Agenda Item 6.1(a)
For Decision

Council

CNL(10)11

Final Report of the
Habitat Protection, Restoration and Enhancement
Focus Area Review Group

CNL(10)11

Final Report of the Habitat Protection, Restoration and Enhancement Focus Area Review Group

1. The second focus area is the protection, restoration and enhancement of Atlantic salmon habitat. Last year the Council received an interim report, CNL(09)12, from this *Ad Hoc* Review Group established to review and analyse the FARs; to identify common management and scientific approaches to challenges; to recommend best practice; and to provide feedback where additional actions may be helpful to ensure consistency with NASCO's Habitat Plan of Action. The Group had met in London in February 2009 and in section 5 of its Interim Report had presented its review and analysis of the FARs and feedback on where additional actions were needed.

2. Since last year, the Review Group has completed its work by correspondence. It has reviewed two more FARs (EU-France and EU-Sweden), received by the Secretariat by the Council's deadline of 1 September 2009. It has also prepared an overview of approaches to addressing scientific and management challenges based on information contained in the FARs, and it has drafted guidelines on habitat, protection, restoration and enhancement.

3. The *Ad Hoc* Review Group will present its findings at a Special Session open to all delegates at the Twenty-Seventh Annual Meeting when the Parties and jurisdictions will have an opportunity to respond. The Council is asked to consider the Group's report and decide on appropriate action.

Secretary
Edinburgh
12 May 2010

IP(09)21

Final Report of the Meeting of the Ad Hoc Review Group on Protection, Restoration and Enhancement of Salmon Habitat

NEAFC Headquarters, 22 Berner's Street, London E1T 3DY 17 - 20 February 2009

Note: ***The Review Group met in London from 17 - 20 February 2009 and its interim report, CNL(09)12, was presented to the Council at NASCO's Twenty-Sixth Annual Meeting in June 2009. Since then the Group has worked only by correspondence and has reviewed two additional FARs (EU - France and EU - Sweden) received by the deadline of 1 September 2009 (section 5.12), and developed draft guidelines on habitat protection, restoration and enhancement (Annex 3) and an overview of approaches to address scientific and management challenges as identified in the FARs (Annex 4). The Group did not reassess the FARs in the light of the draft guidelines but believes that these should assist both the jurisdictions in implementing the NASCO Plan of Action and in developing inventories and subsequent habitat FARs, and future Review Group's in assessing the FARs. This report is based on the Group's Interim Report but has been updated to reflect the work completed by correspondence since last June.***

1. Opening of the Meeting by the Coordinator

1.1 The Coordinator, Dr Malcolm Windsor, opened the meeting and welcomed the members of the *Ad Hoc* Review Group to London. He referred to the lessons learned by the two previous Review Groups that might assist with the assessment of the habitat FARs. The task before the Group is to: review the habitat FARs; identify common management and scientific approaches to challenges; compile recommended best practice; and provide feedback on each FAR detailing where additional actions may be needed to ensure consistency with the NASCO Plan of Action. NASCO's objective is to maintain and, where possible, increase, the current productive capacity of Atlantic salmon habitat. He indicated that the process of reviewing FARs in a transparent and inclusive manner is a central element of the 'Next Steps' process. It is an inclusive review process involving representatives of the Parties and of the NGOs, it allows progress in implementing NASCO's agreements to be assessed and it allows an exchange of information on best practice and identification of common challenges, thereby facilitating the collaborative learning process that the Council seeks to encourage. He stressed that the members of the Group from the Parties are representing the Organization and specifically not their Parties. The NGOs represent the international NGO community in NASCO. The Coordinator's role is to chair the meeting and facilitate the Group's work; he would not be one of the reviewers, nor would the Assistant Secretary who would also facilitate the Group's work and serve as Rapporteur. He also stressed that it was not necessary for the Group to reach unanimous agreement on its assessments although consensus would strengthen its report.

1.2 A list of participants at the Group's meeting in London is contained in Annex 1. Boyce Thorne-Miller was unable to attend the meeting and Sue Scott served as her replacement.

2. Adoption of the Agenda

2.1 The Group adopted its agenda, IP(09)15 (Annex 2). The Group agreed that it would carry out the tasks under agenda item 5, including identifying any questions or issues for the jurisdictions, before developing its recommendations on best practice.

3. Review of the Terms of Reference and Consideration of Working Methods

3.1 The Terms of Reference for the *Ad Hoc* Review Group, as detailed in Council document CNL(08)33 are as follows:

1. Review and analyze the Focus Area Reports on Protection, Restoration and Enhancement of Habitat;

2. Prepare a report which includes the following:

a. Identification of common challenges in the FARs;
b. Identification of common management and scientific approaches to challenges, as reported in the FARs;
c. Compilation of recommended best practice with the intention of increasing the collaborative learning aspect of the 'Next Steps' Process; and
d. Recommendations and/or feedback for each FAR where additional actions may be helpful to ensure consistency with the "Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat."

3.2 The procedure the *Ad Hoc* Review Group was asked to use to accomplish its work is as follows:

1. Meet in February 2009 to review the Focus Area Reports submitted, collaborate to highlight questions and/or issues to be sent back to the Parties/Jurisdictions by March 1, 2009. These answers should assist the *Ad Hoc* Review Group in preparing their report. Responses would be due from the Parties/Jurisdictions by April 1, 2009.

2. Provide a draft report, as described in item 2, by May 15, 2009 for circulation to contracting Parties prior to the annual meeting.

3. Present an overview of the draft report at the Special Session at the 2009 Annual Meeting, and facilitate a discussion on the five areas identified above (paragraph 3.1) in item 2. Parties and jurisdictions will not be expected to present their FAR during the Special Session, but may be asked to present information at the request of the *Ad Hoc* Review Group.

