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NASCO Implementation Plan for the period 2019-2024

UK – Scotland
(Revised October 2022)

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The main purpose of this Implementation Plan is to demonstrate what actions are being taken by the Parties / jurisdictions to implement NASCO's Resolutions, Agreements and Guidelines.

*In completing this Implementation Plan please refer to the **Guidelines for the Preparation and Evaluation of NASCO Implementation Plans and for Reporting on Progress**, CNL(18)49.*

Questions in the Implementation Plan are drawn from the following documents:

- *NASCO Guidelines for Management of Salmon Fisheries, [CNL\(09\)43](#) (referred to as the 'Fisheries Guidelines');*
- *Report of the Working Group on Stock Classification, [CNL\(16\)11](#);*
- *Minimum Standard for Catch Statistics, [CNL\(93\)51](#) (referred to as the 'Minimum Standard');*
- *Revised matrix for the application of the six tenets for effective management of an Atlantic salmon fishery, WGCST(16)16¹;*
- *NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat, [CNL\(01\)51](#);*
- *NASCO Guidelines for Protection, Restoration and Enhancement of Atlantic Salmon Habitat, [CNL\(10\)51](#) (referred to as the 'Habitat Guidelines');*
- *Williamsburg Resolution, [CNL\(06\)48](#);*
- *Guidance on Best Management Practices to address impacts of sea lice and escaped farmed salmon on wild salmon stocks ([SLG\(09\)5](#)) (referred to as the 'BMP Guidance');*
- *Guidelines for Incorporating Social and Economic Factors in Decisions under the Precautionary Approach ([CNL\(04\)57](#)); and*
- *Road Map' to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of *G. salaris* and eradicate it if introduced', [NEA\(18\)08](#).*

Party:	United Kingdom
Jurisdiction / Region:	Scotland

¹ This document can be obtained from the NASCO Secretariat; email hq@nasco.int

1. Introduction

1.1 What are the objectives for the management of wild Atlantic salmon? (Max 200 words)

Scotland's objectives were updated in 2022 through the publication of Scotland's Wild Salmon Strategy [Scottish Wild Salmon Strategy - gov.scot \(www.gov.scot\)](http://www.gov.scot)

Vision

Scotland's wild Atlantic salmon populations are flourishing and an example of nature's recovery. We will achieve this through the application of best-practice science and management.

Objectives

- Scotland's rivers have healthy, self-sustaining populations of wild Atlantic salmon that achieve good conservation status.
- Wild salmon management is evidence-based and underpinned by integrated data gathering, research and dissemination.
- The environmental and socio-economic benefits arising from healthy wild Atlantic salmon populations are identified and maximised through partnerships between the public, private and charitable sectors.

1.2 What reference points (e.g. conservation limits, management targets or other measures of abundance) are used to assess the status of stocks? (Max 200 words) (Reference: Sections 2.4 and 2.5 of the Fisheries Guidelines)

The stock of Atlantic salmon in each Scottish river or assessment area (where fishery catch cannot be assigned to individual rivers) is assessed by setting an egg deposition requirement and estimating whether or not this requirement is met. The egg deposition requirement is set to maintain the sustainability of a stock, rather than maximise juvenile output or other alternate, local management measures. Assessments are undertaken for each river, except in those areas where fishery catch cannot be assigned, when rivers are combined to form assessment areas.

The numbers of eggs required to produce sustainable Atlantic salmon stocks are estimated from population in 12 rivers² from which information on stock-recruitment relationships associated geographic co-variables is available. Mathematical models of these data have been developed to produce egg deposition requirement estimates for areas without stock-recruitment data, using information on their location and productivity. These models have been presented to the ICES Working Group on North Atlantic Salmon. Egg requirements are expressed as the number of eggs required on average for every square metre of wetted area of salmon habitat. The wetted area available to Atlantic salmon for each assessable area is calculated using the most up-to-date information on the distribution of salmon from historical records and recent consultations. The wetted area and egg requirement are multiplied together to produce an overall egg deposition requirement for each river.

1.3 What is the current status of stocks under the new classification system outlined in CNL(16)11?

Stock Classification Score	Salmon Classification Category	No. rivers
0	Not at Risk	
1	Low Risk	50
2	Moderate Risk	38
3	High Risk	123
N/A	Artificially Sustained	

² Please see section 2.7 (b).

N/A	Lost	1
N/A	Unknown	208
Additional comments:		
<p>Scotland's Salmon Classification Category has been generated by creating a simple read across from Scotland's national categories, as assessed for the 2019 salmon fishing season.</p> <p>The conservation status of Atlantic salmon stocks in 173 assessment areas (primarily individual rivers and in some cases groups of rivers where fishery data cannot be assigned to individual rivers) is quantitatively assessed annually using the method described in 1.2. Assessment areas are defined in legislation by reference to designated river outflow point(s), with all inland waters flowing to such points being included in the assessment area. The 173 assessment areas cover 212 individually named rivers.</p> <p>The quantitative conservation assessment in these 173 areas is undertaken on the basis of reported catch returns supplemented by other data. For all other catchments without fisheries data a precautionary approach to conservation assessment is taken where, for the purposes of national legislation, stocks are treated as if they are in poor status and retention of salmon banned. Therefore all rivers in Scotland receive some form of conservation status assessment in national legislation. All rivers without fishery data are classified as "unknown" in section 1.3.</p> <p>The discrepancy between the number of areas assessed nationally (173) and the number of waters listed in Table 1.3 is due to the two factors detailed above.</p>		
<p>1.4 How is stock diversity (e.g. genetics, age composition, run-timing, etc.) taken into account in the management of salmon stocks? (Max 200 words)</p>		
<p>The assessment methods underpinning the Conservation Regulation models temporal changes in the run-timing and age composition of salmon from different river stocks and this information is used to determine egg deposition. However, the assessment is taken for a whole stock level.</p> <p>Sub-stock management in Scotland is achieved through a combination of national and local measures. Due to concerns regarding the health of salmon returning in the early part of the year, a national prohibition on killing of salmon before the 1st April each year is currently in place. Additional management measures to protect sub-stocks are undertaken at a local level through voluntary agreements put in place by District Salmon Fishery Boards, proprietors and angling clubs.</p>		
<p>1.5 To provide a baseline for future comparison, what is the current and potential quantity of salmon habitat? (Max 200 words) (Reference: Section 3.1 of the Habitat Guidelines)</p>		
<p>Recent analysis by Buddendorf <i>et al.</i> 2019, estimates that Scotland's riverine habitat is 208,726,474 m², assuming that all habitat below impassable barriers is used by Atlantic salmon.</p> <p>The same paper's estimates of historical habitat areas that are no longer available to Atlantic salmon are <i>ca.</i> 81,449,488 m² for still waters and 7,365,245 m² for running waters. These figures represent approximately 10% and 4% of the total historical area for still and running waters respectively.</p> <p>In terms of juvenile Atlantic salmon, the analysis by Buddendorf <i>et al.</i>, also reports that historically available habitat that is no longer available to Atlantic salmon (i.e. that above impassable man-made barriers) represents only <i>ca.</i> 1.2% of national production.</p> <p>However, it is also important to recognise that many areas that were historically running water are now still-water areas as a result of flooding by impoundment. These will have been classified as still waters and therefore without further refinement the current GIS analysis will overestimate losses from still waters and underestimate losses from running waters.</p>		

1.6 What is the current extent of freshwater and marine salmonid³ aquaculture?	
Number of marine farms	221
Marine production (tonnes)	155,990
Number of freshwater facilities	71
Freshwater production (tonnes)	47.1M smolts.
Append one or more maps showing the location of aquaculture facilities and aquaculture free zones in rivers and the sea.	
Please see Annex A, which shows the distribution of active Atlantic salmon production sites in 2017.	
1.7 Please describe the process used to consult NGOs and other stakeholders and industries in the development of this Implementation Plan. (Max 200 words)	
<p>Marine Scotland has consulted on early drafts of this plan with the Scottish Environment Protection Agency (SEPA); Scottish Natural Heritage (SNH) – now NatureScot; Fisheries Management Scotland, (FMS); the Atlantic Salmon Trust, (AST); the Institute of Fisheries Management, (IFM); Salmon and Trout Conservation Scotland, (STCS) – now WildFish; the Scottish Environment LINK Aquaculture subgroup; the Salmon Net Fishing Association of Scotland (SNFAS); the Scottish Anglers National Association (SANA); the Scottish Salmon Producers’ Organisation (SSPO) – now Salmon Scotland; and the International Salmon Farmers Association (ISFA).</p> <p>The draft of this plan, for example, was sent to the organisations listed in early December 2018, with feedback requested <i>ca.</i> six weeks later, by 20 January 2019. Four organisations were able to respond within this challenging timescale, given the Christmas and New Year period. We have incorporated their comments in the original draft submitted where appropriate and continue to liaise with stakeholders.</p>	
2. Management of Wild Atlantic Salmon Fisheries:	
<i>In this section please review the management approach to each of the fisheries in your jurisdiction (i.e. commercial, recreational and other fisheries) in line with the relevant NASCO Resolutions, Agreements and Guidelines. For Parties / jurisdictions that prosecute mixedstock fisheries, there should be at least one action related to their management.</i>	
2.1 What are the objectives for the management of the fisheries for wild salmon? (Max. 200 words)	
<p>Objectives for the management of fisheries for wild salmon are consistent with Scotland's overall objectives for the management of wild salmon described at 1.1.</p> <p>Management of salmon fisheries, for the vast majority of Scotland, is undertaken on a regional, catchment basis by District Salmon Fishery Boards (DSFBs), typically with the support of a local Fishery Trust.</p> <p>This plan describes activities which the Scottish Government is directly involved in. It does not, for example, include the wide range of policies and activities which DSFBs deliver in relation to local management needs. Through this work and engagement in consultations, DSFBs and Fishery Trusts are key partners, alongside SEPA and NatureScot, with whom we will continue to work jointly to achieve the objectives.</p> <p>Marine Scotland, Fisheries Management Scotland (FMS) and their members have developed an online mapping tool identifying pressures acting on salmon in individual river reaches⁴. Detailed local information, captured as spatial data, is aggregated to regional and national scales and incorporated into a web application which will be released alongside a detailed online GIS by the end of 2021. Marine Scotland will work with FMS to explore development of a common template for Fishery</p>	

³ This data currently relates to Atlantic salmon.

