IP(19)10rev

NASCO Implementation Plan for the period 2019-2024

EU – UK (Scotland)

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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)16[1];*
- *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:	**European Union**
Jurisdiction / Region:	**UK (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 three key overarching objectives are to:

1. Protect and enhance Scottish wild Atlantic salmon and their habitats.

2. Promote effective, evidence-based, wild Atlantic salmon fishery management through integrated data gathering, research and information dissemination.

3. Maximise the environmental, economic and social benefits from sustainable wild salmon populations and associated fisheries.

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 group 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 groups.

The numbers of eggs required to produce sustainable Atlantic salmon stocks are estimated from population in 11 rivers[2] from which information on stock-recruitment relationships and associated geographic co-variates 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 targets 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 target 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	
N/A	Lost	1
N/A	Unknown	208

Additional comments:

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.

[2] Please see section 2.7 (b).

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)*

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.

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.

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)

Recent analysis by Buddendorf *et al.*2019, estimates that Scotland's riverine habitat is 208,726,474 m^2, assuming that all habitat below impassable barriers is used by Atlantic salmon.

The same paper's estimates of historical habitat areas that are no longer available to Atlantic salmon are *ca.* 81,449,488 m^2 for still waters and 7,365,245 m^2 for running waters. These figures represent approximately **10%** and **4%** of the total historical area for still and running waters respectively.

In terms of juvenile Atlantic salmon, the analysis by Buddendorf *et al.*, also reports that historically available habitat that is no longer available to Atlantic salmon (i.e. that above impassable man-made barriers) represents only *ca.* **1.2% of national production**.

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.

1.6 What is the current extent of freshwater and marine salmonid[3] 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)*

Marine Scotland has consulted with the Scottish Environment Protection Agency (SEPA); Scottish Natural Heritage (SNH); Fisheries Management Scotland, (FMS); the Atlantic Salmon Trust, (AST); the Institute of Fisheries Management, (IFM); Salmon and Trout Conservation Scotland, (STCS); the Scottish Environment LINK Aquaculture subgroup; the Salmon Net Fishing Association of Scotland (SNFAS); the Scottish National Angling Association (SANA); the Scottish Salmon Producers' Organisation (SSPO); and the International Salmon Farmers Association (ISFA) in the development and/or draft of this plan.

The draft of this plan, for example, was sent to the organisations listed in early December 2018, with feedback requested *ca.* six weeks later, by 20 January 2019. Four organisations were able to respond within this challenging timescale, given the Christmas and New Year period.

[3] This data currently relates to Atlantic salmon.

We have incorporated their comments in the original draft submitted where appropriate and continue to liaise with stakeholders.

2. Management of Wild Atlantic Salmon Fisheries:

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 mixed-stock fisheries, there should be at least one action related to their management.

2.1 What are the objectives for the management of the fisheries for wild salmon? *(Max. 200 words)*

The Scottish Government wishes to maximise the socio-economic value from Scotland's wild Atlantic salmon fisheries while protecting and enhancing stocks.

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.

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 SNH, with whom we will continue to work jointly to achieve the objectives.

We are currently developing an on-line pressures mapping tool[4]. When this is implemented, we will work with FMS to explore options for developing a common template for Fishery Management Plans (FMP) which could allow local information to be aggregated and compared at 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. Stocks have been allocated one of three categories:

Category	Probability of Meeting CL	Advice
1	At least 80%	Exploitation is sustainable therefore no additional management action is currently required.

[4] Please see section 3.1 of this plan.

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 outwith the defined netting and rod *&* line seasons the Spring closure period (when all Atlantic salmon must be released).

The conservation status of Atlantic salmon stocks on 173 named rivers and assessment groups is assessed annually. Rivers and assessment groups are defined in legislation by reference to a designated outflow point(s), with all inland waters flowing to that point being included in the river identified.