4. Following the Special Session, prepare a final report for submission to the President by August 31, 2009.

3.3 The Group discussed its working methods. Prior to the meeting a format for assessing the FARs had been developed based closely on the structure and content specified by the Council in document CNL(08)33. An initial reviewer was assigned to each FAR from among the NASCO representatives and the NGOs also undertook initial reviews of all the reports. These initial reviews from the NASCO representatives and the NGOs formed the basis for deliberations by the whole Group (see paragraph 5.9 below).

4. Consideration of the elements of 'Best Practice' relating to the protection, restoration and enhancement of salmon habitat.

4.1 The Group discussed the development of best practice or guidelines for the protection, restoration and enhancement of salmon habitat. The Group recognised that while it could not develop detailed best practice on habitat protection, restoration and enhancement (e.g. relating to fish passage, in-stream habitat improvements, management of riparian vegetation etc.) it could develop guidelines, as had been done for management of salmon fisheries, to assist jurisdictions in implementing NASCO's agreements and reporting in subsequent habitat FARs, to address inconsistencies in the agreements and to assist future Review Group's in assessing the FARs. The Group noted that the NASCO Plan of Action requires the establishment by jurisdictions of comprehensive salmon habitat protection and restoration plans and inventories to measure and improve progress in meeting the objective of the Plan of Action. While the NASCO Plan of Action addresses only habitat protection and restoration, the guidance adopted by the Council on the structure and content of FARs and the work of the Review Group, CNL(08)33, also refers to habitat enhancement. The Group decided, therefore, to include elements on habitat enhancement (both artificial enhancement of existing habitat and opening up previously inaccessible habitat) in the Draft Guidelines since it believes that such activities need careful consideration and consultation because of their potential to adversely impact other species. Furthermore, the Group felt that the development of general guidance on the habitat requirements of the Atlantic salmon and of the factors that may impact on these requirements might assist in the development of inventories, as required under the Plan of Action, and in the development of measures to protect and restore habitat. Draft Guidelines on Habitat Protection, Restoration and Enhancement are contained in document IP(09)22 (Annex 3).

4.2 The Group also considered the question of whether NASCO might facilitate a more detailed exchange of information on specific issues related to habitat management e.g. fish passage, liming of acidified waters, flow requirements. Such a process would further enhance the collaborative learning approach envisaged under the 'Next Steps' process. For example, the Council might consider whether, in future, there might be Special Sessions on particular aspects from among the wide range of factors that can impact salmon habitat. These factors are described in the Draft Guidelines.

5. Review and analysis of FARs and identification of additional actions to ensure consistency with NASCO agreements relating to habitat.

Jurisdictions not submitting a FAR

5.1 Before presenting its recommendations arising from the reviews of the FARs, the Group wishes to note that five jurisdictions (Greenland, Faroes, EU-Germany, EU-Portugal, and EU-Spain) have not presented a habitat FAR. Furthermore, two of these jurisdictions (EU-Spain and EU-Portugal) have not yet developed Implementation Plans either. In the case of the Faroe Islands and Greenland, the lack of habitat FARs is perhaps to be expected. The Implementation Plan for Greenland indicates that there is only one small salmon river and no measures relating to habitat protection and restoration are included in the Implementation Plan. For the Faroe Islands there are only four small salmon rivers in which stocking was used to establish small salmon stocks. The Implementation Plan states that there are no external factors that affect the Faroese Atlantic salmon rivers and their estuaries. There are no proposed measures relating to habitat in the Faroese Implementation Plan.

5.2 For the other three jurisdictions (EU-Germany, EU-Portugal, and EU-Spain), FARs were expected and the Group reiterates the views of previous Review Groups that if there is to be a complete assessment of whether the management actions being taken around the North Atlantic are in accordance with NASCO's agreements they need to have information from all jurisdictions. The development of Implementation Plans and subsequent reporting on progress through FARs is an essential part of the 'Next Steps' process. The lack of the habitat protection and restoration FARs means that it was not possible for the Group to assess if additional actions are required in these countries and to develop a comprehensive North Atlantic wide overview of approaches to addressing challenges in the management of salmon habitat. The Group recommends that the President, on behalf of the Council, again take this up with the jurisdictions concerned. While the habitat Review Group has completed its assessments of the FARs, it considers it essential for the success of the reporting process and the sharing of experience that all jurisdictions submit FARs for subsequent reviews (and for two jurisdictions, Implementation Plans are needed as well).

5.3 The Group noted the following specific points in relation to habitat management in the three jurisdictions referred to in paragraph 5.2:

European Union – Germany: The Implementation Plan for Germany indicates that a combination of habitat restoration activities and efforts to reintroduce Atlantic salmon commenced in 1978. While a number of important areas of habitat have been successfully restored, self-sustaining populations of Atlantic salmon have not yet been established. The fact that Germany has produced an Implementation Plan but did not go the next step and produce a habitat FAR is disappointing.

European Union – Portugal: The Group is aware of the very small wild salmon stocks and their tenuous state in Portugal which, however, being at the southern limit of the range, are very important for genetic diversity. Portugal has not developed an Implementation Plan, a fisheries management FAR or a habitat FAR and the Group

reiterates the views of the earlier Review Groups and hopes that Portugal can contribute to this important aspect of NASCO's work at the earliest opportunity.

European Union – Spain: The Group is aware that Spain has stocks which, being at the southern limit of the range, are important for genetic diversity but are vulnerable. Spain has not presented either a fisheries management FAR or a habitat FAR and has previously notified the Council that it was unable to produce an Implementation Plan referring to the fact that salmon management is devolved to the Provinces. Such devolution is not unusual and the Group hopes that coordination within Spain will produce the necessary outcome so that it can contribute to this important aspect of NASCO's work at the earliest opportunity.

Jurisdictions submitting a FAR

5.4 The Group welcomed the submission of the following thirteen FARs which it reviewed:

- Canada, IP(09)3;
- EU – Denmark, IP(09)12;
- EU - Finland, IP(09)4;
- EU – France, IP(09)20;
- EU - Ireland, IP(09)10;
- EU - EU (Sweden), IP(09)19;
- EU - UK (England and Wales), IP(09)5;
- EU - UK (Northern Ireland), IP(09)14;
- EU - UK (Scotland), IP(09)8;
- Iceland, IP(09)6;
- Norway, IP(09)11;
- Russian Federation, IP(09)13;
- USA, IP(09)7.

