



**CNL(19)82**

***NASCO Implementation Plan for the period 2019-2024***

***EU – Sweden***



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### *NASCO Implementation Plan for the period 2019 – 2024*

*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<sup>1</sup>;*
- *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.*

<b>Party:</b>	<b>European Union</b>
<b>Jurisdiction / Region:</b>	<b>Sweden</b>

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<sup>1</sup> This document can be obtained from the NASCO Secretariat; email [hq@nasco.int](mailto:hq@nasco.int)

<b>1. Introduction</b>		
<b>1.1 What are the objectives for the management of wild salmon? (Max 200 words)</b>		
<p>The long-term objective is to keep the national stock complex above 75% of maximum production.</p> <p>For individual rivers stocks, no stock should have reduced reproductive capacity according to the national evaluation model.</p> <p>The natural genetic variation within stocks and genetic differences between stocks should be maintained, or restored if so required.</p> <p>No net loss of accessible habitat area or habitat quality shall occur.</p> <p>Salmon management should always take into account the biodiversity of rivers and the coastal ecosystem.</p>		
<b>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)</b>		
<p>Yearly monitoring of migrating smolt, ascending spawners and parr densities at spawning and nursery grounds has been ongoing since 1954 in the designated (index) river Ätran, in addition to yearly estimates of river catch. The monitoring data is used to establish a stock/recruitment relationship in the index river (from spawner run and smolt output) which in turn is used to set a conservation limit for the index river from which status of all rivers can be assessed.</p> <p>The reference point for the Swedish stock complex is set according to WGNAS as the conservation limit (<math>S_{lim}</math>). This value is also used as the reference value in reporting according to article 17 in the EU Habitat directive.</p> <p>The reference point for individual stocks are set from the number of deposited eggs (4.5 per m<sup>2</sup> of salmon habitat), or if such data are lacking, from electrofishing data with a lower limit of 10 parr (&gt;0+) per 100 m<sup>2</sup> (Tamario &amp; Degerman 2017).</p>		
<b>1.3 What is the current status of stocks under the new classification system outlined in CNL(16)11?</b>		
Stock Classification Score	Salmon Classification Category	No. rivers
0	Not at Risk	6
1	Low Risk	8
2	Moderate Risk	4
3	High Risk	4
N/A	Artificially Sustained	1
N/A	Lost	
N/A	Unknown	
Additional comments: New classification performed December 5 <sup>th</sup> 2018 by Swedish Univ. of Agricultural Sciences. River Lagan is artificially sustained, but wild salmon exist in the tributary Smedjeån.		
<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)</b>		
<p>A genetic screening of all stocks (baseline) was run 2015-2017 to establish a genetic baseline. Additional sampling of genetics will be performed annually to secure that goals of genetic diversity are met. We have identified three tributaries with lower than expected allelic richness. Actions</p>		

needed are under discussion.

Age and size composition of stocks are monitored through catch statistics from rivers (length, weight, sex). Additional sampling for age determination is carried out annually in two rivers. Based on these data, recommendations have been published on voluntary maximum lengths for landing fish in individual rivers. This is also to be incorporated in the national legislation in rivers with weak stocks.

Run-timing was initially monitored through catch statistics, from which the open season was originally set at the national level. In some rivers with weak stocks the fishing season has been further shortened after discussions with the local fishing associations. Increased open season (March) was tested in one river (R. Suseån), but resulted in high by-catches of trout kelt and was abandoned.

At present run-timing data cannot be monitored solely by catch statistics due to the shortened fishing season. Instead we rely on data from two sites, one in the designated river (R. Högvadsån) where a traditional salmon trap is run, and one in the main river downstream (R. Ätran) where ascending spawners are monitored using an automatic camera equipped fish counter (Vaki-system).

**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)*

It is estimated that 237 ha salmon habitat was available in 1999. A recent compilation (2015) found an increased area to 253 ha. This is mainly due to increased connectivity in the form of fishways. Large inaccessible areas are still situated upstream hydropower dams. The extent of the former distribution range of salmon and its former habitat prevalence will be compiled.

**1.6 What is the current extent of freshwater and marine salmonid aquaculture?**

Number of marine farms	0
Marine production (tonnes)	0
Number of freshwater facilities	1 only smolt production (River Lagan)
Freshwater production (tonnes)	0

Append one or more maps showing the location of aquaculture facilities and aquaculture free zones in rivers and the sea.

Within the habitat of Atlantic salmon there is today only one aquaculture facility with salmonid fish. This is the hatchery and salmon rearing station at Laholm, River Lagan. The production of salmon is land-based in an indoor facility, and no fish is kept in cages in freshwater or the sea. No fish can escape from the facility.