The conservation assessment is undertaken on the bases of reported catch returns – supplemented by other factors. For all rivers without fisheries a precautionary approach is taken where, for the purposes of national legislation, stocks are treated as if they are in poor status and retention of salmon banned. These are classified as "unknown" at section 1.3

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, although for the majority of rivers where killing of salmon is not allowed (those of unknown status) there are no fisheries operating.

(b) 95 rivers or assessment groups, of the 173 assessed, operated on a mandatory catch and release basis during the 2019 fishing season. In addition, catch and release is to be promoted strongly on the 30 further 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 bases, not by individual fishery.

(c) In the 2018 season, the most recent for which catch records have been published, the total reported rod catch (retained and released) of wild Atlantic salmon and grilse for 2018 was 37,196. Total reported catch was 67% of the previous 5-year average and was the lowest on record since records began in 1952.

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.** A proportion of fish released from the rod

fishery may be re-caught and hence inflate the catch statistics by appearing in the reported data more than once.

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) Scotland acknowledges that some rod & line (i), some net & coble (ii) and all fixed engine (iii) fisheries can be expected to meet NASCO's definition of Mixed Stock Fisheries (MSF).

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

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).

(c)

(i) Reported annual rod catch generally increased over the period 1952 to 2010, declining in each subsequent year until 2014, the second lowest on record. Reported rod catch recovered slightly in 2015 and 2016 only to fall again in 2017 and 2018:

- Retained 19.0mt across all rod & line 2014-2018, some of which are MSF (compared with 76.2mt 2009-2013).
- Released 155.8mt across all rod & line 2014-2018, some of which are MSF (compared with 224.1mt 2009-2013).

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 Salmon Conservation Regulations have prohibited the retention of Atlantic salmon caught in coastal waters from the 2016 season onwards.

(ii) The mean reported catch in the net & coble fisheries in the last five years is 10.9mt (compared with 22.4mt 2009-2013).

(iii) The mean reported catch in the fixed engine fisheries in the last five years is 14.5mt (41.6mt 2009-2013).

(d) Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks for 173 rivers or assessment groups. (Please see detailed explanation in sections 1.2 and 2.2).

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)

The primary management objective is to ensure the conservation or restoration of the stock(s).

Any statutory measures need to be supported by a Business and Regulatory Impact Assessment with a focus on the social and economic impacts of any proposal.

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 the 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 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 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, has been produced in March 2019 for consultation with local biologists.

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:	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):	• On-going annual assessment, with autumn public consultations; and • Freeze on underlying methodology until 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 (cont.):	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):	• 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, combined with 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 (cont.):	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. Our aspiration is to introduce 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 mapping based pressures tool is being developed to enable DSFBs, often with input from Fishery Trusts, to illustrate the severity and status of the pressures across their catchment, so that Scotland has both a national and local picture, to inform future policy thinking. It will identify the length and proportion of individual and/or collective rivers impacted by each pressure so that priorities can be established. Six volunteer Boards and Trusts piloted the tool in autumn 2018. The tool is launched in November 2019, and result will be reviewed in 2020. Full funding is in place.

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.

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 management[5].

(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 survive[6]. 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.

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

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	Coastal and marine - inshore commercial fisheries; 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

[5] For further information see: https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature

[6] 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.

	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:	Description of action:	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. 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. 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.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. 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 then publish new RBMPs covering 2021 to 2027.
	Expected outcome:	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.

		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.
	Approach for monitoring effectiveness & enforcement:	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. 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. 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.
	Funding secured for both action and monitoring programme?	Yes
Action H1 (cont):	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. Workshops are planned for November 2019 and February 2020 to plan next steps.
	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.
	Funding secured for both action and monitoring programme?	Expected

Action H2:	Description of action:	River Basin Management Plans (RBMP) have identified that the main pressures on flows and levels in Scotland are from water