Methodology

5.5 The Group agreed on a number of 'ground rules', based on those used by the previous two *Ad Hoc* Review Groups to guide its work in undertaking the reviews. These were as follows:

(a) An initial reviewer was appointed for each FAR who was asked to lead the discussion within the Group and to develop an assessment of consistency of the actions documented in the FAR with the NASCO Plan of Action;

(b) The initial reviewers would remain anonymous in the report and in the event that one or more members of the Group did not agree with a particular aspect or aspects of the review then the report would indicate that there were dissenting views but not disclose which members of the Group expressed the dissenting views unless they wished to be identified;

(c) The Group would base its reviews only on the information presented in the FARs and the final Implementation Plans;

(d) Because not all jurisdictions were represented on the Group, it was agreed that the NASCO representative on the Group from a country whose FAR was being reviewed would not be present during the review of that report;

(e) While the Group recognized that the extent of the salmon stocks and the resources available to manage them varies markedly between jurisdictions, the Group took no account of these differences in undertaking its reviews;

(f) The Group recognized that in some jurisdictions the responsibility for management of salmon habitat rests to some extent with the riparian owners while in others the resource is managed exclusively by the public sector. The Group felt that, nonetheless, governments have or should have powers to protect and restore habitat and it should, therefore, be possible to summarise in the FAR the actions that are expected to be taken by the appropriate bodies in the coming years. Such differences were not, therefore, taken into account in reviewing the reports;

(g) Following the completion of the reviews all assessments were re-examined to ensure consistency.

5.6 The Group's TORs allowed for questions and issues to be raised with the jurisdictions before the Group completed its assessment of the need for additional actions that may be helpful to ensure consistency with the NASCO Plan of Action. The Group decided that in view of the limited time available it would not seek further clarification from the jurisdictions but would base its assessments on the FARs as submitted. This would also be more transparent as any issues that either the Group or the jurisdictions wished to raise would be done so during the Special Session at the Annual Meeting. While not required under its TORs, the Group decided to ask the Secretary to send the draft assessments to the jurisdictions indicating that it did not seek any feedback until the Special Session at the Twenty-Sixth Annual Meeting. Following that Special Session, the Group would carefully consider all feedback on its findings when finalising its assessments. The Group was also aware that the review of Implementation Plans had highlighted some aspects that needed to be addressed in the FARs. In carrying out its assessments the Group checked if any of these aspects related to the habitat FARs.

Recommendations – General Comments on FARs

5.7 The Group noted that the Council had asked that the jurisdictions submit their FARs to the Secretariat no later than 31 December 2008. Many of the FARs were received well after this deadline and in two cases on the day prior to the Review Group meeting. This meant there was no time for the NGOs to complete their consultations within the jurisdictions concerned and limited time for the FARs to be reviewed by the Group. The Group wishes to stress that for the review process to work effectively the timetable set by the Council must be adhered to. The Council had subsequently agreed that those jurisdictions that had not submitted a FAR prior to the Review Group's meeting in February 2009, could do so before 1 September 2009. Two new FARs (EU - France and EU – Sweden) had been received by this extended deadline and have been reviewed by the Group.

5.8 The Group noted that some jurisdictions (EU (Ireland), EU - UK(England and Wales), EU - UK(Northern Ireland), EU – UK (Scotland), Iceland, USA) had adhered exactly to the guidance from the Council on the structure and content of FARs as specified in document CNL(08)33. This had facilitated the Group's work and the Group urges all jurisdictions to adhere to the agreed format in future reporting. The Group also recommends that the Council considers providing further guidance to the jurisdictions concerning the amount of detail to be included in the FARs. It is suggested that a limit of no more than 20 pages be adopted with the option to provide more detailed information in annexes.

5.9 The Group developed a format to facilitate an assessment of the consistency of habitat management actions as detailed in the FARs with the guidance from the Council on the elements to be included. Each of the FARs was assessed against the elements in this format which covered the following aspects:

- There are inventories of the quantity and quality of habitat (historic and current);
- A clear process for identifying and designating priority/key habitat areas or issues is in place;
- A process for sharing and exchanging information on habitat issues and best management practice is in place;
- A comprehensive habitat protection restoration and enhancement plan has been established or is planned;
- The Plan identifies impacts and potential risks to productive capacity;
- The Plan includes procedures for implementing corrective measures;
- The Plan places the burden of proof on proponents of an activity that may impact habitat;
- The Plan describes how risks to salmon stocks are weighed with socio-economic factors;
- The Plan considers the effects of habitat activities on bio-diversity;
- The Plan takes into account other biological factors affecting salmon;
- There is an overview of ongoing habitat activities summarize progress in implementing the plan and describing the approach used to evaluate progress.

5.10 For each of these elements, where there was limited or no evidence of such an approach being developed or if the approach was considered to be only partially developed the Group's assessment would indicate that additional actions are needed. An initial reviewer was assigned to each FAR from among the NASCO representatives on the Group and the NGOs also undertook reviews of all the FARs using the agreed format. These initial reviews formed the basis for deliberations by the whole Group and the development of its recommendations. These recommendations were then subject to a further review to ensure consistency across FARs. The Group was not able to assess the effectiveness of the plans other than on the basis of information presented in the overview of activities that highlight progress in protecting and restoring habitat.