Management Plans (FMP) to allow local information on management actions to be aggregated and compared at a national level.

2.2 What is the decision-making process for the management of salmon fisheries, including predetermined decisions taken under different stock conditions (e.g. the stock levels at which regulations are triggered)? (Max. 200 words)
(This can be answered by providing a flow diagram if this is available.)
(Reference: Sections 2.1 and 2.7 of the Fisheries Guidelines)

The Conservation of Salmon (Scotland) Regulations 2016:

- prohibit the retention of Atlantic salmon caught in coastal waters;
- permit the killing of Atlantic salmon within inland waters where stocks are above a defined conservation limit (CL); and
- require mandatory catch-and-release of Atlantic salmon in areas which fall below their defined CL following the assessment of salmon stocks.

The conservation status of each stock is defined by the probability of the stock meeting its CL over a 5-year period. This is reassessed annually, and stocks are allocated one of three categories for the following fishing season, with the regulations amended accordingly :

Category	Probability of Meeting CL	Advice
1	At least 80%	Exploitation is sustainable therefore no additional management action is currently required.
2	60-80%	Catch-and-release should be promoted strongly in the first instance. The need for mandatory catch-and-release will be reviewed annually.
3	Less than 60%	Mandatory catch-and-release (all methods).

The retention of Atlantic salmon within an estuary requires all the rivers flowing into it to be category 1 or 2.

Retention of salmon is prohibited out-with the defined netting and rod & line seasons and during the Spring closure period (when all Atlantic salmon must be released).

2.3 (a) Are any fisheries permitted to operate on Atlantic salmon stocks that are below their reference point (e.g. Conservation Limits)? If so, (b) how many such fisheries are there and (c) what approaches are taken to managing them that still promotes stock rebuilding? (Max 200 words) *(Reference: Section 2.7 of the Fisheries Guidelines)*

(a) Yes, mandatory catch-and-release fisheries may operate.

(b) 55%, of the 173 rivers or assessment groups assessed in 2019 operated on a mandatory catch and release basis during the 2019 fishing season. In addition, catch and release is to be promoted strongly by local managers on the 17% of the 173 rivers or assessment groups which were given a category 2 status for the season.

Within each of the 173 assessed areas there are a number of discrete fisheries administered by proprietors or tenants, such as angling clubs. So each river, for example, does not operate as a single fishery but rather a number of fisheries along its length. Conservation status is assessed on a river or group basis. The Scottish Government currently receives annual catch returns from *ca.* 2,000 fisheries from the 173 assessment areas which inform the annual assessment. Regulation is on a river or group basis, not by individual fishery.

(c) DSFBs and Fishery Trusts, with the Scottish Government's full support, continue to encourage anglers to release Atlantic salmon catches voluntarily even where the legislation does not require this action. The proportion of the rod catch accounted for by catch-and-release is among the highest recorded. In 2018, **99% of rod caught spring salmon (multi sea-winter fish taken before 1 May) were released, as were 93% of the annual rod catch.**

2.4 (a) Are there any mixed-stock Atlantic salmon fisheries? If so (b) how are these defined, (c) what was the mean catch in these fisheries in the last five years and (d) how are they managed to ensure that all the contributing stocks are meeting their conservation objectives? (Max. 300 words in total)
(Reference: Section 2.8 of the Fisheries Guidelines)

(a) Yes.

(b) Mixed stock fisheries are considered to be those which exploit significant numbers of salmon from two or more river stocks (CNL(09)43). Available evidence is consistent with a gradation from mixed to single-river stock fisheries according to where fisheries are sited in relation to the river mouth, with for example offshore nets exploiting a greater number of stocks than those in estuaries. Management of mixed-stock fisheries is complicated both by the lack of a clear quantitative distinction between mixed- and single-stock fisheries and the lack of detailed knowledge of the stock composition of different fisheries. For the purposes of reporting here, estuarine and coastal fisheries are considered MSF.

Outflow points define where a river ends and define river stocks, whilst estuarine limits designate where coastal waters start.

(c) Reported catch and effort for the fixed engine and net & coble fisheries in 2018 were among the lowest recorded by either fishery since records began in 1952. For net and coble fisheries, both catch and effort were the lowest in the time series while for fixed engines, effort was also the lowest since records began, while catch was the second lowest.

The mean reported catch in the net & coble fisheries in the last five years is 10.9mt (compared with 22.4mt 2009-2013), some of which are MSF but quantitative estimates are not available.

The mean reported catch in the fixed engine fisheries in the last five years is 14.5mt (41.6mt 2009-2013), some of which are MSF but quantitative estimates are not available.

(d) The Salmon Conservation Regulations have prohibited the retention of Atlantic salmon caught in coastal waters from 2016.

The retention of Atlantic salmon within estuaries requires all the rivers or assessment groups flowing into it to be category 1 or 2. The retention of Atlantic salmon in rivers requires the specific river or assessment group to be category 1 or 2.

Both apply within the defined netting and rod & line season, respectively, and outwith the Spring closure period (when all Atlantic salmon must be released).

Mandatory catch and release applies to any MSF areas beyond defined outflow points.

2.5 How are socio-economic factors taken into account in making decisions on management of salmon fisheries? (Max. 200 words) (Reference: Section 2.9 of the Fisheries Guidelines)

Scottish Ministers' primary management objective is to ensure the conservation or restoration of the stock(s). A range of conservation measures have been introduced including a Scotland-wide review of spring conservation measures and annual stock conservation assessments. However, Ministers must balance this primary concern with an acknowledgement of the importance of salmon fisheries to the overall Scottish economy.

Any statutory measures, including annual changes in river gradings, must take account of a number of parallel impact assessments, including a Business and Regulatory Impact Assessment which considers the social and economic impacts of any proposal. Such assessments enable Ministers and Parliament to address issues and impacts arising from statutory conservation measures.

2.6 What is the current level of unreported catch and what measures are being taken to reduce this? (Max. 200 words) (Reference: Section 2.2 of the Fisheries Guidelines and the Minimum Standard)

The total (potential) unreported catch (including the unreported landings by authorised fishers and illegal catches by unauthorised fishers) for Scotland in 2018 was estimated to be 1.9mt representing approximately 10% of the reported number and 9% of the total number of Atlantic salmon caught and killed (i.e. reported plus unreported).

The following measures are in place to reduce unreported catches:

- a continued ban on the sale of rod-caught Atlantic salmon;
- targeted enforcement activity to suppress illegal fishing activity; and
- the introduction, in 2016, of salmon carcass tagging regulations which apply to net-caught Atlantic salmon above estuary limits in areas which are designated category 1 or 2. Any Atlantic salmon taken must be tagged no later than when the salmon is brought to the shore or bank, through the mouth and out the gill opening and then secured with the cable tie and lock.

As at 31 December 2018, there were 167 warranted water bailiffs appointed by either Scottish Ministers or DSFBs. Water bailiffs have wide ranging powers to enforce the legislation to protect and enhance wild Atlantic salmon, as described in Part 5 of the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

2.7 Has an assessment under the Six Tenets for Effective Management of an Atlantic Salmon Fishery been conducted? If so, (a) has the assessment been made available to the Secretariat and (b) what actions are planned to improve the monitoring and control of the fishery? (c) If the six tenets have not been applied, what is the timescale for doing so? (Max. 200 words) (Reference: Six Tenets for Effective Management of an Atlantic Salmon Fishery, WGCST(16)16)

(a) WGCIS(17)3 includes Scotland's self-assessment.

(b) In previous years the number of Atlantic salmon eggs required was estimated to fall between 1.1 and 9.8 eggs per square metre wetted area of Atlantic salmon habitat. Since the 2017 season new egg requirements, based on information from 11 sites in Scotland, allow targets to differ among areas.

We have also updated the methods to estimate the numbers of adults from rod catches, removing any geographic component from the process with the relationship between catch and Atlantic salmon numbers being determined by month and the flow conditions.

Our intention is that there will be no further changes to the assessment methodology until after the 2022 assessment. This will allow the various aspects of the process to be published in peer review journals. It should be noted, however, that the work has already been the subject of public consultation exercises and has been scrutinised by the public, DSFBs and river trusts, politicians and universities.

A paper outlining a method for assessing the status of juvenile Atlantic salmon from electrofishing data, collected at a national level using a standard approach, was published in 2019 along with results from the first nationwide annual census conducted in 2018. A second national survey was conducted in 2019 and reported in 2020, including further details on methods to combine surveys among and within years. Summary outputs have been published via a web application.

An adult-based method, combined with a juvenile tool would deliver a greater confidence in our annual assessment of Scotland's wild Atlantic salmon stocks.

(c) Scotland has applied the six tenets.

2.8 Identify the threats to wild salmon and challenges for management associated with their exploitation in fisheries, including bycatch of salmon in fisheries targeting other species.

Threat / challenge F1	Regulated fishing exceeds levels that are sustainable and threatens conservation of stocks.
Threat / challenge F2	Illegal fishing damages stocks.

2.9 What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 2.8 to implement NASCO's Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for the management of salmon fisheries?

Action F1-1:	Description of action:	Continued annual assessment of Scotland's stocks using an adult based assessment method based on rod catch information and additional ancillary data.
	Planned timescale (include milestones where appropriate):	<ul style="list-style-type: none"> • On-going annual assessment, with autumn public consultations; and • Freeze on underlying methodology until after the 2022 assessment.
	Expected outcome:	Various aspects of the process are published in peer reviewed journals in advance of the 2022 fishing season, recognising the robustness of Scotland's assessment.