Only Atlantic salmon of the River Lagan strain is used as brood-stock (genetic screening). Circa 400 ascending adult salmon are stripped of eggs and milt annually. Annually, 100 000 one-year old smolt and 30 000 two-year old smolt are produced. These are stocked in Rivers Lagan and Nissan as compensation for hydropower development that has led to loss of rearing habitat upstream and deterioration of habitat quality downstream.

The production of smolt for River Göta älv is conducted in an inland facility, in a river system draining to the Baltic sea. It is situated upstream of several migration obstacles, i.e. the risk of contamination wild Baltic salmon with alien genetic material is minimized.

Otherwise no salmon or rainbow trout farms exist in coastal waters or in coastal rivers within the range of Atlantic salmon. However, rainbow trout is farmed at several places in watersheds emptying on the Swedish west coast. All these are in inland waters, well beyond the migration of Atlantic salmon.

**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)**

A public conference was held in November 29<sup>th</sup> 2018. The present status, suggested improvement to national legislation and the new implementation plan were presented. The public could ask questions and raise new issues, both orally and in writing. At the meeting were representatives of several different NGOs, regional fishing officers, fishing right owners, the Sportfishing association of Sweden and the press. (At the meeting the Year of the salmon 2019 was also launched.)

A special project by the Swedish Federation of Fishing Rights Owners, funded by the Swedish Agency for Marine and Water Management, to facilitate the forming of new fish management units is ongoing, to facilitate local management and improve implementation of management guidelines and actions in salmon rivers.

## **2. Management of 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 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)**

Management should consider both production and conservation goals, with the latter being prioritized at the present stock situation, aiming at full reproductive capacity of individual river stocks with maintained or restored genetic diversity.

Fishing must be adapted to each stock status and diversity, while maintaining a common framework as far as possible with respect to general rules and legislation.

Increased local awareness and participation in salmon management and conservation is encouraged.

### **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 Swedish Agency for Marine and Water Management monitors the fisheries and evaluates the status of the stocks and the fishing annually, with the assistance of the County Administrative Boards and the Swedish University of Agricultural Sciences. Suggestions of altered management are first discussed in this group (National fish management group) before suggestions are made to stakeholders and NGO's.

Fishing rights owners, NGO's or the public can also continuously suggest actions for conservation and rebuilding of stocks.

Evaluation of the status of each stock and the stock-complex as a whole is carried out annually. Altered legislation is normally applied before the start of the next fishing season. If there is need for urgent regulation of fishing rules the Swedish Agency for Marine and Water Management can take appropriate measures to regulate or even stop salmon fisheries both on the coast and in specific rivers. So far this has not been necessary as voluntary actions are undertaken if needed, e.g. closed river fishing during the warm summer of 2018.

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

a) Yes, but with caution.
b) 10 individual rivers (46% of rivers monitored) are below reference values, but fishing does not occur in 3 of these rivers.
<p>c) According to a proposal for a new national legislation all large (MSW) salmon caught will have to be released in rivers with reduced reproduction capacity, starting the fishing season of 2020. The size of salmon that needs to be released is adapted to characteristics of the individual rivers. An increase in egg deposition of at least 25% is expected from this management action, according to an assessment made.</p> <p>The proportion of 1SW salmon returns has decreased over time. The feeding conditions at sea determines the proportion of 1SW salmon returning to spawn. With harsher conditions at sea more fish need more time at sea to mature and hence return as MSW. The increasing proportion of returning MSW fish, in addition to their relatively greater contribution to recruitment (larger fish produce more and larger eggs), makes them a more important resource to protect for stock rebuilding.</p> <p>Catch and release are practiced in an increasing amount in rivers, today ca 30% of the catch is released back alive. This is not required by the national legislation, but is voluntary. With dwindling stocks these voluntary restrictions have increased due to information exchange with responsible authorities.</p>
<p><b>2.4 (a) Are there any mixed-stock 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)</b> (Reference: Section 2.8 of the Fisheries Guidelines)</p>
<p>(a) Yes, in three rivers (see b). The coastal fishery was formerly a mixed-stock fishing, but catches of salmon is now negligible (no salmon traps, no commercial fishing, restrictive regulation of gill nets fishing with a ban on fishing at depth of 3 m or more, number of nets limited and set time and mesh size is regulated). Reported catches in the coastal fishery are below 50 kg (often by-catch of salmon in trawling) in 2016-2018.</p>
<p>(b) There are mixed-stock fisheries in three rivers because of stocking of reared salmon smolt (fin-clipped), a compensation for lost habitat upstream and poorer habitat downstream (e.g. hydropeaking) due to hydropower production. Wild salmon from tributaries are caught in rod-and-line fishing along with stocked salmon.</p>
<p>c- The exact amount of wild salmon caught in these rivers has not been possible to monitor fully due to lack of detailed catch statistics (inadequate reporting of fin-clipped salmon). A study performed in River Göta älv in 2018 (when also the reporting of fin-clipping was satisfactory) revealed that 30 – 40 % (500 salmon) of the total catch was wild salmon and the other part result of compensatory releases of farmed and fin-clipped smolt. The amount in the other two rivers is estimated to be much less, around 50 salmon. This would amount to 10% of the total annual nominal catch of wild salmon in river Lagan and Nissan, and less than 5% of the total nominal catch (reared and wild).</p>
<p>(d) The Swedish Agency for Marine and Water management will propose to change the national legislation prohibiting landing of wild salmon (with adipose fin) in these rivers starting in 2020. As for the wild stocks they are managed and monitored as all other stocks.</p>
<p><b>2.5 How are socio-economic factors taken into account in making decisions on management of salmon fisheries? (Max. 200 words)</b> (Reference: Section 2.9 of the Fisheries Guidelines)</p>
<p>The fishing right is privately owned and often managed in the form of “fishing management units” (FMU; “Fiskevårdsområden” in Swedish). These are often organized within “The Swedish Federation of Fishing Rights Owners”.</p> <p>The decision-making process includes these and other stakeholders, e.g. the national sport fishing association, nature conservancy groups, coastal household fishing associations etc., in the form of a written remittance of suggested fisheries management. This procedure gives a transparent process and is common in Sweden. Biannually or annually a conference, where all</p>