		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. 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. 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. 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.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. 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 then publish new RBMPs covering 2021 to 2027.
	Expected outcome:	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. 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.
	Approach for monitoring effectiveness & enforcement:	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. 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. 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.
	Funding secured for both action and monitoring programme?	Yes
Action H3:	Description of action:	Implement Scotland's Second Climate Change Adaptation Programme (SCCAP2). This will highlight Scotland's adaptation priorities going forward.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period.
	Expected outcome:	Riparian shade to be increased in sensitive and appropriate water bodies, through collaborative projects undertaken by DSFBs and/or Fisheries Trusts.
	Approach for monitoring effectiveness & enforcement:	MSS has established the Scotland River Temperature Monitoring Network (SRTMN), in collaboration with FMS members and University of Birmingham[7] 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. 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. 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.
	Funding secured for both action and monitoring programme?	Expected

[7] https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature

Action H4:	Description of action:	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.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. 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 then publish new RBMPs covering 2021 to 2027.
	Expected outcome:	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. 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.
	Approach for monitoring effectiveness & enforcement:	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. 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. A range of new indicators is also being developed by SEPA to improve assessment of fine sediment and morphological impacts.
	Funding secured for both action and monitoring programme?	Expected
Action H5:	Description of action:	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 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. The benefits of riparian native woodland will be reinstated on water courses as part of the initiative to moderate river temperatures outlined in H3.
	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:	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. We acknowledge that it is important to ensure that any impacts on fish 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.
	Funding secured for both action and monitoring programme?	Expected

Action H6:	Description of action:	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. 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. SEPA is leading on work to remove or ease redundant barriers in rivers, utilising *ca.* £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.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. 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.
	Expected outcome:	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. 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.
	Approach for monitoring effectiveness & enforcement:	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 Environment[8] 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 assessments that estimate the value of habitat from river length or area.

[8] https://www.sciencedirect.com/science/article/pii/S0048969718346199

		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 re-colonise 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.
	Funding secured for both action and monitoring programme?	Yes
Action H7:	Description of action:	Continued implementation of monitoring/research strategy for potential marine renewable and salmonid interactions.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. MSS is working with AST regarding the latter's delivery of a *ca.* £1m salmon and sea trout smolt acoustic tagging project across seven rivers in the Moray Firth in 2019 which will contribute to the objectives of the National Research and Monitoring Strategy for Diadromous Fish (NRMSD).
	Expected outcome:	Improved understanding of the potential impacts of marine renewable energy generation on Atlantic salmon. Continued monitoring of the effectiveness, enforcement and development of appropriate renewable energy industry mitigation for identified effects on salmonids.
	Approach for monitoring effectiveness & enforcement:	MSS has developed models to predict movements of Atlantic salmon smolts emerging from rivers around Scotland across a range of swimming directions. Complementary empirical work involves tracking the movements of Atlantic salmon smolts from Loch Linnhe, around Mull, from the River Applecross (west coast) and from the Aberdeenshire River Dee (east coast). Data are also becoming available regarding emigration of Atlantic salmon in the Moray Firth rivers. In addition, experimental work near Applecross has tested swimming vectors of salmon from east and west coast under controlled conditions. The output will be predictions of dispersal of Atlantic salmon smolts under a range of environmental conditions.
	Funding secured for both action and monitoring programme?	Yes

Action H7 (cont.):	Description of action:	ATLANTIC SALMON AT SEA - factors affecting their growth and survival (SeaSalar). The Norwegian Institute for Nature

		Research (NINA) is the lead institution of the program. Marine Scotland is part of the expert consortium.
	Planned timescale (include milestones where appropriate):	The project started 1 August 2018 and will last for four years.
	Expected outcome:	The main aim of the SeaSalar research programme is to examine factors impacting variation in marine survival of Atlantic salmon over time and in different geographical areas.
	Approach for monitoring effectiveness & enforcement:	The origin of the fish captured in the project is being determined using genetic assignments. Scottish fish can be identified as such but, using the available Scottish genetic microsatellite baseline (the genetic markers which the project is utilising), no higher regional resolution can be achieved. In order to be able identify fish from rivers/regions within Scotland, genetic screening of baseline samples would be required using a larger number of genetic markers than are currently used. At present, the Scottish microsatellite baseline comprises of 14 markers, whilst the SeaSalar project will be utilising 31 to give the enhanced resolution. It is not possible to specify, at this point, the actual degree of enhanced resolution, but we will provide more information as the project proceeds. ~1500 fish from various regions of the Scotland, as defined from previous research, have now been screened using those 31 markers. Regional structuring within Scotland will be examined and geographic assignment units defined. The various marine metrics for the different units of Scottish fish will then be examined to provide information on Scottish Atlantic salmon stock-specific ecology and mortality at sea.
	Funding secured for both action and monitoring programme?	Yes