	Approach for monitoring effectiveness & enforcement:	In advance of the 2022 season the overall aim is to be in a position to assess the combined impacts of five years of the conservation measures being in place, alongside continuing developments in the adult model, which will have been fully and transparently peer-reviewed.
	Funding secured for both action and monitoring programme?	Yes
Action F1-2:	Description of action:	Development of a complementary juvenile assessment tool based on a strategically designed programme of electrofishing (National Electrofishing Programme for Scotland : NEPS) delivered through local fisheries management organisations.
	Planned timescale (include milestones where appropriate):	<ul style="list-style-type: none"> • Produce a report showing how juvenile electrofishing data can be used to assess the status of salmon stocks at a regional level using data collected under the National Electrofishing Programme for Scotland (July 2019) • Produce the NEPS statistical electrofishing survey for 2019 (July 2019). • Work with local fisheries managers to obtain juvenile electrofishing data more than 800 sites across 27 regions of Scotland between July and September 2019. • Assess the status of salmon for the 27 NEPS regions and publish a report (March 2020) • Design a new NEPS statistical survey, building on experience from 2018-2019 (March 2020)
	Expected outcome:	An adult based assessment method, based on rod catch information and additional ancillary data, read alongside a juvenile assessment tool, based on electrofishing data collected at a local level, deliver a greater level of confidence in the status of Scotland's wild Atlantic salmon stocks and a better measure of the potential impact of our measures to mitigate the pressures on the stocks.
	Approach for monitoring effectiveness & enforcement:	Juvenile assessments will be used to supplement adult assessments on the status of salmon populations and inform management actions at national and local scales. Data on the status of juvenile fish populations will provide further assurance of the efficacy of conservation measures.
	Funding secured for both action and monitoring programme?	Yes

Action F1-3:	Description of action:	A small research study conducted over three-years with three main goals: 1) to assess immediate effects of catch-and-release angling on the physiology and behaviour of adult Atlantic salmon; 2) to study, for the first time in the context of catch-and-release angling, transgenerational effects of maternal stress on offspring physiology and behaviour; and 3) potentially to provide new understanding of the impacts of catch-and-release angling for consideration in guidelines for anglers and models underpinning national fishery regulations.
	Planned timescale	Report in 2023.
	(include milestones where appropriate):	
	Expected outcome:	This project will provide the first scientific evidence for incorporating lethal and sub-lethal effects of catch-and-release into MSS's estimates of spawning escapement and conservation limits. The information will be important for devising catch-and-release protocols and setting angling seasons if effects of catch-and-release are sensitive to time from spawning. Findings will be disseminated by MSS through FMS, the IFM and the International Council for Exploration of the Seas working groups to NASCO.
	Approach for monitoring effectiveness & enforcement:	This project will improve our understanding of the impacts of catch and release on stocks. If impacts are shown to be greater than currently understood then this could inform future decisions on the use of catch and release in rivers that fail to meet their Conservation Limit
	Funding secured for both action and monitoring programme?	Yes
Action F2:	Description of action:	Review of Scotland's inshore marine gill net legislation. Illegal gill netting, very close to the shore, remains a recurrent issue, because the existing regulation allows illegal operators to claim that they are targeting species other than Atlantic salmon and sea trout. We will consider introducing new legislation to prohibit the deployment of gill nets where this could result in a high risk of a salmon and/or sea trout bycatch.
	Planned timescale (include milestones where appropriate):	We plan to consult on amendments to the regulation within the five-year plan period. We do not anticipate that this process will take until 2024 to conclude, but there remain too many uncertainties at this point to be more precise about the exact timeframe for delivery.
	Expected outcome:	Reduced illegal wild Atlantic salmon catches by the end of the five-year NASCO plan period.

	Approach for monitoring effectiveness & enforcement:	Marine Scotland will work closely with FMS and its members, as well as sea fisheries stakeholders, including but not limited to Inshore Fisheries Groups (IFGs).
	Funding secured for both action and monitoring programme?	Expected

3. Protection and Restoration of Salmon Habitat:

In this section please review the management approach to the protection and restoration of habitat in your jurisdiction in line with the relevant NASCO Resolutions, Agreements and Guidelines.

3.1 How are risks to productive capacity identified and options for restoring degraded or lost salmon habitat prioritised, taking into account the principle of ‘no net loss’ and the need for inventories to provide baseline data? (Max. 200 words) (Reference: Section 3 of the Habitat Guidelines)

An on-line (GIS) tool has been developed to enable district salmon fishery boards (DSFBs) to map and understand the impacts of pressures acting on salmon. This work was informed by the results of adult and juvenile stock assessments, and data collected by national and local organisations, but ultimately relies on knowledge from local fisheries managers. For each river reach the status of the pressure (historical, contemporary, emerging), the severity of the pressure (impact on salmon production) and the confidence of the classification (High or Low) are recorded. These data are aggregated to regional and national scales where they can be interrogated using approaches similar to those developed in Norway. The outputs will be published by the end of 2021. Having established a baseline understanding of pressures, future iterations of this work could assess improvements or degradation in the impacts of pressures acting on salmon.

The River Basin Management Plans (RBMP) identify water bodies that are at risk of failing to meet good ecological status or good ecological potential and prioritises them for improvement. The Scottish Environment Protection Agency (SEPA) has produced annual RBMP classifications since 2007, describing by how much water bodies’ condition or status differs from near natural conditions, which help prioritise objectives for improving the water environment over a six year cycle, currently 2015 to 2021.

SEPA’s classification system follows EU and UK guidance, is underpinned by a range of biological quality elements, supported by measurements of chemistry, hydrology, morphology, and assessment of invasive non-native species, and has higher specific standards for salmonid supporting rivers.

3.2 How are socio-economic factors taken into account in making decisions on salmon habitat management? (Max. 200 words) (Reference: Section 3.9 of the Habitat Guidelines)

The default objectives for surface waters under the WFD (Water Framework Directive) are Good Ecological Status or Good Ecological Potential, including the condition of salmon habitat. ‘Alternative objectives’ describe the WFD mechanism for considering other environmental, social and economic priorities alongside water management issues, and for prioritising action over successive river basin planning cycles, to be set when it is not possible or affordable to achieve objectives in the short term, giving an extended deadline or less stringent objectives. Only these objectives and their conditions are relevant for prioritisation of actions under the WFD.

Activities impacting on salmon habitat management are likely to require authorisation by SEPA. There is a presumption against proposals resulting in significant adverse impacts on the water environment such as a breach of standards or deterioration in status. SEPA will consider such proposals only if: it’s benefits to human health or safety or sustainable development outweigh the benefits of protecting the water environment; and legislative requirements relevant to protection of the water environment are not compromised. Social, economic, and environmental factors are taken into

consideration when assessing the significance of positive and negative impacts. The application is also advertised, and relevant organisations are formally consulted.

The Scottish Parliament has enacted The UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 which establishes a new framework for environmental governance in Scotland. The Act confers on the Scottish Government a broad power to make regulations corresponding with or implementing EU laws, similar to the power previously prescribed by the European Communities Act 1972.

In addition, Environmental Standards Scotland has been established, initially on a non-statutory basis. This is a new, independent body to consider the implementation of and compliance with environmental law in Scotland, which was formally established later on 1 October 2021.

3.3 What management measures are planned to protect wild Atlantic salmon and its habitats from (a) climate change and (b) invasive aquatic species? (Max. 200 words each)
(Reference: Section 3.2 of the Habitat Guidelines)

(a) Marine Scotland (MS) has established the Scotland River Temperature Monitoring Network (SRTMN) to monitor and assess the effects of changing climate on Scotland's rivers and to prioritise management action. One of the main management options available to managers involves planting trees on river banks to provide shading, which reduces damaging high temperatures. Modelling work undertaken by MS using SRTMN data has identified which Scottish rivers experience the highest temperatures and which are likely to change most under climate change. These model outputs have been turned into [interactive online maps](#) (displayed via the MS National Marine Plan interactive (NMPi) website) which can be used by local fisheries managers to decide on the optimal locations for riparian trees. The temperature mapping is also available as a background layer in the "pressures tool" of Fisheries Management Plans (see above) thereby allowing local fisheries managers to prioritise areas for funding applications and on-the-ground management⁴.

(b) Impact may occur from a wide range of non-native species, such as mink and signal crayfish. . An international Pacific pink salmon workshop, organised by SNH, was held on 21 September 2017, when relevant specialists discussed the issue and explored ways forward. Experiments by MSS in 2017, using eggs deposited in Scottish rivers, indicate that the young fish can survive initially, but will emerge in winter rather than spring (which is the normal season in the native range) and are unlikely then to survive⁵. A full Non Native Risk Assessment has been completed and is under consideration, with SEPA coordinating Scotland's input, as the lead authority for aquatic INNS.

The SNH-led Scottish Invasive Species Initiative (SISI) is a priority project in the Scottish Biodiversity Strategy's route map to 2020. The route map sets out the major steps needed to improve the state of nature in Scotland and halt the loss of biodiversity by 2020. It highlights the spread of invasive species as one of the key pressures on biodiversity. The SISI project is not only involved in highlighting the spread of invasive species, but is also engaged in practical management action to control such species.

3. Identify the main threats to wild salmon and challenges for management in relation to estuarine and freshwater habitat.

⁴ For further information see: <https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature>

⁵ For further information, please see the paper published by MS, SNH and FMS:

Armstrong, J.D., Bean, C.W. & Wells, A. (2018) The Scottish invasion of pink salmon in 2017. *Journal of Fish Biology*, 93, 8–11.