stakeholders are invited, is held presenting stock status, suggestions on future fishery management and where the advice of ICES and NASCO is presented.	
<b>2.6 What is the current level of unreported catch and what measures are being taken to reduce this? (Max. 200 words)</b> <i>(Reference: Section 2.2 of the Fisheries Guidelines and the Minimum Standard)</i>	
As a precautionary approach, it has nationally been decided to estimate the unreported catch to 10% of the reported catch (both reared <u>and</u> wild salmon). The correct figure is definitively lower, but not quantified as data from sport fishing and household fishing on the coast is not available. However, a survey undertaken in 2000 showed insignificant numbers of salmon caught in household fishing.	
Catch statistics from the rivers regarding numbers and weight of salmon landed is good and reliable. The commercial salmon fishery on the coast is gone. But, as stated above, sport fishing and household fishing on the coast are not reporting. According to Swedish legislation, responsible authorities cannot force these fishermen to submit catch statistics. Sweden is planning a large survey of coastal fishing of salmon and brown trout, which will improve the estimate of unreported catches.	
<b>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)</b> <i>(Reference: Six Tenets for Effective Management of an Atlantic Salmon Fishery, WGCST(16)16)</i>	
(a) No assessment carried out yet.	
(b) Not applicable.	
(c) No formal assessment according to the protocol has been performed. It is scheduled to be carried out in 2022.	
<b>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.</b>	
Threat / challenge F1	Decreased marine survival makes all, but especially already weak, salmon stocks more sensitive to exploitation.
Threat / challenge F2	Mixed-stock fisheries in three rivers (wild and reared salmon).
Threat / challenge F3	Over-exploitation of large salmon in weak stocks.
Threat / challenge F4	46% of river stocks are assessed having reduced reproductive capacity.
Threat / challenge F5	Maintaining genetic diversity of stocks and biodiversity of salmon rivers.

<b>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?</b>		
<b>Action F1:</b>	Description of action:	New fishing rules: Implementing fishing rules that avoids exploitation of large salmon in weak stocks by introducing maximum length for landed fish (prohibiting catch of large salmon) or if needed more restrictive fishing rules. New fishing rules will be followed up by special projects for information about the new rules and fisheries control. (Threat / challenge F3: Over-exploitation of large salmon in weak stocks.)
	Planned timescale (include milestones where appropriate):	New legislation will be enforced in 2021.
	Expected outcome:	Decreased number of rivers with weak (reduced reproductive capacity) stocks.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : New fishing rules implemented in 2020. Monitored by: Fishery statistics.
	Funding secured for both action and monitoring programme?	Yes
<b>Action F2:</b>	Description of action:	Fin-clipping smolts: Continue the ongoing fin-clipping (adipose fin) program since 2005 of all reared and stocked salmon and brown trout smolt to be able to separate wild and reared salmon in mixed stock river fisheries. (Threat / challenge F2: Mixed-stock fisheries in three rivers (wild and reared salmon).)
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.
	Expected outcome:	Enabling anglers to distinguish between wild and reared salmon in mixed stock fisheries to avoid landing wild salmon. Only reared salmon is landed in these rivers (all wild salmon released alive).
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : all reared and stocked salmon and brown trout smolts are fin-clipped each year. Monitored by: The County Board’s regionally responsible fisheries officer checks smolt quality and fin-clipping before release of reared smolt.
	Funding secured for both action and monitoring programme?	Yes
<b>Action F3:</b>	Description of action:	Coastal MSF: Avoiding mixed-stock fisheries on the coast to counteract effects of decreased marine survival by reducing exploitation of weak stocks. (Threat /challenge F1: Decreased marine survival makes all, but especially already weak, salmon stocks more