5.11 The NASCO Plan of Action states that each jurisdiction should develop a comprehensive salmon habitat protection and restoration plan. It further states that this should contain a general strategy for the protection of habitat for <u>all</u> salmon rivers including measures to minimise impacts and identify and prioritise requirements for

restoration. The Group recognised that in some jurisdictions very strong protective measures have been afforded to designated rivers under, for example, the US Endangered Species Act and the Norwegian National Salmon Rivers programme. While the Group recognises the very strong measures applying to these rivers, the protection applies to only a proportion of rivers and cannot, therefore, be considered to be a general strategy for the protection of habitat for all salmon rivers. In these cases where clear progress has been made the Group has indicated that the approach is partially consistent with the Plan of Action. It anticipates that progress in developing national plans will be reported in the next habitat FARs. Furthermore, the Icelandic FAR states that a comprehensive plan is not needed because there are few pressures on habitat and, in fact, there has been a significant increase in available habitat through opening access to areas above natural barriers. In this case, although recognising that Iceland has successfully protected and restored habitat, the Group considered that the approach is not strictly consistent with the NASCO Plan of Action.

5.12 The Group identified a number of elements that many of the FARs failed to address in detail. This meant that is was difficult for the Group to conduct a comprehensive evaluation of the consistency of these aspects with the NASCO Plan of Action. It is hoped that these aspects can be fully addressed the next time that the Council focuses on the management of salmon habitat. The following areas require particular attention:

Quantity and Quality of Habitat

The Group believes that it would be useful if all FARs provided an overview of salmon rivers with a map showing their location, management jurisdictions etc. While some FARs provided information on the quantity and quality of current habitat (and in some cases historical habitat) many did not. This information is important in providing a benchmark for assessing progress in protecting and restoring salmon habitat and it is hoped that all plans will include such information next time the focus is on habitat issues.

Biodiversity

The NASCO Plan of Action states that habitat protection and restoration plans should aim to maintain biodiversity. The Group's interpretation was that the FARs should describe how habitat activities affect other species of flora and fauna in the area where these activities are conducted. Few FARs reported on this aspect. It is, perhaps, most important to assess the impact of habitat activities on biodiversity when salmon habitat restoration works are planned and particularly for habitat enhancement work which may involve providing access for salmon to habitats that they have not previously occupied.

Other biological factors

The NASCO Plan of Action requires that habitat protection and restoration plans should take into account other biological factors affecting the productive capacity of salmon. Most FARs failed to address this issue in any detail, possibly because it was felt that this would be addressed in the FARs dealing with other aspects of the

Implementation Plans. A brief overview of such factors would be valuable in subsequent habitat FARs. In particular, the NASCO Plan of Action refers to predator-prey interactions but other factors might include invasive species, poor water quality, aquaculture and diseases and parasites. The Group notes that similar concerns were expressed in relation to the review of the fisheries management FARs. The Group felt that it would also be useful for subsequent habitat FARs to consider the issue of climate change and its expected impacts on salmon habitat and any approaches that are being considered or implemented to mitigate impacts.

Burden of proof

Under the NASCO Plan of Action, habitat plans should aim to place the burden of proof on proponents of an activity which may have an impact on habitat. This means that there is a requirement for proponents of an activity to demonstrate by weight of evidence that an activity would not significantly degrade the productive capacity of the resource. The Group felt that while most FARs provided some details on how this important aspect of the habitat plans is addressed further clarification would be useful in the next habitat FARs.

Socio-economic factors

The NASCO Plan of Action states that the habitat plans should balance the risks and the benefits to the Atlantic salmon stocks with the socio-economic implications of any given project. The Agreement on Adoption of a Precautionary Approach states that priority should be given to conserving the productive capacity of the resource where the likely impact of resource use is uncertain. Thus, the NASCO Guidelines and Agreements do not make it clear how habitat management decisions are to be taken when there are conflicts between socio-economic and conservation issues. Most FARs also failed to provide a clear indication of how socio-economic factors are incorporated into decisions concerning the management of salmon habitat. For future reporting, it would be useful if this aspect could be addressed.

Recommendations – Additional Actions

Canada

The Group recognises that there is a large number of salmon rivers in Canada, many in remote areas. It is clear that there is a well-developed process for sharing and exchanging information on habitat issues. Furthermore, a range of legislative tools is available to protect habitat, there is a stated policy of 'No Net Loss' of habitat, and a detailed risk assessment process is described for evaluating proposed activities that could impact habitat.

However, the Group found it difficult to assess the FAR as it did not follow the guidance provided by the Council and many of the elements on which information was requested were not adequately addressed. Furthermore, a comprehensive habitat protection and restoration plan has not been developed. For the Inner Bay of Fundy salmon stocks, which are listed as endangered under the Species at Risk Act, no

recovery plan has been developed. Similarly, there is no plan for a comprehensive liming programme of the 63 severely affected acidified rivers in Nova Scotia.

On the basis of the information presented to the Group, the approach is not consistent with the NASCO Plan of Action and in addition to the above, failed to adequately address the following issues:

- It is unclear how the burden of proof is placed on proponents of activities that could impact on salmon habitat;
- It is unclear how the effects of habitat activities on biodiversity are considered;
- No details are provided of how other biological factors are taken into account;
- There is no clear overview of ongoing habitat initiatives and the approach used to evaluate their effectiveness.

European Union - Denmark

The Group is aware that salmon stocks in Denmark are currently low as a result of severe habitat degradation. The FAR includes maps that illustrate the extent of contemporary salmon habitat, impact factors have been identified and there is a process for information exchange. A National Salmon Rehabilitation Plan has been developed which applies to the four salmon rivers with remnant wild stocks present. However, no details are provided on the content of the Plan, or on the management of habitat in rivers not covered by it but which are subject to severe anthropogenic stressors. On the basis of the extremely limited information presented to the Group, the approach is not consistent with the NASCO Plan of Action and in addition to the above, failed to adequately address the following issues:

- The potential risks to productive capacity are not clearly described;
- There are no details of procedures for implementing corrective measures;
- It is unclear how the burden of proof is placed on proponents of activities that could impact on salmon habitat;
- There is no information on how risks to salmon stocks are weighed with socio-economic considerations;
- It is unclear how the effects of habitat activities on biodiversity are considered;
- No details are provided of how other biological factors are taken into account;
- There is no clear overview of ongoing habitat initiatives and the approach used to evaluate their effectiveness.