Action H8:	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. The details of this are still being finalised but are expected to include: • 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. • 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?	Expected
Action H8 (cont.):	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 (cont.):	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 – many of our policies include approaches/practices outlined in SLG (09)5 - Guidance on Best Management Practices to address impacts of sea lice and escaped farmed salmon on wild salmon stocks (Adopted in June 2009 and Revised in June 2010).

A priority action for Scottish Government, and included in Scotland's 10 Year Farmed Fish Health Framework, was a review of Scotland's farmed fish sea lice compliance policy. That review looked at the operation of the policy in Scotland and considered the recommendations of the committee enquiries.

The Scottish Government sea lice compliance policy does not operate in isolation. All marine salmon farms follow the independently audited Code of Good Practice for Scottish Finfish Aquaculture. That Code includes a section on sea lice, national treatment standards and a suggested criteria for treatment of 0.5 adult female lice per fish from February to June, coinciding with the smolt run, and 1.0 from July to January.

In June the reporting and intervention thresholds lowered from 3 and 8 average adult female lice to fish to 2 and 6 respectively. Reporting legislation will be introduced in 2020 which will require all marine farms to report a weekly sea lice number to Scottish Government, one week in arrears.

We are also committed, unless there is compelling evidence to the contrary, to a further reduction of the intervention thresholds in 2021, 12 months following the introduction of reporting legislation to 2 and 4 average adult female lice per fish. Furthermore we are exploring the potential introduction of independent checks on sea lice counts on sea lice counts, in addition to the Fish Health Inspectorates enhanced sea lice inspection regime.

Further information can be found here; https://www2.gov.scot/Resource/0054/00547487.pdf

NASCO will also be aware of the recently published report by the Scottish Parliament Rural Economy Committee on 'Salmon Farming in Scotland' which detailed 65 recommendations on action to improve the regulation of the Scottish salmon farming industry and to address fish health and environmental challenges. We carefully considered the committee's recommendations and responded in full in early 2019. Scottish Ministers have confirmed in this response that the status quo is not an option in relation to the regulation of salmon farming and actions are now underway to improve current arrangements. At the heart of this is an adaptive management approach based on

improved assessments of potential impacts from farmed to wild fish and on enhanced monitoring to improve the evidence base and inform continuous improvement in regulation in this area on an incremental basis.

(b) We recognise that some stakeholders remain of the view that the current regulatory regime does not provide sufficient protection for wild Atlantic salmon from the impacts of aquaculture. That view was strongly expressed during the Parliamentary inquiries, referenced in (a) above.

As part of our response, a regulators' technical working group has been established, tasked with developing a practical framework for assessing the sea lice loading and management requirements taking account of the best available scientific understanding and the precautionary principle. The group comprises experts from the regulators - Marine Scotland, SEPA, SNH and representatives of local authorities.

It is intended that this framework will underpin future planning advice. Through the framework adaptive management based on enhanced monitoring will create an enabling environment for encouraging further aquaculture development where impacts can be mitigated

In the interim Marine Scotland has issued advice (in January) stating that as part of any future request for aquaculture planning advice they will expect an Environmental Management Plan (EMP) to be delivered for any consents for marine aquaculture planning applications (when there is/or there is potential for a wild/farmed interaction).