		sensitive to exploitation.)
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.
	Expected outcome:	Catches of salmon in coastal waters will stay negligible (<100 salmon) to mitigate effects of low marine survival and help restore weak stocks.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : No new mixed stock fisheries operating on the coast in 2019-2024. Monitored by: Catch statistics of salmon.
	Funding secured for both action and monitoring programme?	Yes
<b>Action F4:</b>	Description of action:	Riverine MSF: Avoiding mixed-stock fisheries in rivers with stocking of reared salmon in the main river stem and production of wild salmon in tributaries. (Threat /challenge F2: Mixed-stock fisheries in three rivers (wild and reared salmon)). New fishing rules will be followed up by special projects for information about the new rules and fisheries control.
	Planned timescale (include milestones where appropriate):	New legislation will be enforced in 2021.
	Expected outcome:	Recovery of wild salmon stocks in tributaries to the rivers Göta älv, Nissan and Lagan. No landed wild salmon in rivers with mixed stocks of reared and wild salmon from 2021 and onward. The status of tributary stocks above reduced reproductive capacity in 2030 (two generations).
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : New legislation enforced in 2021. Monitored by: Catch statistics (to assess number of landed wild and reared salmon).
	Funding secured for both action and monitoring programme?	Yes
<b>Action F5:</b>	Description of action:	Genetic diversity: Successively, improve knowledge of genetic diversity and status of all stocks in the main rivers, and larger tributaries to be able to maintain genetic diversity. Has been ongoing since 2015. (Threat /challenge F5: Maintaining genetic diversity of stocks and biodiversity of salmon rivers). This action may lend itself to a more qualitative approach to monitoring as it focuses on learning and increasing knowledge, which is hard to strictly quantify. The aim will be to improve the genetic baseline by increasing the number of analyzed individuals in the baseline.
	Planned timescale (include milestones where appropriate):	Will continue 2019-2024.
	Expected outcome:	Improved genetic baseline and genetic diversity data will give a

		new tool for management, where genetic diversity can be included in management (see section 1.1).
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : analyse at least 30 individuals per major river stock sampled at multiple sites, collected by electrofishing and have all salmon rivers, even with small habitat/smolt production, sampled by 2024.
	Funding secured for both action and monitoring programme?	Expected
<b>Action F6:</b>	Description of action:	Stock status: Annually assesses each river stock's reproductive capacity (stock status). Ongoing, since 2017 using improved assessment model. Stocks with a salmon habitat less than 2 hectares or with smolt estimates <500 smolt will be assessed only if data (electrofishing, automatic fish counters) is available from other programmes (outside salmon monitoring). In rivers where smolt and spawner counts are not available electrofishing data is used together with the stock/recruitment function from the index river to set a conservation limit. (Threat /challenge F4: 46% of river stocks are assessed having reduced reproductive capacity)
	Planned timescale (include milestones where appropriate):	Will continue 2019-2024.
	Expected outcome:	Attainment of essential data for better local and national management by estimating number of smolt, ascending individuals and parr in salmon smolt traps, fish counters and electrofishing surveys respectively. Yearly estimates of parr densities at spawning and nursery grounds in all rivers with an estimated smolt production >500 smolt annually. Yearly estimates of stock status in these rivers. In rivers with smaller habitat/production status is estimated if data are available from other programs.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Yearly estimates of stock status in ten rivers with an estimated smolt production >500 smolt annually. Monitored by: Stock status reported yearly to ICES WGNAS.
	Funding secured for both action and monitoring programme?	Yes
<b>Action F7:</b>	Description of action:	Exploitation in rivers: Monitor exploitation in two rivers to be able to assess exploitation effects on stock status. This data can then be extrapolated to other rivers. (Threat /challenge F4: 46% of river stocks are assessed having reduced reproductive capacity). Ongoing since 2000.
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.