European Union - Finland

The Group recognises that the salmon habitat in Finland is largely pristine, with few pressures from anthropogenic factors. However, efforts have been made to quantify problems associated with culverts and actions taken to address fish passage issues. The two rivers with wild Atlantic salmon are border rivers with Norway. In accordance with the EU Water Framework Directive, an international river basin district has been established for the Tenojoki-Naatamojoki-Paatsjoki (the latter having lost its salmon population due to dams) and a draft river basin management plan has been developed. During 2009 management measures for 2010 – 2015 will be developed. A well developed process is in place for information exchange.

On the basis of the information presented to the Group, the approach is not consistent with the NASCO Plan of Action because it fails to adequately address the following issues:

- There are no details of procedures for implementing corrective measures;
- It is unclear how the burden of proof is placed on proponents of activities that could impact on salmon habitat;
- There is no information on how risks to salmon stocks are weighed with socio-economic considerations;
- It is unclear how the effects of habitat activities on biodiversity are considered;
- No details are provided of how other biological factors are taken into account.

European Union – France

The FAR indicates that wild salmon populations have become extinct in about one third of French rivers, including the majority of the major rivers and there are fears of further extinctions. Efforts are underway to restore habitat in a number of rivers e.g. by 're-energising' rivers to improve the substrate and stocking has resulted in runs of salmon in some rivers. There is a comprehensive overview of the historic and current status of salmon in France with both quantitative and qualitative assessments of the current available habitat. Key habitat issues have been identified as the construction of dams, weirs and other obstacles to migration. Where fish passes have been constructed they are not always effective. Gravel abstraction, pollution (particularly in the lower reaches of rivers) and changes to the river bed are also identified. There is a clear process for sharing and exchanging information through reports, websites, databases and, most recently, an international symposium. More than 80 sites have been designated under Natura 2000 and land acquisition may be used to establish protected areas. While the first National Salmon Plan was developed in 1976, most salmon related management is undertaken through basin-specific five-year management plans. Under the Water Framework Directive, six regional Water Management and Planning Programmes aim to restore ecological continuity through *inter alia* the removal of dams. An inventory of more than 50,000 obstacles to migration has been developed.

On the basis of the information presented to the Group, the approach is not consistent with the NASCO Plan of Action because it fails to adequately address the following issues:

- It is unclear how the burden of proof is placed on proponents of activities that could impact on salmon habitat;
- There is no information on how risks to salmon stocks are weighed with socio-economic considerations;
- It is unclear how the effects of habitat activities on biodiversity are considered;
- No details are provided of how other biological factors are taken into account.

European Union – Ireland

The Group congratulates Ireland on an exceptionally comprehensive FAR and on the major initiatives to protect and restore salmon habitat that have been implemented in

recent years. There is a comprehensive inventory and description of habitat impact factors for each river to support and inform appropriate habitat management. There are comprehensive habitat protection, restoration and enhancement plans in place both at the individual river level and for the four River Basin Districts established under the Water Framework Directive. A well-integrated process for information exchange exists and a training manual on habitat restoration has been prepared.

On the basis of the information presented to the Group, the approach is consistent with the NASCO Plan of Action.

European Union - Sweden

The FAR includes an excellent description of the quantity of current salmon habitat and the potential for improvement and includes a map of the salmon rivers. While the extent of historical habitat is not clearly identified it is indicated that removal of barriers to migration and habitat restoration work could increase available habitat by 18%. Threats to habitat are clearly identified and a comprehensive structure for sharing habitat information is in place through open databases, guideline documents, seminars and workshops. In addition, a manual for the restoration of rivers has been developed. A section on protection and restoration of Atlantic salmon habitat is included in the Swedish National Plan for Atlantic salmon for 2007-2011. The plan identifies five threats to salmon populations as migration obstacles, habitat deterioration, acidification, spread of *Gyrodactylus salaris,* and eutrophication. While some mitigation measures have been identified and a major liming programme implemented in acidified rivers, there do not appear to be clear procedures in place to implement measures in all cases, although it is stated that under the Water Framework Directive the goal will be to achieve good ecological status in rivers by 2015. A comprehensive habitat monitoring and reporting program is undertaken annually.

On the basis of the information presented to the Group, the approach is not consistent with the NASCO Plan of Action because it does not adequately address the following issues:

- There are no details on how the burden of proof is placed on proponents of activities that could impact salmon habitat;
- There is no information on how risks to salmon are weighed with socio-economic considerations;
- No details on how the effects of habitat activities on biodiversity are considered.

European Union – UK (England & Wales)

This is a comprehensive FAR that is well structured and addressed all the required elements. There is a clear, comprehensive description of the approach being adopted under the Water Framework Directive including the procedures for close cooperation and partnerships with stakeholders. A River Restoration Centre has been established to provide a focal point for the exchange of information and expertise. There are comprehensive habitat protection, restoration and enhancement plans in place both at the National and individual river level, which identify impacts and potential risks that might lead to failure of ecological quality. The Group notes that alternative approaches to traditional predator control are being trialled and it would welcome an

update in the next habitat FAR. The FAR also refers to the need for longer-term evaluation of restoration and enhancement schemes and similarly the Group would welcome a report on progress in this regard in the next habitat FAR.

On the basis of the information presented to the Group, the approach is consistent with the NASCO Plan of Action.

European Union – UK (Northern Ireland)

This is a comprehensive and detailed FAR, but the Group is concerned that it was submitted in draft form and was only received the day before the Group met creating difficulties for its review. There is a clear description of the approach used to assess habitat quantity and quality through the use of Geographical Information Systems (GIS). There is a well integrated process in place to share and exchange information and engage stakeholders. A River Basin Management Plan has been developed together with a programme of measures designed to address all the pressures affecting the water environment. Restoration plans have been developed or are under development for all rivers, strongly supported by use of data to identify issues and inform corrective measures.

On the basis of the information presented to the Group, the approach is consistent with the NASCO Plan of Action.