Threat / challenge H1	Water quality – acidification; point-source pollution; diffuse pollution; other pollution; eutrophication; oligotrophication.
Threat / challenge H2	Water quantity – abstraction; flow regulation; upland/agriculture land-use and drainage; changing rainfall patterns; forestry drainage.
Threat / challenge H3	Thermal habitat - loss of shading; over-shading; changing temperature patterns; thermal discharge; impoundment modification; other.
Threat / challenge H4	Instream habitat – sedimentation; loss of sediment transfer; lack of, or excessive, large woody debris; canalisation/dredging/boulder removal.
Threat / challenge H5	Riparian habitat - loss of natural riparian vegetation; conifer afforestation.
Threat / challenge H6	Barriers to migration - upstream passage (consider cumulative impacts); downstream passage; dams/weirs/large water bodies; other.
Threat / challenge H7	Developments – including wind/wave/energy projects; other. (Please note that the main threats to wild salmon and challenges for management in relation to aquaculture, introductions and transfers, and transgenics are covered in section 4 of this plan).
Threat / challenge H8	Predation & competition – piscivorous birds; piscivorous fish; seals; dolphins; otters; other.
3.5	What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 3.4 to implement NASCO’s Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for the Protection, Restoration and Enhancement of Atlantic Salmon Habitat?

Action H1-1:	Description of action:	<p>Reductions in point source and diffuse pollution will be achieved through River Basin Management Planning (RBMP) and associated Regulations including “General Binding Rules” (GBRs). Adherence to other guidelines, such as Managing forest operations to protect the water environment, will also contribute to the reduction of diffuse pollution. GBRs include a range of land use requirements to reduce diffuse pollution through measures such as buffer strips to reduce fine sediment and nutrient delivery and encourage the growth of riparian vegetation.</p> <p>In RBMP cycle 1 there were 14 Priority Catchments selected where SEPA worked with farmers to reduced diffuse pollution. In RBMP cycle 2 from 2015 to 2021 all other predominantly agricultural catchments (57 in total) have been selected with audits of all farms to reduce diffuse pollution. To date SEPA has visited 5277 farming units in 43 of the 57 Priority catchments.</p> <p>Through RBMP the Diffuse Pollution Management Advisory Group (DPMAG) was set up as partnership that focuses on protecting and improving Scotland's water environment by reducing rural diffuse pollution. DPMAG have developed a two tiered strategy approach to reduce diffuse pollution in Scotland: a national campaign to prevent water bodies from deteriorating in status and make improvement where they are not far from a status boundary; and a targeted approach in priority catchments. The Rural Diffuse Pollution Plan for Scotland aims to ensure that the key stakeholders in Scotland work in a co-ordinated way to reduce diffuse pollution from rural sources.</p>
	Planned timescale (include milestones where appropriate):	<p>On-going throughout the five-year NASCO plan period.</p> <p>The River Basin Management Plans, available here, set out timescales in which identified waste water discharges and rural diffuse pollution pressures will be addressed in Scotland within the current six year cycle ending in 2021. Following a review and formal consultation process SEPA will publish new RBMPs covering 2021 to 2027 in December 2021.</p>
	Expected outcome:	<p>RBMPs utilise SEPA classification results to set objectives for improving the water environment over a six year cycle, the current being from 2015 to 2021. The third RBMPs will build on the work completed under RBMP2 up to 2021 to reduce point source and diffuse pollution pressures and will prioritise future targets up to 2027.</p> <p>Once the new online, GIS pressures mapping tool is delivered, our target will be for it to show a reduction, by the end of the five-year NASCO plan period, in the river length affected by acidification; point-source pollution; diffuse pollution; other pollution; changing rainfall patterns; eutrophication; and/or oligotrophication.</p>

	Approach for monitoring effectiveness & enforcement:	<p>SEPA has produced an annual RBMP classification for all the water bodies in Scotland since 2007. Classification results for the current and previous years can be found on the Water Classification Hub. In general, the classification of water bodies describes by how much their condition or status differs from near natural conditions and includes a range of biological quality elements supported by measurements of chemistry.</p> <p>The new online, GIS pressures mapping tool should allow us to identify the length and proportion of individual and/or collective rivers impacted by this pressure.</p> <p>SEPA's work to ensure compliance with GBR requirements to reduce diffuse pollution from agriculture is being scaled up, with visits to more catchments to be undertaken.</p>
	Funding secured for both action and monitoring programme?	Yes
Action H1-2:	Description of action:	Explore the benefit and feasibility of nutrient enrichment in upland oligotrophic parts of river systems.
	Planned timescale (include milestones where appropriate):	MSS has an on-going collaboration with Glasgow University, Cromarty Fisheries Trust and the US Forest Service regarding the potential for nutrient enrichment to improve the size, condition and therefore marine survival of smolts.
	Expected outcome:	Our aspiration is that nutrient enrichment in upland oligotrophic parts of river systems improves the size, condition and therefore marine survival of smolts. Next stages of work are expected to provide knowledge on how to add nutrients effectively on large scale and across a range of river types.
	Approach for monitoring effectiveness & enforcement:	We have established and published in peer-reviewed literature that 1) that addition of nutrients to streams in nutrient-poor upland streams increases growth and condition of salmon parr; 2) that longer and better condition smolts have higher marine survival. Next stages of work will establish whether nutrient additions can be applied over large spatial scales to increase numbers of smolts and/ or individual survival through effects on body size and/or condition. Any such action will need to be considered within the wider aims of the RBMP process to ensure appropriate nutrient balance.
	Funding secured for both action and monitoring programme?	Expected

Action H2:	Description of action:	<p>River Basin Management Plans (RBMP) have identified that the main pressures on flows and levels in Scotland are from water</p> <p>abstractions or reservoirs used for hydroelectricity generation, the irrigation of crops and the manufacture of food and drink along with public water supplies to a lesser extent. This assessment includes consideration of salmon flow requirements.</p> <p>SEPA will work with hydroelectricity producers, farmers and other businesses abstracting water or storing it in reservoirs, to ensure that they take the actions necessary to improve water flows and levels during the current RBMP cycle and beyond.</p> <p>Scottish Water is investing, in the current investment programme 2015-21, to improve abstraction regimes in nine water resource zones to ensure that there is sufficient water remaining in the water bodies during periods of low rainfall.</p> <p>SEPA assesses any new abstraction proposal against standards in the current regulatory framework to prevent deterioration of good ecological status/ potential of the water environment and protect wild salmon.</p>
	Planned timescale (include milestones where appropriate):	<p>On-going throughout the five-year NASCO plan period.</p> <p>The River Basin Management Plans, available here, set out timescales in which identified water quantity pressures will be addressed in Scotland within the current six year cycle ending in 2021. Following a review and formal consultation process SEPA will publish new RBMPs covering 2021 to 2027 in December 2021.</p>
	Expected outcome:	<p>River Basin Management Plans (RBMPs) utilise SEPA classification results to set objectives for improving the water environment over a six year cycle, the current RBMP2 being from 2015 to 2021. The third RBMPs will build on the work completed under RBMP2 up to 2021 to reduce abstraction and flow regulation pressures and will prioritise future targets up to 2027.</p> <p>Once the new online, GIS pressures mapping tool has been delivered, our target will be for it to show a reduction, by the end of the five-year NASCO plan period, in the river length affected by abstraction; flow regulation; upland/agriculture land-use and drainage; and/or forestry drainage.</p>

	<p>Approach for monitoring effectiveness & enforcement:</p>	<p>The Scottish Environment Protection Agency (SEPA) has produced an annual RBMP classification for all the water bodies in Scotland since 2007. Classification results for the current and previous years can be found on the Water Classification Hub. In general, the classification of water bodies describes by how much their condition or status differs from near natural conditions and includes supporting hydrology (changes to water levels and water flows) elements.</p> <p>The effectiveness of changing flow regimes will be assessed through regular WFD monitoring. Where fish are the target of the altered flow regime, they will form part of the assessment process. Regular inspections by SEPA staff will be used to assess compliance with licenses and license reviews will be carried out as necessary.</p> <p>MSS has undertaken significant research to improve understanding of the effects of flow regime on Atlantic salmon. These studies reveal the limitation of historical approaches such as Physical Habitat Simulation System (PHABSIM) for decision making and have the potential to improve understanding of the relationships between discharge and Atlantic salmon in managed systems and inform scientifically defensible adjustments to flow regime in the future.</p>
	<p>Funding secured for both action and monitoring programme?</p>	<p>Yes</p>
<p>Action H3:</p>	<p>Description of action:</p>	<p>Implement Scotland's Second Climate Change Adaptation Programme (SCCAP2). This will highlight Scotland's adaptation priorities going forward.</p>
	<p>Planned timescale (include milestones where appropriate):</p>	<p>On-going throughout the five-year NASCO plan period.</p>
	<p>Expected outcome:</p>	<p>Riparian shade to be increased in sensitive and appropriate water bodies, through collaborative projects undertaken by DSFBs and/or Fisheries Trusts.</p>

	<p>Approach for monitoring effectiveness & enforcement:</p>	<p>MSS has established the Scotland River Temperature Monitoring Network (SRTMN), in collaboration with FMS members and University of Birmingham⁶</p> <p>This project has produced models to map rivers' reaches that are most vulnerable to temperature change. This project will continue to monitor river temperature and improve tools for management decision making, focussed on riparian tree planting. These tools will be made available online through the National Marine Plan Interactive (NMPi) website and other appropriate online resources.</p> <p>Future work aims to (1) Model mean daily temperature to better understand relationships between river temperature and salmonids in the natural environment; (2) incorporate river temperature into the national juvenile Atlantic salmon density model to identify critical thresholds for production; and (3) undertake climate change projections for Scottish rivers.</p> <p>The new online, GIS pressures mapping tool should allow us to identify the length and proportion of individual and/or collective rivers impacted by loss of shading; over-shading; changing temperature patterns; thermal discharge; hydro modification; and/or other.</p>
	<p>Funding secured for both action and monitoring programme?</p>	<p>Expected</p>
<p>Action H4:</p>	<p>Description of action:</p>	<p>Prevention of morphological impacts and passive recovery of watercourses will be achieved through the controlled activity regulations (CAR) and associated "General Binding Rules" and adherence to other guidelines such as the forest and water guidelines. GBRs include requirements for buffer strips to reduce fine sediment and nutrient delivery and encourage the growth of riparian vegetation.</p>
	<p>Planned timescale (include milestones where appropriate):</p>	<p>On-going throughout the five-year NASCO plan period.</p> <p>The River Basin Management Plans set out timescales in which identified morphology pressures will be addressed in Scotland within the current six year cycle ending in 2021. Following a review and formal consultation process SEPA will publish new RBMPs covering 2021 to 2027 in December 2021.</p>