This advice was further built on in July, with Marine Scotland's planning advice outlining the minimum criteria it expects within EMPs.

We accept that change is required and we believe our existing and planned arrangements are consistent with the international goals.

As highlighted (4.1), the farmed fish sea lice statutory regime has been strengthened, and will be further strengthened, to support improvements to fish farm sea lice management.

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) Effective sea lice management is central to Scotland's 10-year Farmed Fish Health Framework and our farmed fish Sea Lice Compliance policy, as trailed at NASCO 2017.

In addition, in July we wrote to local authorities and industry stating that Marine Scotland's Screening and Scoping responses to applications for aquaculture developments will include a requirement that should the applicant submit a finfish planning application in the future, an EMP should be included (when there is/or there is potential for a wild/farmed interaction), and that as a minimum any monitoring scheme will:

- 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;
- details how and what monitoring data will be collected to assess potential interaction with wild fish;
- and details how this monitoring information will feed back to management practice.
- This plan should also include a regular review process to ensure that it remains fit for

purpose.

Consultation responses will confirm whether these areas have been included in an EMP.

This will apply to all new marine fish farm applications (when there is/or there is potential for a wild/farmed interaction).

Our Technical Working Group has been tasked with developing a practical framework for assessing the sea lice loading and management requirements taking account of the best available scientific understanding and the precautionary principle. The group comprises experts from the regulators - Marine Scotland, SEPA, SNH and representatives of local authorities.

It is intended that this framework will underpin future planning advice. Through the framework adaptive management based on enhanced monitoring will create an enabling environment for encouraging further aquaculture development where impacts can be mitigated.

(b) The Framework is overseen by a Working Group, which FMS attends in an observatory capacity. Four working groups have been established to progress the seven work streams detailed in the Framework document. These are public facing and incorporate web based information on the membership ad activities of each group, available to all those with an interest. Updates are provided to Scottish Ministers and the Scottish Parliament.

As detailed at Section 4.1(a), we have reviewed and updated our sea lice compliance policy and will move to place sea lice reporting on a statutory basis in 2020.

The independently chaired Interactions Working Group will also consider and discuss the NASCO Implementation plans, commitments and progress towards delivery.

(c) n/a

4.3 (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)(i) The Scottish Government has already published 'A Technical Standard for Scottish Finfish Aquaculture'. The purpose of the Standard is to help prevent escapes of finfish as a result of technical failure and related issues at Scottish finfish farms. It was a key output of the Ministerial Group for Sustainable Aquaculture and has been developed by an expert group comprising finfish farmers and trade associations, fish farm equipment suppliers and manufacturers (nets, pens and moorings), insurers, researchers, engineers and regulators. All equipment will be expected to meet the requirements by 2020 at the latest. Scottish Government Fish Health Inspectorate currently conduct risk-based enhanced containment inspections at freshwater and seawater aquaculture facilities. Case information is published online. However, before this plan is finalised, we will include herein, for ease of reference, a table of notified escapes over the last five years.

(a)(ii) The expert group that initially helped to structure the framework has been re-established to ensure the standard remains fit for purpose and future proofed. The group is currently considering future needs, including a standardised training programme for all users and future users of the equipment, and future monitoring compliance mechanisms – statutory and non-statutory.

The improved containment group has met several times to discuss and take forward this action, with the next meeting scheduled to take place in late 2019.

(b) Marine Scotland proactively, and with the input from aquaculture, DSFBs and Fishery Trusts, initiated a national introgression project in July 2018 that seeks to quantify levels of introgression of genetic material from farm escapees into wild Scottish Atlantic salmon populations. This is explained in more detail in section 4.11 below. There is currently no routine monitoring of wild fish.

(c) n/a

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)

The Scottish Government's response to the parliamentary enquiry into the impacts of salmon farming made clear its commitment to moving beyond the status quo and further developing an adaptive management approach to the regulation of impacts from finfish farms. The Government has since been undertaking this work through a Technical Working Group and the Salmon Interactions Working Group. In 2019 the Cabinet Secretary for the Rural Economy announced to the Parliament the initial actions being taken in this area – namely reform of Scotland's sea lice compliance policy and a move to placing sea lice reporting on a statutory basis in 2020.