European Union - UK (Scotland)

This is a comprehensive FAR that is well structured and addressed all the required elements. A detailed inventory of historic and current habitat has been developed using a GIS approach and in accordance with the EU Water Framework Directive comprehensive salmon habitat protection and restoration plans have been developed with timelines for implementing corrective measures and monitoring. Local fishery management plans have been commissioned and are at various stages of development. Useful information on the effectiveness of habitat restoration initiatives in increasing access for salmon is provided. Monitoring programmes have been put in place to assess implementation of the plans.

On the basis of the information presented to the Group, the approach is consistent with the NASCO Plan of Action.

Iceland:

The Group recognises that the salmon habitat in Iceland is largely pristine, with few pressures from anthropogenic factors. Furthermore, through improvements to fish passage at natural waterfalls, the length of river accessible to salmon has been increased by 27%. There is a strong regulatory framework in place to reduce anthropogenic threats to salmon habitat. It is recognised that a high importance is afforded to salmon in Iceland and this has had clear benefits in protecting the resource from Hydro-electricity developments. However, the Group notes that some potential impacts have been referred to (including those associated with urbanisation around Reykjavik) in the FAR and a wider range of issues is identified in the Implementation Plan. However, no specific overview of impacts on a river-by-river basis is provided

and no comprehensive habitat protection, restoration and enhancement plan has been developed although Environmental Impact Assessments or Biological Impact Assessments are required.

On the basis of the information presented to the Group, the approach is not consistent with the NASCO Plan of Action because of the lack of a habitat protection, restoration and enhancement plan.

Norway

The FAR describes a wide range of measures and approaches to managing salmon habitat in Norway. Threats to habitat and salmon generally are identified and prioritised. There is a well-developed, clear process for identifying and designating key habitat issues including a rigorous assessment of threats and how these are being addressed. A comprehensive liming programme is undertaken and has had significant benefits to date. An over-arching salmon restoration plan will be completed by 2010. National Salmon Rivers (52 rivers) and National Salmon Fjords (29 fjords) are afforded additional protection. While this is a relatively small proportion of Norway's 450 rivers they represent 75% of the present Norwegian salmon stock. An additional 118 rivers, not all of which contain salmon, have been designated under the National Protection Plan which protects them from further hydro-electric development. However, there does not appear to be a habitat protection plan in place to cover all salmon rivers.

On the basis of the information presented to the Group, the approach is only partially consistent with the NASCO Plan of Action because there does not appear to be a habitat protection plan in place that covers all salmon rivers.

Russian Federation

The FAR contains a comprehensive overview of the Atlantic salmon habitat resources, particularly for the Murmansk Region. The threats to salmon habitat are generally well characterized. There is a strong regulatory framework in place to reduce anthropogenic threats to salmon habitat, and a process for implementing corrective measures for habitat impacts that do occur. There is also a compensation process that aims to fund projects to remedy habitat impacts at a local scale. There are programmes that aim to enhance natural productivity of salmon rivers. The Group recognizes that detailed habitat protection and restoration plans are under development for specific rivers and it looks forward to an update on progress the next time habitat FARs are reviewed.

On the basis of the information presented to the Group, the approach is only partially consistent with the NASCO Plan of Action because the plan is still under-development and it is not clear if the proposed plan will cover all salmon rivers.

USA

The Group notes that salmon habitat in the US has historically suffered severe degradation as a result of construction of dams and other factors and that major efforts are underway to rebuild and restore salmon stocks. Recently, a major initiative on the

Penobscot River led by NGOs and the Penobscot First Nation has resulted in an agreement to purchase three dams at a cost of $25 million and funds are now being raised to allow for their removal. This initiative could open an estimated additional 1,000 miles to salmon and other anadromous fish. The protection afforded to the habitat in eight wild salmon rivers in Maine under the Endangered Species Act is extremely comprehensive and there is a Recovery Plan for these rivers. The Group notes that there are proposals to extend this protection to a further three large wild salmon rivers in Maine. The FAR is less clear in describing the measures currently in place to protect and restore salmon habitat in these three rivers.

On the basis of the information presented to the Group, the approach is only partially consistent with the NASCO Plan of Action because there does not appear to be a habitat protection plan in place that covers all salmon rivers.

6. Identification of common challenges and common management and scientific approaches to address them

6.1 The Council asked that the Review Group identify common management and scientific approaches to challenges as reported in the FARs. This overview, IP(09)17, is contained in Annex 4. It includes some recommendations on future reporting through habitat FARs and other approaches for further improving the exchange of information.

7. Report of the Meeting

7.1 The Group agreed its report.

8. Any other business

8.1 There was no other business.

10. Close of the Meeting

10.1 The Coordinator closed the meeting and thanked the participants for their contributions.

Annex 1

List of Participants

Mr Tony Blanchard	Fisheries and Oceans, Canada
Dr Paddy Gargan	Central Fisheries Board, Ireland
Dr Peter Hutchinson	NASCO Secretariat (Rapporteur)
Mr Paul Knight	Salmon & Trout Association, UK
Dr Sergei Prusov	PINRO, Murmansk, Russian Federation
Mr Rory Saunders	NOAA Fisheries, USA
Ms Sue Scott	Atlantic Salmon Federation, Canada
Dr Malcolm Windsor	NASCO Secretariat (Coordinator)

Annex 2

IP(09)15

Agenda

1. Opening of the Meeting by the Coordinator
2. Adoption of the Agenda
3. Review of the Terms of Reference and consideration of working methods.
4. Consideration of the elements of best practice relating to the protection, restoration and enhancement of salmon habitat.
5. Review and analysis of FARs and identification of additional actions to ensure consistency with NASCO agreements relating to habitat.
6. Identification of common challenges and common management and scientific approaches to address them.
7. Arrangements for the 2009 Special Session.
8. Report of the meeting.
9. Any other business.
10. Close of the meeting.