⁶ <https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature>

	<p>Expected outcome:</p>	<p>River Basin Management Plans (RBMPs) utilise SEPA classification results to set objectives for improving the water environment over a six year cycle, the current RBMP2 being from 2015 to 2021. The third RBMPs will build on the work completed under RBMP2 up to 2021 to reduce morphology pressures and will prioritise future targets up to 2027.</p> <p>Once the new online, GIS pressures mapping tool is delivered, our target will be for it to show a reduction, by the end of the five-year NASCO plan period, in the river length affected by sedimentation; loss of sediment transfer; lack of, or excessive, large woody debris; canalisation/dredging/boulder removal.</p>
	<p>Approach for monitoring effectiveness & enforcement:</p>	<p>The Scottish Environment Protection Agency (SEPA) has produced an annual RBMP classification for all the water bodies in Scotland since 2007. Classification results for the current and previous years can be found on the Water Classification Hub. In general, the classification of water bodies describes by how much their condition or status differs from near natural conditions and includes supporting morphology elements.</p> <p>The new online, GIS pressures mapping tool should allow us to identify the length and proportion of individual and/or collective rivers impacted by this pressure.</p> <p>A range of new indicators is also being developed by SEPA to improve assessment of fine sediment and morphological impacts.</p>
	<p>Funding secured for both action and monitoring programme?</p>	<p>Expected</p>
<p>Action H5:</p>	<p>Description of action:</p>	<p>The UK Forestry Standard (UKFS) and its supporting Forests and Water Guidelines require that: ‘Where new planting or restocking is proposed within the catchments of water bodies at risk of acidification, an assessment of the contribution of forestry to acidification and the recovery process should be</p>

		<p>carried out; details of the assessment procedure should be agreed with the water regulatory authority'. This guidance, agreed by the relevant forestry, water and nature conservation authorities in the UK, describes how to meet this requirement, including the need to undertake a critical load assessment where new planting or restocking is proposed within the catchments of water bodies that are failing or at risk of failing Good Ecological Status due to acidification, and a site impact assessment where felling is planned.</p> <p>The benefits of riparian native woodland will be reinstated on water courses as part of the initiative to moderate river temperatures outlined in H3.</p>
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period.
	Expected outcome:	Once the new online, GIS pressures mapping tool is delivered, our target will be for it to show a reduction, by the end of the five-year NASCO plan period, in the river length affected by loss of natural riparian vegetation and/or conifer afforestation.
	Approach for monitoring effectiveness & enforcement:	<p>Guidance, agreed by the relevant forestry, water and nature conservation authorities in the UK, describes how to meet the requirement described above, including the need to undertake a critical load assessment where new planting or restocking is proposed within the catchments of water bodies that are failing or at risk of failing Good Ecological Status due to acidification, and a site impact assessment where felling is planned.</p> <p>We acknowledge that it is important to ensure that any impacts on fish, including wild salmon, are picked up by the current processes in order that management action can be prioritised. In some cases, particularly in SW Scotland, local monitoring suggests impacts on juvenile fish.</p>
	Funding secured for both action and monitoring programme?	Expected

Action H6:	Description of action:	<p>Scotland’s River Basin Management Plans (RBMPs), published in 2015, set objectives for the protection and improvement of our water environment, with the aim of 87% of water bodies achieving a classification of ‘Good Ecological Status’ by 2027.</p> <p>Fish passage is recognised as one of the three main priorities of RBMP2 (2015 – 2021), including the challenges faced by Atlantic salmon smolts in their downstream migration, particularly in relation to hydro schemes. The second RBMPs identified fish migration pressures in 392 water bodies across Scotland.</p> <p>SEPA is leading on work to remove or ease redundant barriers in rivers, utilising <i>ca.</i> £5m annual funding from the Scottish Government. Through SEPA regulatory action and the Water Environment Fund more than 1000 kilometres of good-quality salmon habitat has been opened-up by the removal of barriers to fish migration.</p>
	Planned timescale (include milestones where appropriate):	<p>On-going throughout the five-year NASCO plan period.</p> <p>Through River Basin Management Plans (RBMPs) SEPA intends to remove a further 72 barriers by 2021. At the end of 2021 RBMPs for cycle 3 will be published with planned targets for fish barrier removal from 2021 to 2027.</p>
	Expected outcome:	<p>River Basin Management Plans (RBMPs) utilise SEPA’s classification results to set objectives for improving the water environment over a six year cycle, the current RBMP2 being from 2015 to 2021. The third RBMPs will build on the work completed under RBMP2 up to 2021 to reduce fish barrier pressures and will prioritise future targets up to 2027.</p> <p>Once the new online, GIS pressures mapping tool is delivered, our target will be for it to show a reduction, by the end of the five-year NASCO plan period, in the river length affected by upstream passage (consider cumulative impacts); downstream passage; dams/weirs/large water bodies; and/or other.</p>

	Approach for monitoring effectiveness & enforcement:	<p>The Scottish Environment Protection Agency (SEPA) has produced an annual RBMP classification for all the water bodies in Scotland since 2007. Classification results for the current and previous years can be found on the Water Classification Hub. In general, the classification of water bodies describes by how much their condition or status differs from near natural conditions and includes range of biological quality elements, supported by measurements of morphology. Scientists from MSS, University of Aberdeen and the James Hutton Institute have authored a scientific paper, published in the journal Science of the Total Environment⁷ in 2019, that identifies the impacts of barriers (e.g. dams, weirs and other in river structures) on river connectivity for Atlantic salmon. This information forms a valuable resource to inform and prioritise river restoration efforts and financial investment and provides a substantial methodological improvement on previous</p>
		<p>assessments that estimate the value of habitat from river length or area.</p> <p>Scotland's third River Basin Management Plan will be finalised by December 2021. MSS' research will be considered during SEPA's barrier prioritisation in the updated plan. Where complete barrier removal is carried out, the expected improvements are self-evident and no monitoring is currently proposed. Stakeholder feedback from our consultation of the draft plan has challenged whether there is a need to monitor to assess the length of time taken for Atlantic salmon to recolonise newly available habitats and to assess whether riverine processes (including the transport of bed material) has occurred and are actually being used. Where barrier easement or improvements to fish pass passage are carried out, appropriate site specific monitoring is required to indicate achievement of Good Ecological Status/Potential under WFD or local fisheries management objectives.</p>
	Funding secured for both action and monitoring programme?	Yes
Action H7:	Description of action:	<p>Carry out detailed assessments required for the regulation of existing marine renewable developments, new developments and proposed new developments on whether migrating salmon are likely to be present and whether the development will pose risk to salmon populations during construction and operation, and whether mitigation should be implemented to minimise any potential impacts. The existing developments are mainly off the east coast of Scotland and in the Moray Firth.</p>

⁷ <https://www.sciencedirect.com/science/article/pii/S0048969718346199>

		<p>In the five-year NASCO plan period (2019-2024), the work will concentrate on investigations on the spatial and temporal distribution of emigrating salmon smolts in, and in the vicinity of, existing and proposed development areas.</p> <p>The work will be carried out under the ScotMER (Scottish Marine Energy Research) initiative which prioritises research needs, promotes appropriate research and coordinates and records progress with filling in knowledge / evidence gaps for salmon and other receptors in relation to marine renewables development.</p>
	<p>Planned timescale (include milestones where appropriate):</p>	<p>2019 - Complete the models to predict movements of Atlantic salmon smolts emerging from rivers around Scotland with a range of directed swimming directions (Marine Scotland Science project). Paper published 2019.</p> <p>2019 and 2021 - Tag salmon and sea trout smolts using acoustic tags in seven rivers in the Moray Firth area and subsequently track them during their seaward migration across the Moray Firth using an array of acoustic receivers (partnership project led by the Atlantic Salmon Trust)</p> <p>2019 and 2021 - Tag salmon and sea trout using acoustic tags in the Rivers Dee and Don on the Scottish east coast and subsequently track them across coastal waters using an array of acoustic receivers (partnership project led by the River Dee Trust, with funding from the EOWDC [European Offshore Wind Deployment Centre]). A report is to be submitted to the EOWDC by the end of 2021.</p> <p>2019 and 2021- Trawl for salmon smolts in the Moray Firth and off the Scottish east coast to assess the marine distribution of post-smolts, and genetically assign them to regions or rivers of origin (Marine Scotland Science project). A full report to be completed in 2022.</p> <p>2019 and 2021 - Complementary studies are being conducted on the west coast to understand migratory behaviours with relation to aquaculture (see section A4 below). To date, these have tracked the movements of smolts from Loch Linnhe, around Mull; from the River Applecross; in Upper Loch Torridon, Loch Shildaig and Outer Loch Torridon and large scale arrays positioned further away from natal rivers.</p>
	<p>Expected outcome:</p>	<p>Improved understanding of the potential impacts of marine renewable energy installations (during construction and operation) on Atlantic salmon.</p> <p>Improved assessment of the risks marine renewables developments pose to salmon populations during construction and operation, and whether mitigation should be implemented.</p>

	Approach for monitoring effectiveness & enforcement:	The outputs of these research projects will be improved knowledge of the density of Atlantic salmon smolts in the vicinity of marine renewables development sites and what rivers they are associated with. This information will be considered in the context of known stressors, such as the clearance by detonation of unexploded ordnance at construction sites, and potential stressors, such as possible increased predation resulting from the structures providing shelter and feeding opportunities to predators. The outputs will be used to reduce any risk the construction and operation of marine renewable developments pose to salmon populations.
	Funding secured for both action and monitoring programme?	Yes
Action H8-1:	Description of action:	Research, review and experimentation to better understand and address, as appropriate, the impact of piscivorous birds on Atlantic salmon.
	Planned timescale (include milestones where appropriate):	A three-year programme commencing in 2019. Includes: A study to assess the dietary composition of piscivorous birds to determine if this has changed in response to changing fish species distributions over recent decades. <ul style="list-style-type: none"> • A study to characterise in-river migration and losses of smolts in a selection of Scottish rivers, including application of very small transmitters and evaluation of the effects of handling smolts on their subsequent mortality risk. • A pilot study to investigate approaches for studying the movement and behaviour of Goosanders during salmon smolt migration time and in response to scaring for management.
	Expected outcome:	Increase the scientific information available to underpin the management of piscivorous birds.
	Approach for monitoring effectiveness & enforcement:	Results of the research will inform the approach to managing piscivorous birds.
	Funding secured for both action and monitoring programme?	Yes
Action H8-2:	Description of action:	Pilot study to identify the degree of interaction and potential scale of impact of dolphins on returning adult Atlantic salmon in the Moray Firth.