	Expected outcome:	Attainment of exploitation data used for the ICES WGNAS salmon stock complex assessment by data collection in fish counters and salmon traps combined with fishery statistics.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Yearly data on exploitation rate in two rivers. Monitoring by: Data reported yearly to ICES WGNAS.
	Funding secured for both action and monitoring programme?	Yes
<b>Action F8:</b>	Description of action:	Improve catch statistics: In rivers, with regard to catch and release and fin-clipping. Focus will be on informing people responsible for river fisheries of the requirements for satisfactory catch statistics. National mandatory reporting of recreational catches are not permitted according to Swedish fishery legislation, but if stock status/or the presence of mixed-stock fisheries cannot be assessed the river stock as a whole could be considered as of weak status. (Threat /challenge F1- F4: Decreased marine survival makes all, but especially already weak salmon stocks more sensitive to exploitation, Mixed-stock fisheries in three rivers (wild and reared salmon), Over-exploitation of large salmon in weak stocks, 46% of river stocks are assessed having reduced reproductive capacity.)
	Planned timescale (include milestones where appropriate):	Have total reporting of C&R in river fishery in 2024. Have total reporting of presence/absence of adipose fin from fishing in all rivers in 2024 (one river remaining).
	Expected outcome:	Improved catch statistics resulting in better management advice.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Total reporting of C&R in ten rivers with majority of fishery.
	Funding secured for both action and monitoring programme?	Yes

<b>3. Protection and Restoration of Salmon Habitat:</b> <i>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.</i>
<b>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)</b>
Productive capacity is assessed on a stock basis, river by river, according to the national model (see Section 1.1 and 1.2). Habitat area has been found to be linked with genetic diversity of salmon, and thereby with salmon population status. Further, salmon habitat is important for overall biodiversity and river health, as well as several ecosystem services. Conservation of the salmon habitat is also essential for red-listed species, e.g. eel, sea lamprey, freshwater pearl mussel, river otter and the kingfisher. Salmon habitat conservation and restoration is thus an important societal task and

prioritized in water management.

Risks to productive capacity are identified by habitat loss or deterioration. The habitat area is continuously monitored. Sweden has started to develop a standardized method for identifying salmon habitat and to assess the quality (in a scale from 0 to 8). The model will be further improved during the implementation period.

As evident from section 1.5 the total salmon habitat has increased 7% from 1999 to 2015. New and continued inventories and restoration measures are suggested below. Several of the actions suggested will increase available habitat and the quality of habitat. Net loss of available habitat or the habitat quality shall be avoided.

**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)*

Fishing rights in fresh waters are privately owned, but generally open to the public through fishing licenses. Relevant stakeholders are invited to be involved in the management process. Socioeconomic factors are considered in the management by considering the opinions and management suggestions made by relevant stakeholders on this issue, as well as considering official national and NASCO socio-economic guidelines and policies, when making decisions on habitat management. Along with the Swedish Federation of Fishing Rights Owners and the Swedish Anglers association, also several municipalities participate in the work with salmon and healthy rivers. Through “Catchments Partnerships” (according to the Water framework directive; in Swedish “Vattenråd”) societal cooperation has also increased along river valleys.

As stated in section 2.1 public participation in management and conservation is encouraged through information and transparent decision making. To increase information transfer the Swedish Agency for Marine and Water Management is developing a public web-site focussing on salmon (Baltic, Atlantic and land-locked salmon of Lake Vänern).

**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) The most important issues are to implement better water regulation from hydropower production and to regulate water removal by agriculture and urban areas. Both these issues are addressed below.

(b) This is mainly addressed under the next section (4) with focus on identification.

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

Threat / challenge H1	Hydropower exploitation resulting in habitat loss (dams) and degradation (water regulation, channelization).
Threat / challenge H2	Channelizing rivers for agricultural activities (drainage of land areas) resulting in habitat loss and degradation.
Threat / challenge H3	Acidification (increasing mortality of salmon eggs and fry).
Threat / challenge H4	Water withdrawal for irrigation purposes resulting in habitat loss and degradation.

**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?**

<b>Action H1:</b>	Description of action:	Liming: Continued liming of acidified salmon rivers and tributaries to counteract acidification. There are presently 18 river systems in the liming program. (Threat / challenge H3: Acidification (increasing mortality of salmon eggs and fry)). Liming has been ongoing since 1976.
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.
	Expected outcome:	Keeping pH-levels above 6.0 and inorganic aluminium at non-toxic levels, thereby minimizing mortality of salmon eggs and fry. Keeping pH-levels above 6.0 and inorganic aluminium at non-toxic levels will also keep a generally high biodiversity (especially invertebrates, amphibians and fish) in salmon rivers.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal:</u> List of all rivers limed each year in 2019-2024. Monitored by: Electrofishing & chemical monitoring carried out by the County Administrative Boards to assess water chemistry and survival of eggs and fry.
	Funding secured for both action and monitoring programme?	Yes Funded within the Swedish liming programme.
<b>Action H2:</b>	Description of action:	Habitat survey: Compiling habitat surveys, adding quality assured and new data when required to map good as well as degraded and lost salmon habitats resulting from Threat / challenge H1-H4 (hydropower exploitation, channelizing, acidification and water withdrawal) to be able to take the correct management actions.
	Planned timescale (include milestones where appropriate):	A compilation of existing salmon habitats was carried out in 2015. An update will be compiled in 2022 and the quality of the salmon habitats will be quantified in 2024.
	Expected outcome:	The data compilation, using field surveys, electrofishing data & GIS analyses, will form the basis for further actions to improve quality and extent of salmon habitats. As stated above several other species and ecosystem services will also benefit from relevant actions identified.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal:</u> Compile an updated habitat survey in 2022. Quantify the quality of the salmon habitats in 2024. Monitored by: Not applicable.
	Funding secured for both action and monitoring programme?	Expected
<b>Action H3:</b>	Description of action:	Habitat restoration: Develop <i>Best available methods</i> to restore salmon habitats that

