fisheries Co-ordination Centre
DSFBs	District Salmon Fisheries Boards	SG	Scottish Government
FCS	Forestry Commission Scotland	SNH	Scottish Natural Heritage
LAIA	Loch Awe Improvement Association	SSPO	Scottish Salmon Producers' Organisation
MS	Marine Scotland	TWG	Tripartite Wording Group