	Planned timescale (include milestones where appropriate):	We will analyse the results of the research in 2019 and aim to report or publish in 2020.
	Expected outcome:	Improved understanding of the predation interactions between dolphins and salmon.
	Approach for monitoring effectiveness & enforcement:	A joint research project between MS, the Ness DSFB and Aberdeen University commenced on 9 July and successfully acoustically tagged 109 adult grilse.
	Funding secured for both action and monitoring programme?	Yes
Action H8-3:	Description of action:	The Seals and Salmon Interactions (SSI) work to identify the impact of seal predation on wild Atlantic salmon.
	Planned timescale (include milestones where appropriate):	The Sea Mammal Research Unit (SMRU) will conclude their analysis of photo-id and behavioural observation data by March 2020.
	Expected outcome:	Provision of estimates of potential Atlantic salmon removals from the River Dee by seals.
	Approach for monitoring effectiveness & enforcement:	MS will progress the purchase of suitable surface cameras, in order for SMRU to trial their ability to record seal movements both upstream and downstream in the River Dee.
	Funding secured for both action and monitoring programme?	Yes

4. Management of Aquaculture, Introductions and Transfers, and Transgenics:

Council has requested that for Parties / jurisdictions with salmon farms, there should be a greater focus on actions to minimise impacts of salmon farming on wild salmonid stocks. Each Party / jurisdiction with salmon farming should therefore include at least one action relating to sea lice management and at least one action relating to containment, providing quantitative data in Annual Progress Reports to demonstrate progress towards the international goals agreed by NASCO and the International Salmon Farmers Association (ISFA):

- *100% of farms to have effective sea lice management such that there is no increase in sea lice loads or lice-induced mortality of wild salmonids attributable to the farms;*
- *100% farmed fish to be retained in all production facilities.*

In this section please provide information on all types of aquaculture, introductions and transfers, and transgenics (including freshwater hatcheries, smolt-rearing etc.

4.1 (a) Is the current policy concerning the protection of wild salmonids consistent with the international goals on sea lice and containment agreed by NASCO and ISFA? (b) If the current policy is not consistent with these international goals, when will current policy be adapted to ensure consistency with the international goals and what management measures are planned to ensure achievement of these goals and in what timescale? (Max. 200 words for each) (Reference: BMP Guidance)

(a)
Yes. The Scottish regulatory framework, policies and Codes of Good Practice are consistent with the NASCO/ISFA Best Management Practice guidelines.

In consideration of the recommendations made by the Salmon Interactions Working Group, Scottish Ministers have further committed to strengthening the regulatory controls on sea lice and containment: [Salmon Interactions Working Group Report: Scottish Government Response - gov.scot](http://www.gov.scot) (www.gov.scot). (see (b))

(b)

Sea lice

The Scottish Environment Protection Agency (SEPA) is the lead body responsible for managing the risk to wild fish from sea lice from fish farms. SEPA is developing a risk assessment framework which will apply site-specific conditions to new and expanding farms to control sea lice losses in 'wild salmonid protection zones' to below environmental thresholds. The framework is designed to easily incorporate new evidence, in particular evidence that improves assessments of risk. Public consultation on the proposals has taken place and SEPA intends to work towards the initial adoption of the controls on new and expanding farms in the second half of 2023, following further consultation. SEPA intend to progressively move towards controls on existing farms where this is required to improve salmonid populations.

Containment

Scottish Ministers are committed to minimising the escape of farmed fish and supporting farmers to achieve a goal of 100% containment in production facilities. Together with the fish farming sector the Scottish Government is revising the Technical Standard for Scottish Finfish Aquaculture (published in 2015), which will take account of climate change and higher energy sites to further improve containment. We are also considering the introduction of proportionate financial penalties for fish farm escapes with the ultimate aim of ring-fencing or redistributing this money to support wild salmonid conservation and research.

4.2 (a) What quantifiable progress can be demonstrated towards the achievement of the international goals for 100% of farms to have effective sea lice management such that there is no increase in sea lice loads, or lice-induced mortality of wild salmonids attributable to sea lice? (b) How is this progress monitored, including monitoring of wild fish? (c) If progress cannot be demonstrated, what additional measures are proposed and in what timescale? (Max. 200 words each)

(Reference: BMP Guidance)

The measures by which these goals may be achieved, and against which the Review Group will be measuring the effectiveness of the Implementation Plan, are set out in the BMP Guidance SLG(09)5 (Best management practice; reporting and tracking; factors facilitating implementation) as agreed by NASCO and ISFA.

(a)

While a range of monitoring of sea lice loads on wild fish takes place in Scotland (see (b)) it is not currently possible to demonstrate quantifiable progress towards the international goal on sea lice.

(b)

Aquaculture Production Businesses (APBs) must have satisfactory measures in place for the prevention, control and reduction of sea lice on marine farm sites. Under the [Fish Farming Businesses \(Reporting\) \(Scotland\) Order 2020](#) APBs must report the weekly average adult female sea lice numbers per fish on farm sites no later than 8 days after the end of the reporting week. The data are published online: [Scotland's aquaculture - sea lice data \(arcgis.com\)](#).

Following advice issued by the Scottish Government to local Planning Authorities in 2019, requirements for monitoring the potential impacts of sea lice on wild fish are included as a condition of planning permission for new or expanding fish farms through Environmental Management Plans (EMPs). EMPs are designed to inform an ongoing process of adaptive management to support farm management and inform future fish farm applications.

Marine Scotland specifies that an EMP should:

- be able to report on the level of lice released into the environment (i.e. both farmed fish numbers and adult female lice numbers);
- identify the likely area(s) of sea lice dispersal from the farm;
- detail how and what monitoring data will be collected to assess potential interaction with wild fish;
- detail how this monitoring information will feed back to management practice;
- include a regular review process to ensure that it remains fit for purpose.

EMPs are an interim measure pending implementation of the new sea lice risk assessment framework (see (c)).

Marine Scotland supports local fishery trusts to carry out a programme of sweep netting on the West Coast of Scotland to provide data on sea lice levels on post smolt sea trout. These data are published online: [Publications and Data - Fisheries Management Scotland \(fms.scot\)](#).

Sea lice levels and burdens on wild fish have been monitored in Loch Shiel and River Shiel since 1999. Return rates of sea trout to the River Shiel are monitored in relation to fish farm production cycles: [Aquaculture Interactions: Shiel Field Station - gov.scot \(www.gov.scot\)](#).

(c)

A new sea lice risk assessment framework that evaluates risk from sea lice loads from new and expanding fish farms for Scotland is in development by the Scottish Environment Protection Agency.

The proposed framework would operate to protect wild Atlantic salmon post-smolts during the period of smolt migration from rivers (from March to June).

Any proposal where the expected contribution of sea lice into the environment could not be accommodated within the sea lice exposure threshold would not be granted authorisation.

Permits for approved farm developments would include such conditions as necessary to ensure the number of sea lice emanating from the developments is kept low enough to protect wild salmon post-smolts as they pass through wild salmon protection zones.

Monitoring for effectiveness will be delivered through collaborative initiatives between industry, local fisheries managers and government bodies.

This framework will be applied through the Water Environment (Controlled Activities) (Scotland) (CAR) Regulations 2011, meaning that new and expanding developments must be evaluated through this framework before they can legally operate.

It is expected that this framework will be implemented by the end of 2023.

4. (a) What quantifiable progress can be demonstrated towards the achievement of the international goals for achieving 100% containment in all (i) freshwater and (ii) marine aquaculture production facilities? (b) How is this progress monitored, including monitoring of wild fish (genetic introgression) and proportion of escaped farmed salmon in the spawning populations? (c) If progress cannot be demonstrated, what additional measures (e.g. use of sterile salmon in fish farming) are proposed and in what timescale? (Max. 200 words each)

(Reference: BMP Guidance)

The measures by which these goals may be achieved, and against which the Review Group will be measuring the effectiveness of the Implementation Plan, are set out in the BMP Guidance SLG(09)5 (Best management practice; reporting and tracking; factors facilitating implementation) as agreed by NASCO and ISFA.

(a)

Confirmed escapes from freshwater (FW) and saltwater (SW) Atlantic salmon farms 2014-2021.

	2014	2015	2016	2017	2018	2019	2020	2021
FW escape events	1	0	1	1	0	1	1	0
FW total escaped fish	1	0	70	163	0	4,465	20	0
SW escape events	10	5	4	5	5	3	5	1
SW total escaped fish	184,613	16,005	11,496	30,006	47,726	28,470	204,901	19,686

NB the escape events above are limited to those that resulted in fish escapes. Full details of all escape events, including reported incidents that resulted in no loss of fish are published online: [Scotland's Aquaculture | Fish Escapes](#).

(b)

Any suspected escape from a fish farm, or circumstances which could give rise to a significant risk of escape, must be reported to the Scottish Government immediately. Details of all escapes events are published online: [Scotland's Aquaculture | Fish Escapes](#)..

Additionally, the number of salmon caught that are believed to be of farmed origin are reported in annual fisheries statistics: [Salmon fishery statistics: 2021 - gov.scot \(www.gov.scot\)](#)..