		have been degraded or lost due to Threat /challenge H1-H4 (hydropower exploitation, channelizing, acidification and water withdrawal).
	Planned timescale (include milestones where appropriate):	Undertaken in cooperation with a Life-project (Rönneå river). Results are planned to be presented in 2023.
	Expected outcome:	Web-based guidelines for <i>Best available methods</i> on restoration publicly available on a planned “Restoration website” of the Swedish Agency for Marine and Water Management.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Web-based guidelines published on website in 2023. Monitored by: Not applicable.
	Funding secured for both action and monitoring programme?	Expected
		Choose an item.
<b>Action H4:</b>	Description of action:	Habitat restoration: Continued habitat restoration in salmon rivers to counteract degraded and lost salmon habitats resulting from Threat / challenge H1-H4 (hydropower exploitation, channelizing, acidification and water withdrawal) and strengthen salmon stocks. Habitat restoration has been ongoing since the late 1970s.
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.
	Expected outcome:	Improved conditions facilitating increased smolt production, salmon genetic diversity and general aquatic and riparian biodiversity.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Increase the total area of accessible salmon habitat during 2019-2024 as compared to 2015. Monitored by: Compare habitat survey to the survey made in 2015.
	Funding secured for both action and monitoring programme?	Yes
<b>Action H5:</b>	Description of action:	Connectivity: Publish national guidelines for best available technology (BAT) of fish passages, to let salmon pass hydropower plants and other migrations obstacles (Threat /challenge H1, hydropower exploitation, channelizing, acidification and water withdrawal), based on a compilation of existing knowledge, from international and national literature. This action may lend itself to a more qualitative approach and monitoring as it is hard to measure the increase in knowledge the guidelines will produce.
	Planned timescale (include milestones where appropriate):	Have guidelines published in 2020.
	Expected outcome:	A handbook will facilitate decision-making in planning new fish passages.
	Approach for	<u>Quantitative goal</u> : The electronically available handbook (in

	monitoring effectiveness & enforcement:	Swedish) will be available in 2020. Monitored by: Not applicable.
	Funding secured for both action and monitoring programme?	Yes
<b>Action H6:</b>	Description of action:	Water regulation: Development of national guidelines for water regulation that can protect or restore salmon habitats. (Threat / challenge H1, H2 and H4, hydropower exploitation, channelizing and water withdrawal). Water regulation that leave riverbeds dry or with very low or irregular flows (hydropeaking) will result in degraded or lost salmon habitats. See also action H8.
	Planned timescale (include milestones where appropriate):	Research projects: Ecospill finished in 2022 (focussed on hydropeaking and habitat restoration in in bypassed river reaches),
	Expected outcome:	Water regulation that can protect or restore salmon habitats.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal:</u> Scientific based recommendations available 2022. Monitoring by: Implementation pending the work with the national plan for environmental screening of all hydropower (see below). No short term effects expected but on the longer time scale electrofishing data/fish counter data can be used to study effects of a more salmon friendly water regulation.
	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)**

<i>(Reference: BMP Guidance)</i>	
(a)	Not applicable as Sweden has no rearing of salmon in net pens in the sea.
(b)	See above.
<b>4.2</b>	<p><b>(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)</b></p> <p><i>(Reference: BMP Guidance)</i></p> <p><i>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.</i></p>
(a)	Not applicable as Sweden has no rearing of salmon in net pens in the sea.
(b)	Not applicable as Sweden has no rearing of salmon in net pens in the sea.
(c)	Not applicable as Sweden has no rearing of salmon in nets pen in the sea.
<b>4.3</b>	<p><b>(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)</b></p> <p><i>(Reference: BMP Guidance)</i></p> <p><i>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.</i></p>
(a)(i)	Not applicable.
(a)(ii)	Not applicable.
d)	Not applicable.
e)	Not applicable.
<b>4.4</b>	<p><b>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)</b></p> <p><i>(Reference: BMP Guidance and Article 11 of the Williamsburg Resolution)</i></p>
Not applicable.	
<b>4.5</b>	<p><b>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)</b></p>
(a)	Farming of rainbow trout is not allowed within the distribution range of Atlantic salmon in rivers. In rivers without <i>Gyrodactylus salaris</i> salmonids are not allowed to be stocked, due to the risk of spreading the parasite.
(b)	Not applicable.
<b>4.6</b>	<p><b>What progress has been made to implement NASCO's guidance on introductions, transfers and stocking? (Max. 200 words)</b></p> <p><i>(Reference: Articles 5 and 6 and Annex 4 of the Williamsburg Resolution)</i></p>