Marine Scotland (MS) has been collaborating with SEPA to develop hydrographic modelling – drawing on data from Norway - for sea lice dispersal. This will underpin the new approach being developed by the Technical Working Group to managing impacts from finish farms and thereby enabling spatial planning for the industry in a way which more effectively accounts for such impacts.

Inland Fisheries Ireland and the Norwegian Institute of Marine Research to build a sea lice dispersal model which focuses, utilising Killary Harbour as a case study, on the potential impact of the dispersal on wild salmon, as opposed to the potential connectivity of sea lice between fish farms. The project aims to report in the summer of 2019.

MS is also part of the new ICES Working Group on Environmental Interactions of Aquaculture (WGEIA), which met for the first time on 11 – 14 December 2018. WGEIA will seek to prioritize areas where aquaculture management can lead to better environmental performance of the industry. The working group will develop risk/benefit assessment methods and models to support informed sustainable industry management.

The joint Ministerial statement makes clear our ambition to strike the right balance between the benefits that continued growth of the aquaculture industry will provide, whilst managing the potential impacts on our sea lochs and other coastal waters. This includes recognition and promotion of the role which low impact production systems play.

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 and shellfish farms are determined in accordance with Local Development Plans and objectives, and general policies within Scotland's National Marine Plan. Each new fish farm site is considered on its merits through the terrestrial planning process, with advice provided by statutory consultees (including Scottish Environment Protection Agency, Marine Scotland and Scottish Natural Heritage) and consideration of representations from other interested parties and the general public.

Local 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 is necessary.

In the Government's response to the parliamentary inquiry into salmon farming it acknowledged that there is currently a lack of clarity with regard to the regulatory arrangements that apply to the impact of salmon farms on wild salmon stocks and where the responsibility should lie in regulating this impact. This was a key reason for establishing a Regulators' Technical Working Group to work in parallel with the Salmon Interactions Working Group.
In the interim we have made it clear that for any aquaculture development an Environmental Management Plan should be drawn up (see 4.2(a) for details.)

(b) As above. Marine Scotland provides advice to Local Planning Authorities on the potential impact of an aquaculture application on wild Atlantic salmon.
Our national marine plan promotes an ecosystem approach, putting the marine environment at the heart of the planning process to promote ecosystem health, resilience to human induced change and the ability to support sustainable development and use.

Our Technical Working Group has been tasked with developing a practical framework for assessing the sea lice loading and management requirements taking account of the best available scientific understanding and the precautionary principle. The group comprises experts from the regulators - Marine Scotland, SEPA, SNH and representatives of local authorities.

It is intended that this framework will underpin future planning advice. Through the framework adaptive management based on enhanced monitoring will create an enabling environment for encouraging further aquaculture development where impacts can be mitigated

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.

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) 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).

A review of the stocking policy which permits Atlantic salmon introductions has been completed to inform future decision making.

(b) 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)

Gyrodactylus salaris has not been detected in the UK to date. A Defra-led joint contingency exercise (named 'Exercise Alpheus') was held on 3 December 2015. Live fish movements from areas known to be infected and in freshwater represent the most significant risk of introduction. However anglers also present a risk of spreading the parasite.