Scotland's Fish Health Inspectorate conducts containment assessments and inspections of fish farms to determine that satisfactory measures are in place to contain fish, prevent escapes and recover escaped fish: [Surveillance programme - Fish Health Inspectorate - gov.scot \(www.gov.scot\)](#).

In October 2021, Marine Scotland Science (MSS) published the first national assessment of genetic introgression in Scotland: [A national assessment of the influence of farmed salmon escapes on the genetic integrity of wild Scottish Atlantic salmon populations | Marine Scotland Data Publications](#). The study shows that there is a risk to wild salmon from introgression of genes from farmed salmon that escape, but that it may be low outside the aquaculture regions even though escaped fish may disperse widely at sea.

(c)

A Technical Standard for Scottish Finfish Aquaculture has been in place since 2015 to help prevent escapes of finfish as a result of technical failure and related issues at Scottish finfish farms. Together with the fish farming sector the Scottish Government are revising the Technical Standard, which will take account of climate change and higher energy sites to further improve containment. We are also considering the introduction of proportionate financial penalties for fish farm escapes with the ultimate aim of ring-fencing or redistributing this money to support wild salmonid conservation and research.

A Code of Practice covering the Containment of and Prevention of Escape of Fish on Fish Farms in relation to Marine Mammal Interactions was introduced in November 2021.

4.4 What adaptive management and / or scientific research is underway that could facilitate better achievement of NASCO’s international goals for sea lice and containment such that the environmental impact on wild salmonids can be minimised? (Max 200 words)
(Reference: BMP Guidance and Article 11 of the Williamsburg Resolution)

Marine Scotland Science (MSS) is collaborating with Scottish Environment Protection Agency to develop the sea lice risk assessment framework (including its key components such as adaptive management), as well as producing research papers to support the evidence base on sea lice.

MSS has a long-standing project, which aims to assess the interaction between salmonid farms and wild salmonids in the environment. Its work modules include: modelling parasite-driven impacts of aquaculture on wild fish (this module will influence the development of SEPA’s sea lice risk assessment framework) with the next findings paper expected in early 2023; modelling sea lice production on farms and dispersal through the environment to assess where sea lice are transported to; and design of field sampling to detect lice, which will support more effective Environment Management Plans (see 4.2(b)), and model validation.

Salmon Parasites in Linnhe, Lorne and Shuna (SPILLS) is a research project that aims to explore the viability of ensemble modelling through cross-model comparison (in this case, between salmon producer MOWI, research institution the Scottish Association of Marine Science, and Scottish Government). The key output of SPILLS is to provide the best policy advice and promote collaborative working between industry, academia and Scottish Government.

4.5 What is the approach for determining the location of aquaculture facilities in (a) freshwater and (b) marine environments to minimise the risks to wild salmonid stocks? (Max. 200 words for each)

(a) Applications for planning permission for finfish farms in freshwater are determined by local Planning Authorities in accordance with Local Development Plans and national level Scottish Planning Policy.

Each new fish farm site is considered on its merits through the planning system, with advice provided by statutory consultees (including Scottish Environment Protection Agency, Marine Scotland, District Salmon Fishery Boards and NatureScot) and consideration of representations from other interested parties and the general public. Local Planning Authorities will consider a wide range of issues, which include, for example, considering the potential environmental consequences of the proposal prior to granting planning permission.

Most finfish developments require to be screened as to whether an Environmental Impact Assessment (including Habitats Regulation Appraisal with respect to potential effects on designated protected areas) is necessary and must be submitted as part of the planning application.

(b)

Applications for planning permission for marine fish farm developments are determined by sub-national local Planning Authorities in accordance with Local Development Plans, and national level Scottish Planning Policy and National Marine Plan.

National level planning policy stipulates that the planning system maintains a presumption against further finfish farm developments on the north and east coasts of Scotland to safeguard migratory salmonids.⁸ Marine fish farms are therefore situated on the west coast of the Scottish mainland and in the Western Isles, Orkney and Shetland (see Annex A).

Each new fish farm site is considered on its merits through the planning system, with advice provided by statutory consultees (including Scottish Environment Protection Agency, Marine Scotland, District Salmon Fishery Boards, and NatureScot) and consideration of representations from other interested parties and the general public.

Planning Authorities will consider a wide range of issues which include, for example, considering the potential environmental consequences of the proposal prior to granting planning permission.

Most finfish developments require to be screened as to whether an Environmental Impact Assessment (including Habitats Regulation Appraisal with respect to potential effects on designated protected areas) is necessary and must be submitted as part of the planning application.

A new risk assessment framework for managing sea lice interactions between farmed and wild salmonids is expected to be implemented by the end of 2023. The framework will be applied by the Scottish Environment Protection Agency through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 meaning that new and expanding developments must be evaluated through this framework before they can legally operate. Monitoring and feedback from implementation will be used to build on, and refine the approach over time as part of an adaptive management process.

4.6 What progress has been made to implement NASCO's guidance on introductions, transfers and stocking? (Max. 200 words)

(Reference: Articles 5 and 6 and Annex 4 of the Williamsburg Resolution)

The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 (as amended) regulates the introduction of live fish and spawn into inland waters. Introductions, and broodstock collection, require permission from either Scottish Ministers or DSFBs. Scottish Ministers' consenting functions are operated by Marine Scotland based on a risk assessment system. The Aquaculture and Fisheries (Scotland) Act 2013 contains powers for Scottish Ministers to revoke or restrict the powers of DSFBs to consent to introduction of salmon or salmon spawn, and provides that conditions can be placed on any consents granted.

In addition, the control of invasive non-native species is governed by the Wildlife and Countryside (Scotland) Act 1981, as amended by the Wildlife and Natural Environment (Scotland) Act 2011 (WANE). The keeping of certain species and release out with their native range without permission is an offence.

Scottish Government has a stocking policy which enables a sustainable approach to Atlantic salmon introductions. This policy is currently under review.

⁸ While national planning policy is undergoing revision at the time of writing in Oct 2022, published proposals for a new National Planning Framework would see a continuation of this planning principle.

4.7 Is there (a) a requirement to evaluate thoroughly risks and benefits before undertaking any stocking programme and (b) a presumption against stocking for purely socio-political / economic reasons? (Max. 200 words each)
(Reference: Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach and Annex 4 of the Williamsburg Resolution)

(a) Marine Scotland regulates stocking of Atlantic salmon in those areas without a DSFB and evaluates the risks and benefits of any stocking programme prior to consent.

In Special Areas of Conservation (SACs) Marine Scotland and, if applicable, the DSFB must complete a Habitat Regulation Assessment (HRA) which considers whether either the removal of broodstock and/or the stocking programme will adversely affect the integrity of the SAC. This includes not only the impact on Atlantic salmon, but also on those other conservation features which depend upon them (such as Freshwater Pearl Mussel).

(b) Marine Scotland does have a presumption against stocking for purely socio-political/ economic reasons.

4.8 What is the policy / strategy on use of transgenic salmon? (Max. 200 words)
(Reference: Article 7 and Annex 5 of the Williamsburg Resolution)

The Scottish Government is opposed to the cultivation of GM crops. Before any GMO (including Atlantic salmon) can be released in Scotland, Scottish Ministers would require, under the Environmental Protection Act 1990, to give consent – this would include an assessment of the potential for detrimental effects.

4.9 For Members of the North-East Atlantic Commission only: What measures are in place, or are planned, to implement the eleven recommendations contained in the ‘Road Map’ to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of *Gyrodactylus salaris* and eradicate it if introduced, including the development and testing of contingency plans? (Max. 200 words)
(Reference ‘Road Map’ to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of G. salaris and eradicate it if introduced, NEA(18)08)

Scotland continues to apply the recommendations of the ‘Road Map’ to support the ToR of the G. salaris (Gs) working group where these are relevant and resources allow.

Gs has not been detected in the UK to date. Scotland, as part of the GB health zone, remains disease free with respect to this parasite. The majority of Atlantic salmon movements into Scotland are ova to supply the salmon aquaculture industry, few live fish movements (considered to pose the greatest risk) occur.

The following measures are taken to prevent its introduction and spread in Scotland:

- Maintenance of trade measures to prevent introducing Gs, including health certification and restriction of trade that could pose a risk
- Aquatic animal health surveillance and diagnostic testing, including measures to help detect Gs, implemented by Marine Scotland
- Wild fishery stakeholders maintain biosecurity plans and actively promote the ‘clean, check, dry’ campaign
- Provision of Home and Dry campaign material where requested and where necessary.
- Contingency plans and periodic exercises involving cross border parties to help ensure preparedness. Scottish contingency plans require updates to reflect recent structural and legislative changes – the process commenced in September 2022 and will conclude in early 2023.

4.10 Identify the main threats to wild salmon and challenges for management in relation to aquaculture, introductions and transfers, and transgenics.

Threat / Challenge A1	Genetic introgression - stocking.
Threat / challenge A2	Genetic introgression - escapees
Threat / challenge A3	Fish health – disease; sea lice; other parasites.

4.11 What SMART actions are planned during the period covered by this Implementation Plan (2019 – 2024) to address each of the threats and challenges identified in section 4.10 to implement NASCO’s Resolutions, Agreements and Guidelines and demonstrate progress towards achievement of its goals and objectives for aquaculture, introductions and transfers, and transgenics?

Action A1:	Description of action:	Marine Scotland has reviewed the policy permitting salmon introductions (stocking), and will also revisit options for a new licensing regime under that policy.
	Planned timescale (include milestones where appropriate):	The policy review in summer 2019 included stakeholder consultations and the new regime is now in place, with applications for stocking received and considered by Marine Scotland. In 2020 we aim to identify options for a review of the licensing regime under the new policy, with a consultation taking place thereafter if required.
	Expected outcome:	A licensing regime aiming at improving the conservation status of local wild Atlantic salmon populations.