<p>Open rivers and streams by removing barriers and create conditions required for fish migration, including habitat restoration of spawning and nursery areas. For example in river Ätran, upstream migration of the Atlantic salmon increased with 47% during the first year (Addressing Annex 4 of the Williamsburg Resolution).</p>
<p>Publication in 2018 of a national Alien Species List, with ecological impact assessments (including indigenous species) of more than a thousand of alien species. About forty fish species, including “door-knockers” (potentially introduced in near future) are systematically evaluated by using a method developed by Norwegian Biodiversity Information Centre (Addressing article 6 of the Williamsburg Resolution).</p>
<p>River classification - complementing and updating the list of “national valuable lakes and streams”, taking into account environmental, cultural and/or fish/fishery perspectives. (Addressing Annex 4 of the Williamsburg Resolution).</p>
<p>Special efforts are made to increase knowledge and awareness on risks of illegal introductions and transfers of fish, including non-indigenous populations/species, diseases and parasites. For example by web-information, web-application developed for facilitating citizen participation in reporting and campaigns (Addressing article 5, article 6 and Annex 4 of the Williamsburg Resolution).</p>
<p><b>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)</b>  <i>(Reference: Guidelines for incorporating social and economic factors in decisions under the Precautionary Approach and Annex 4 of the Williamsburg Resolution)</i></p>
<p>(a) Decisions on fish stocking are examined by the competent authorities, i.e. the regional county boards. The decisions are based on international and national guidelines and legislation, addressing potential risk, as for example fish with infectious diseases or none-indigenous species, including populations. Decisions are taken with respect to, for example valuable populations and/or habitats, and risk of spread.</p>
<p>(b) No</p>
<p><b>4.8 What is the policy / strategy on use of transgenic salmon? (Max. 200 words)</b>  <i>(Reference: Article 7 and Annex 5 of the Williamsburg Resolution)</i></p>
<p>Transgenic fish is due to national legislation only allowed to be kept in enclosed biosecure laboratory facilities. The Swedish Agency for Marine and Water Management examine time-limited permits.</p>
<p><b>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 <i>Gyrodactylus salaris</i> and eradicate it if introduced, including the development and testing of contingency plans? (Max. 200 words)</b>  <i>(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)</i></p>
<ol style="list-style-type: none"> <li>1. Preventive measures and contingency planning: Stocking of fish to uninfected river systems are forbidden. A contingency plan for <i>Gyrodactylus</i> is planned (see below).</li> <li>2. Cooperation on management: Sweden is participating in the NASCO <i>Gyrodactylus salaris</i>-group. Extended cooperation with Norway is on-going, e.g. with regard to information on known populations of <i>Gyrodactylus</i>, risk analysis, determination of species and clads/haplotypes.</li> <li>3. Monitoring methods for use in watercourses, lakes and in aquaculture: In the present program, salmon fry and parr are collected with electrofishing and then screened for</li> </ol>

<p><i>Gyrodactylus</i>. Cooperation with Norway to determine species and haplotype. eDNA may be introduced in the monitoring from 2020.</p> <ol style="list-style-type: none"> <li>4. Distribution of <i>G. salaris</i> in the NEAC area and adjacent areas: Ongoing monitoring of <i>G. salaris</i> distribution since 2001 in its present form. First investigations 1989-1992.</li> <li>5. Classification of <i>Gyrodactylus</i> species: Species and haplotype analysed yearly.</li> <li>6. Publicity, education, and awareness: Public instructions on how to prevent further spread of <i>Gyrodactylus</i> are available on the web.</li> <li>7. Criteria for diagnosis and establishing <i>G. salaris</i> free zones. <i>G. salaris</i> is sampled and analysed according to OIE Manual of Diagnostic Tests for Aquatic Animals (ethanol-preserved fish, DNA analysis).</li> <li>8. Trade in live susceptible fish species: Stocking of fish to uninfected river systems is forbidden.</li> <li>9. Shared catchments: No shared catchments exist now, but extended cooperation with Norway is on-going, e.g. with regard to information on known populations of <i>Gyrodactylus</i>, risk analysis, determination of species and clads/haplotypes.</li> </ol>	
<p><b>4.10 Identify the main threats to wild salmon and challenges for management in relation to aquaculture, introductions and transfers, and transgenics.</b></p>	
Threat / Challenge A1	Invasions of alien Atlantic salmon, often escapees from salmon farms in other countries.
Threat / challenge A2	Alien species of <i>Oncorhynchus</i> can spread parasites and diseases, disturb spawning and cause interspecific hybridisation.
Threat / challenge A3	Increased occurrence of adult salmon with diseases (visible as dermal fungus and open wounds) and high mortality. The cause(s) is not yet established but disease can spread from fish farms or with fish farm escapees.
Threat / challenge A4	Impact of <i>Gyrodactylus salaris</i> on stocks.