The majority of Atlantic salmon movements into Scotland are eggs transported from Norway to supply the salmon aquaculture industry. These must be sourced from disease free compartments. The following measures have been taken to prevent its introduction and spread in Scotland:

- UK supports the maintenance of the EU guarantee that prevents higher risk imports of live farmed (or other) salmonids from *G. salaris* risk areas;
- A surveillance programme for *G. salaris* is in place. This is managed by the Fish Health Inspectorate (FHI) and collects fish from a monitoring programme;
- Defra is funding research to assess the colonisation risk of *G. salaris* in UK (Cefas 2009-13) and the susceptibility of UK fish stocks to this parasite (Stirling University PhD, 2008-2012);
- DSFBs and Fishery Trusts maintain biosecurity plans and actively promote the clean, check, dry campaign; and
- A Contingency plan is in place and exercises take place, every couple of years, to ensure preparedness for any potential outbreak.
- Annual Home and Dry advert in Fish in Scotland magazine, reminding anglers of the risks which they pose with regards to the introduction of *G.salaris* and advice on good practice, including equipment disinfection. Provision of Home and Dry campaign material to gateways where anglers may frequently travel to and from upon request– eg. Inverness Airport.

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:	Marine Scotland has initiated a national introgression project in July 2018 that seeks to quantify levels of introgression of genetic material from farm escapees into wild Scottish Atlantic salmon populations.
	Planned timescale (include milestones where appropriate):	The project will cover three broad related areas: (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. (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 and historical information regarding the stocking of non-native fish. Samples for this work will be collected in Year 1 of the project and analysis carried out over 2019/20 and 2020/21. (c) Temporal changes in levels of introgression Using historical samples held at Marine Scotland, levels of genetic introgression will be determined and compared to levels in contemporary samples collected from the same site/river/region. This analysis will be performed over 2019/20 and 2020/21.
	Expected outcome:	It will measure how much introgression there has been of genomic material of Norwegian origin, completing by the end of March 2021.
	Approach for monitoring effectiveness & enforcement:	The national introgression project will seek to utilise 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 will then be quantified and examined in relation to the presence/absence and concentration of aquaculture production in the different rivers and regions sampled. 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.
	Funding secured for both action and monitoring programme?	Yes
Action A3:	Description of action:	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.
	Planned timescale (include milestones where appropriate):	On-going throughout the five-year NASCO plan period. Between March-November 2018 and 2019, a study into sea trout (*Salmo trutta*) movements has and will be conducted in the area of Loch Torridon, a sea loch in the NW Highlands. The study will involve tagging sea trout smolts as they leave rivers in the area with small acoustic transmitters. To follow the movements of sea trout, 79 acoustic receivers will be placed in Outer Loch Torridon, Loch Shieldaig and Inner Loch Torridon.

		Analysis of this data will be completed in 2020.
	Expected outcome:	Recommendations for a future interactions approach.
	Approach for monitoring effectiveness & enforcement:	The post-smolt sweep net project is a continuation of a body of work started in 2003 in order to look at interactions between the aquaculture and wild fish industries. Since spring 1999, planktonic lice levels have been measured by MSS in the intertidal areas at the head of Loch Shieldaig. 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. 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. The historical fish trap and environmental data collected at Shieldaig will be analysed with expectation of publishing in the scientific literature in 2020. The data collection at the site will be reviewed after completion of the formal data analysis.
	Funding secured for both action and monitoring programme?	Expected
Action A2 & A3:	Description of action:	A new Salmon Interactions Workstream will provide 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.
	Planned timescale (include milestones where appropriate):	Initially, the Group is: • Considering the evidence coming from the ECCLR and REC Committee inquiries (including the literature review undertaken by SAMS), and any other work, concerning the environmental impacts of salmon farms on wild salmon and marine trout; • Reviewing current Scottish Government policy and advice governing wild/farmed salmon interactions including, but not limited to, sea lice, pathogens and escapes; • Reviewing the actions required to monitor and mitigate the impact of farmed salmon and marine trout on wild salmon (including through Environmental Management Plans, or other future regulatory mechanisms) so that any impact is reduced in accordance with our international and domestic obligations; and • preparing recommendations 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 management of potential impacts. Our expectation is that these actions will be completed by early 2020.
	Expected outcome:	An approach to managing interactions which 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.
	Approach for monitoring effectiveness & enforcement:	This will be taken forward once we have considered the initial Working Group's recommendations.
	Funding secured for both action and monitoring programme?	Expected

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

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