	Approach for monitoring effectiveness & enforcement:	Marine Scotland, the licensing authority, considers each stocking application on its individual merits, fully evaluating the risks and benefits as advised in NASCO's Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach. A record is kept of all applications and decisions ensuring that they are in line with the current stocking policy.
	Funding secured for both action and monitoring programme?	Yes
Action A2:	Description of action:	In support of Article 11 of CNL(06)48 Marine Scotland initiated a national introgression project in July 2018 to investigate the extent of hybridisation and quantify levels of introgression of genetic material from farm escapees into wild Scottish Atlantic salmon populations. This project provides key data to support the minimisation of adverse genetic interactions by identifying impacted areas.
	Planned timescale (include milestones where appropriate):	<p>The project covered three broad related areas:</p> <p>(a) Genetic impact of freshwater smolt rearing This part of the investigation will entail the collection of samples from the areas immediately adjacent to active freshwater smolt rearing facilities. Levels of introgression will then be examined and compared to neighbouring areas where there has been no smolt production. This work will be performed in 2018/19.</p> <p>(b) Genetic impact of aquaculture across Scotland This part of the investigation will focus on the examination of samples collected from across Scotland as part of the National Electrofishing Programme for Scotland (NEPS). Using a random sampling design, tissue samples will be collected from sites across the country and levels of introgression examined. Patterns of introgression will be examined in relation to the presence of aquaculture production. Samples for this work will be collected in Year 1 of the project and analysis carried out over 2019/20 and 2020/21.</p>
	Expected outcome:	In October 2021, Marine Scotland Science published the first national assessment of genetic introgression in Scotland. The study shows that there is a risk to wild salmon from introgression of genes from farmed salmon that escape, but that it may be low outside the aquaculture regions even though escaped fish may disperse widely at sea. The study is a snap shot in time and the findings are in line with observations from similar studies in Norway.

		<p>We have given a commitment to continue to invest in the National Electrofishing Programme for Scotland (NEPS), which provides detailed local information on juvenile salmon stocks in the aquaculture regions and elsewhere within a robust structured framework and underpins continuation of the National Introgression Programme for Scotland.</p>
	<p>Approach for monitoring effectiveness & enforcement:</p>	<p>The national introgression project utilised a panel of genetic markers to screen juvenile fish tissue samples collected from sites around Scotland in structured surveys and is expected to continue over three years, completing by end of March 2021. Levels of introgression are quantified and examined in relation to the presence/absence and concentration of aquaculture production in the different rivers and regions sampled.</p> <p>The technique basically takes two groups of fish and from these creates two sets of reference data, one to represent farmed fish and one to represent wild. Individual fish can then be examined in relation to these two reference sets of fish and characterisation made as to where the individual fish falls along the spectrum of genetic difference between the two groups. This work has focused on distinguishing between wild Scottish salmon and farmed fish of Norwegian origin stock.</p>
	<p>Funding secured for both action and monitoring programme?</p>	<p>Yes</p>
<p>Action A3(i):</p>	<p>Description of action:</p>	<p>Post-smolt, west coast sweep netting and a continued work programme at the Shieldaig site to provide data to investigate potential links between sea lice, farms and sea trout.</p>
	<p>Planned timescale (include milestones where appropriate):</p>	<p>On-going throughout the five-year NASCO plan period.</p> <p>Between March-November 2018 and 2022, a study into sea trout (<i>Salmo trutta</i>) movements has and will be conducted in the area of Loch Torridon, a sea loch in the NW Highlands.</p> <p>The study involved tagging sea trout smolts as they leave rivers in the area with small acoustic transmitters. To follow the movements of sea trout, networks of acoustic receivers were placed in Outer Loch Torridon, Loch Shieldaig and Inner Loch Torridon. Analysis of these data will be completed in 2020.</p> <p>The post-smolt west coast sweep net project occurs annually and is a continuation of a body of work started in 2003 in</p>

		<p>order to look at interactions between the aquaculture and wild fish industries.</p> <p>Since spring 1999, planktonic lice levels have been measured by MSS in the intertidal areas at the head of Loch Shieldaig.</p> <p>Every May and June since 1999, trout have been collected in the lower reaches of the River Shieldaig by electrofishing to monitor their sea lice levels and condition.</p> <p>A two-way fish trap has been operated on the river Shieldaig since 1999. This system allows the capture of sea trout as they migrate to sea and as they return to the river. Individually marking the fish enables calculation of the proportion of pit tagged emigrants that subsequently return to the river, providing an index of marine conditions.</p> <p>The historical fish trap and environmental data collected at Shieldaig will be analysed with expectation of publishing in the scientific literature in 2022.</p> <p>The data collection at the site will be reviewed after completion of the formal data analysis.</p>
	Expected outcome:	Improved knowledge of sea lice dispersion, impacts on wild salmonids and migratory behaviours of salmonids in complex sea loch environments. These data will be used to inform the proposed sea lice framework as part of an adaptive management process.
	Approach for monitoring effectiveness & enforcement:	Standard programme management approaches are in place to ensure effectiveness and scientific rigour.
	Funding secured for both action and monitoring programme?	Expected
Action A2 & A3(ii):	Description of action:	<p>The Salmon Interactions Workstream has provided advice on existing and potential future arrangements to mitigate the 12 high level pressures on wild salmon. As an initial task, a new, independently chaired Working Group was established in October 2018, to examine and provide advice on the interactions between wild and farmed Atlantic salmon.</p> <p>This process is a critical step in working towards the achievement of NASCO's goals on containment and sea lice.</p>

	<p>Planned timescale (include milestones where appropriate):</p>	<p>The group was tasked to:</p> <ul style="list-style-type: none"> • Consider the evidence coming from the Environment, Climate Change and Land Reform and Rural Economy and Connectivity Committee Inquiries (including the literature review undertaken by Scottish Association of Marine Science), and any other work, concerning the environmental impacts of salmon and trout farms on wild salmonids; • Review current Scottish Government policy and advice governing wild/farmed salmon interactions including, but not limited to, sea lice, pathogens and escapes; • Review the actions required to monitor and mitigate the impact of farmed salmon and trout on wild salmonids (including through Environmental Management Plans, or other future regulatory mechanisms) so that any impact is reduced in accordance with our international and domestic obligations; • Make recommendations, including a delivery plan of agreed actions and timescales, for a future interactions approach, including the need for any further research; changes to the regulatory regime, including planning advice and environmental monitoring; and the potential use of 'adaptive management' techniques, including the management of risk; • Look at the conclusions and any emerging recommendations from the Scottish Parliamentary Inquiries into farmed salmon in Scotland. <p>The Salmon Interactions Working Group Report was published in May 2020: The final SIWG Report contains over 40 recommendations on a future approach for managing interactions between wild and farmed salmon in Scotland.</p>
	<p>Expected outcome:</p>	<p>An approach to managing interactions which meets international commitments and enables the protection and enhancement of Scotland's wild Atlantic salmon stocks alongside the sustainable development of aquaculture, maintaining the right balance across our economic, environmental and social responsibilities – in line with Scotland's National Marine Plan.</p>
	<p>Approach for monitoring effectiveness & enforcement:</p>	<p>Standard programme management approaches are in place to ensure effectiveness and reporting of progress (e.g. The Scottish Government response to the Salmon Interactions Working Group Report was published in October 2021: Salmon Interactions Working Group Report: Scottish Government Response - gov.scot (www.gov.scot))</p>
	<p>Funding secured for both action and monitoring programme?</p>	<p>Expected</p>

Action A3 (iii)	Description of action:	Develop and implement field studies and migration models to better understand migration behaviours and potential interactions between salmonids and aquaculture developments.
	Planned timescale (include milestones where appropriate):	<p>On-going investigations of the spatial and temporal distribution of emigrating salmon smolts throughout the five-year NASCO plan period.</p> <p>Marine Scotland Science (MSS) is working with the Atlantic Salmon Trust regarding the latter's delivery of a salmon smolt acoustic tagging project the West coast in 2020. This work is looking a large scale movements of smolts from sea lochs toward the known migration corridor on the Scottish shelf. The locations of smolts captured on the deployed acoustic receivers will be compared to published modelling studies to understand potential migration routes to the open sea.</p> <p>MSS is also conducting focused tracking studies on Atlantic salmon regarding their behaviours as the migrate through sea loch systems. These have been focused on Loch Linnhe (2016/2017) and now Loch Torridon (2018- 2023). The loch Torridon studies use receivers arranged in grids that allow finer scale interpretation of movements.</p>
	Expected outcome:	<p>Improved understanding of salmon migration behaviours and the potential for interactions between migration of smolts and aquaculture installations.</p> <p>Data will inform the smolt swimming model, which will be used to support the implementation of a new spatially adaptive sea lice risk assessment framework to minimise risk to wild salmon.</p>
	Approach for monitoring effectiveness & enforcement:	Standard project management approaches are in place to ensure effectiveness and scientific rigour.
	Funding secured for both action and monitoring programme?	Yes

Figure 1. The distribution of active Atlantic salmon smolt sites in 2017

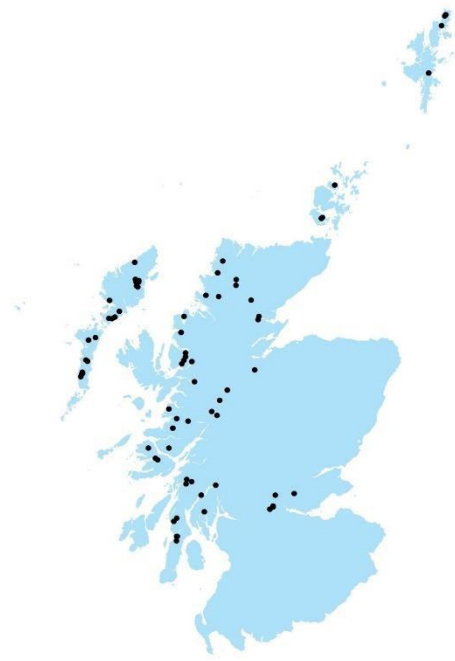


Figure 2. The distribution of active Atlantic salmon production sites in 2017