<p><b>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?</b></p>		
<b>Action A1:</b>	Description of action:	<i>Gyrodactylus salaris</i> : Continued monitoring of <i>Gyrodactylus salaris</i> to assess impact in already infected populations of salmon and to detect potential spread of the parasite to new rivers. Monitoring program has been ongoing since 2001. First investigations 1989-1992. In the present program, salmon fry and parr are collected with electrofishing and then screened for <i>Gyrodactylus</i> . Cooperation with Norway to determine species and haplotype. eDNA may be introduced in the monitoring from 2020. (Threat / challenge A4: Impact of <i>Gyrodactylus salaris</i> on stocks)
	Planned timescale (include milestones where appropriate):	Will continue in 2019-2024.
	Expected outcome:	Continuous information on impact in already infected populations of salmon and detection potential spread of the parasite to new rivers.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Yearly quality assured data on presence and prevalence of the parasite. Data stored in database. Monitored by: Data is reported yearly to ICES WGNAS.
	Funding secured for both action and	Yes

	monitoring programme?	
<b>Action A2:</b>	Description of action:	<i>Gyrodactylus salaris</i> : Develop contingency plan for <i>Gyrodactylus salaris</i> so that actions to mitigate the effects of a spread of the parasite can be rapidly undertaken. In the existing monitoring program, salmon fry and parr are collected with electrofishing and then screened for <i>Gyrodactylus</i> . Cooperation with Norway to determine species and haplotype. eDNA may be introduced in the monitoring from 2020). (Threat / challenge A4: Impact of <i>Gyrodactylus salaris</i> on stocks)
	Planned timescale (include milestones where appropriate):	Plan submitted to NASCO in 2022.
	Expected outcome:	Decided actions to be undertaken if the parasite spreads to new water systems close to Norway or the Atlantic coast of Finland. Relevant authorities and stakeholders identified. The parasite is considered endemic to the Baltic sea area.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Contingency plan to mitigate the effects of a parasite spread submitted to NASCO in 2022.
	Funding secured for both action and monitoring programme?	Yes
<b>Action A3:</b>	Description of action:	Alien species or populations: Develop the national ability to genetically identify alien Atlantic salmon ( <i>Salmo salar</i> ) and <i>Oncorhynchus</i> species in catches. Alien species and escaped cultured salmon into natural ecosystems may threaten wild populations both ecologically and genetically. Especially alien Atlantic salmon can be hard to distinguish from our stocks in field, but if tissue samples from suspected alien fish can be sent to the lab for genetic identification efforts to screen for and remove alien fish can be made when they pass fish ladders or are caught in brood stock fishery. The aim is to genetically screen a maximum of 100 suspected alien species/salmon annually reported by fishermen or caught in the trap in index river. (Threat / challenge A1-A2: Invasions of alien Atlantic salmon, often escapees from salmon farms in other countries; Alien species of <i>Oncorhynchus</i> can spread parasites and diseases, disturb spawning and cause interspecific hybridisation)
	Planned timescale (include milestones where appropriate):	Good ability to identify reared Atlantic salmon by 2020. As for <i>Oncorhynchus</i> species we are awaiting Norwegian results.
	Expected outcome:	Ability to identify alien species and stocks in our rivers. According to the impending new legislation in stocked salmon rivers only fin-clipped salmon can be landed. If escapees from salmon farms occur, they will have intact adipose fins (and cannot be harvested in the river fishery). It is important to rapidly be able to identify these fish genetically so that they may be removed when they pass fish ladders or are caught in brood stock fishery.

		The aim is to remove all alien species from brood stocks and remove as many alien individuals as possible from the index river.
	Approach for monitoring effectiveness & enforcement:	<u>Quantitative goal</u> : Yearly report of the number of screened fish. Monitored by: Data on detected alien species/populations reported to ICES WGNAS. Comparing genetic analyses with other countries will secure for good detection ability.
	Funding secured for both action and monitoring programme?	Expected
		Choose an item.