Annex 3

IP(09)22

Draft NASCO Guidelines for the Protection, Restoration and Enhancement of Atlantic salmon Habitat

1. Introduction

Salmon habitat in freshwater has been greatly affected by various activities, both small- and large-scale in nature, and it is clear that much habitat has been lost over the last 150 years, although in recent years there have also been some notable gains. NASCO's objectives of conserving, restoring and enhancing Atlantic salmon can only be achieved if their habitat is protected, restored and, where appropriate enhanced. NASCO and its Parties have, therefore, agreed to adopt and apply a Precautionary Approach to the conservation, management and exploitation of salmon in order to protect the resource and preserve the environments in which it lives. Accordingly, their objective for the protection and restoration of salmon habitat is to **maintain and, where possible, increase the current productive capacity of Atlantic salmon habitat,** hereinafter referred to as the 'international objective'. In support of the international objective, NASCO has developed the following agreement:

- NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat, CNL(01)51.

NASCO has also developed the following guidelines which are relevant to the protection and restoration of salmon habitat:

- Guidelines for Incorporating Social and Economic Factors in Decisions Under the Precautionary Approach, CNL(04)57;
- Guidelines on the Use of Stock Rebuilding Programmes in the Context of the Precautionary Management of Salmon Stocks, CNL(04)55.

The NASCO Plan of Action provides a framework for use by the appropriate jurisdictions, national, regional and local, that have responsibilities for activities involving salmon habitat. It lays down the guiding principles to support application of the Precautionary Approach to habitat protection and restoration. It calls for the development of comprehensive habitat protection and restoration plans and inventories by each jurisdiction in support of the international objective. The intention in developing these guidelines is:

- to assist the jurisdictions in making further progress in implementing NASCO's agreements and guidelines for the protection and restoration of salmon habitat, subject to their national legislation;
- to provide for an exchange of information on approaches to the protection, restoration and enhancement of salmon habitat around the North Atlantic;
- to assist jurisdictions in the preparation of future Focus Area Reports (FARs) on habitat protection, restoration and enhancement as well as the process for reviewing the FARs; and
- to assist in the identification of what additional actions may be required.

2. Salmon habitat requirements

Understanding the Atlantic salmon's habitat requirements and identifying impacts to this habitat are key requirements in meeting the international objective for the protection and restoration of habitats. This section provides a brief outline of the Atlantic salmon's habitat requirements and the range of factors that could adversely impact it, so as to provide a structure around which the development of the habitat inventories called for under the NASCO Plan of Action may be developed.

Wild Atlantic salmon have a complex life-cycle and, consequently, complex habitat requirements. As a geographically widespread, anadromous species, the Atlantic salmon has adapted to highly variable habitats and environmental conditions e.g. with regard to length of growing season, water acidity and temperature etc. These adaptations are often referred to as 'river specific' adaptations. However, anthropogenic changes to habitat may be so severe or rapid that the salmon is unable to adapt to them resulting in declines in abundance or even local extinctions. Protecting the environmental conditions that allow the maintenance of variable life-history strategies should be a guiding principle in salmon habitat management.

There are many threats of a physical, chemical and biological nature to habitat which Atlantic salmon require for:

- spawning, incubation and early development;
- juvenile rearing;
- juvenile and adult migrations; and
- pre-spawning adults.

Each of these elements of the life-cycle require specific habitat and environmental conditions; they are summarised in general terms below, together with the factors that may impact each habitat. Examples of activities that may cause these impacts are described in paragraph 3.5 below. Given the range of tolerance to environmental variables among salmon populations (i.e. local adaptations) it is not possible to specifically describe optimal habitat conditions applicable to all salmon populations across the North Atlantic. However, the general requirements are described below.

(a) Habitat for spawning, incubation and early development

Salmon spawn in nests or redds excavated in areas of non-compacted, stable, permeable gravel, often in riffles or at the head or tail of a pool. After hatching from the egg, the young fish, known as alevins, remain in the gravel for several weeks before emerging. A number of factors influence the choice of spawning site, including intra-gravel flow, gravel size, water quantity and quality, and cover. Egg and alevin survival in the nest depend on many factors but oxygen supply and temperature are particularly important.

Requirements: permeable gravel substrate with an adequate flow of cool, well oxygenated water.

Impact factors: Increased siltation/sedimentation, changes in substrate (e.g. gravel removal), changes in river morphology (e.g. channelization), changes in water quantity (e.g. reduced base flows) and quality (e.g. domestic and industrial effluents and nutrient enrichment).

(b) Juvenile rearing habitat

After emergence through spaces in the gravel, juvenile salmon establish and defend territories, the size of which determines the carrying capacity of a stream. The size of a territory is influenced by both biotic and abiotic factors including channel morphology, substrate, gradient, water quantity and quality, cover, food abundance, and predator and competitor abundance. Salmon fry and parr generally prefer riffle habitat but may move into deeper water as they grow in size and during the winter and periods of drought. Juvenile salmon may also occupy lakes, ponds and slackwater areas. Thus, a diverse array of well connected habitat types is required.

Requirements: well connected freshwater areas with cool, clean, well-oxygenated water, adequate food supply and cover for shade and protection from predation and severe environmental events.

Impact factors: Increased siltation/sedimentation, changes to shelter/cover (e.g. removal of in-stream boulders and large woody debris, removal of bankside vegetation), changes in substrate, changes in river morphology, changes in water quantity and quality, changes to the food supply (e.g. reduction in invertebrate production), changes in species composition and abundance (e.g. introduction of invasive species, increase in predators, reductions in the diadromous fish community).

(c) Juvenile and adult migration

At the end of the freshwater phase, juvenile salmon migrate to sea as smolts. Adult salmon require free access to the spawning grounds. Barriers to migration in fresh water and estuaries, whether natural or man-made, can either block or delay access and may lead to increased mortality through, for example, diseases and predation. Delays in smolt migration may also result in increased disease incidence and predation and may affect the smolt's ability to adapt to sea water. Water flow and temperature are important factors.

Requirements: Migration corridors free from physical, chemical or biological barriers that prevent or impede: in-river movements of parr (e.g. to over-wintering habitat); downstream movements of parr and smolts to the estuary/sea; and upstream migration of adults to spawning grounds.

Impact factors: Physical obstructions to migration (e.g. dams), changes in river morphology, changes in water quantity and quality, changes in species composition and abundance.

(d) Habitat for pre-spawning adults

Adult salmon require holding and resting areas both during their upstream migration and in the vicinity of the spawning grounds, since they may arrive well in advance of spawning. These holding areas provide shade and protection from predation and severe environmental events.

Requirements: deep pools with cool, clean, well oxygenated water and cover for shade and protection from predation and severe environmental events.

Impact factors: Increased siltation/sedimentation, changes to shelter/cover, changes in substrate, changes in river morphology, changes in water quantity and quality.

3 Key elements of management

It is recognised that the size of salmon stocks, the management responsibilities and approaches, the pressures on the habitat, and the resources available for habitat protection, restoration and enhancement vary considerably among countries. Nevertheless, to achieve the international goal of maintaining, and where possible increasing, the productive capacity of Atlantic salmon habitat, the following elements of NASCO's agreements and guidelines should be applied in all jurisdictions through the establishment of comprehensive plans for the protection, restoration and enhancement of salmon habitat and inventories to allow an assessment of progress towards achieving the international objective.

3.1 Description of current and historic habitat

- A range of information should be collected on a routine basis through reporting and monitoring programmes relating to the productive capacity of salmon stocks and any factors that may be adversely affecting it. Section 2 above provides a structure around which inventories of information might be developed. In particular, the quantity and quality of salmon habitat currently available should be determined. This information is essential in providing a baseline against which achievement of the international goal can be assessed. The information should be collected for individual rivers and their tributaries and maintained in inventories and be regularly updated.
- Where available, information on the quantity of habitat historically available to salmon should be used to inform restoration initiatives. Where such information is not available, efforts should be made to obtain it.

3.2 Identifying risks to productive capacity

- Wherever feasible, a holistic approach should be taken to habitat protection and restoration, through catchment management planning so as to identify risks to the productive capacity of the resource and prioritise measures to address them. In this regard, it should be noted that the cumulative effect of several impact factors may exceed the sum of the individual factors. Furthermore, while losses during the early stages of the salmon's life-cycle may be compensated for through natural processes, this does not occur for losses of parr and smolts. Actions to enhance salmon habitat, both artificial enhancement of current habitat and opening previously inaccessible habitat, require careful consideration and consultation (see section 3.7 below) because of the potential adverse effects on other species.
- Management measures to protect habitat should be reviewed and updated, in a timely fashion, in response to any new or emerging threats to the productive capacity of the resource. For example, climate change poses significant challenges for the management of salmon habitat in the future e.g. in relation to managing water abstraction and riparian vegetation.

3.3 Information Exchange

- One of the complexities of salmon habitat management is that there are many factors and activities (both natural and man-made) that can affect the productive capacity of

the resource, and many stakeholders involved. Procedures should, therefore, be in place for consultation and information exchange among all relevant agencies and stakeholders within a jurisdiction and internationally to improve awareness of salmon habitat issues and approaches to addressing them.

3.4 Decision making process

- Consistent with the Precautionary Approach, there should be clear and transparent descriptions available to all stakeholders of the process by which management decisions will be taken in relation to habitat protection, restoration and enhancement; these could take the form of a flow diagram or decision structure.
- Proponents of any activity that could adversely impact salmon habitat should be required to provide all the information needed to allow the risks to the productive capacity of the resource to be assessed, including a range of options for achieving the objectives of the proposed activity.
- In evaluating options for activities that could adversely impact salmon habitat, conservation of the productive capacity of the resource should take precedence (see section 3.5 below).
- Where activities are approved that could result in the loss of productive capacity of the resource, on the basis of overriding socio-economic factors, the losses should be minimised and compensation or mitigation measures should be agreed prior to approval of the activity so that there will be no net loss of productive capacity. The costs of these compensation or mitigation measures should be borne by the proponent.
- Where salmon stocks have been designated for special protection, there should be a strong presumption against any loss of productive capacity, even where measures to compensate or mitigate for the losses are proposed.
- In assessing risks to productive capacity of the resource, consistent with the Precautionary Approach, managers should demonstrate that they are being more cautious when information is uncertain, unreliable or inadequate, and the absence of adequate scientific information should not be used as a reason for postponing or failing to take appropriate conservation and management measures.
- Monitoring should be conducted to ensure compliance with all conditions specified in authorising an activity. In the event that monitoring identifies a need for corrective measures, these should be implemented without delay and should achieve their purpose promptly. It should be a requirement of an authorisation that the costs associated with any corrective measures should be borne by those conducting the activity.

3.5 Protection of salmon habitat

Measures should be taken to protect salmon habitat for all freshwater life-stages of Atlantic salmon and to prevent the loss of productive capacity of the resource, *inter alia*, as a result of any of the impact factors listed in section 2 above (or other factors known to adversely affect salmon populations) resulting from the following activities:

- increased siltation and sedimentation resulting from activities such as development construction, forestry. agricultural and other land management practices, road and urban run-off etc; damage to spawning substrate resulting from activities such as gravel abstraction, and changes in flow regime;
- loss of shelter and cover resulting from activities such as removal of riparian and in-

river vegetation, and substrate alteration;

- reductions in food supply resulting from activities such as removal of riparian and in-river vegetation;
- changes in species composition and abundance resulting from activities such as stocking predators or competitors, and reductions in the abundance of species that provide prey and/or a predation buffer for salmon;
- creating physical barriers to migration resulting from activities such as dam, bridge and weir construction. and hydropower facilities;
- changes in river morphology through activities such as dam, bridge, culvert and weir construction, and in-river engineering;
- changes in water quantity through activities such as irrigation, abstraction, deforestation, land drainage, and livestock over-grazing;
- deterioration in water quality through addition of chemicals and nutrients from activities such as industrial and domestic waste discharges, agriculture and forestry, and freshwater fish farming.

3.6 Identifying and designating key habitats for improvement

- Where salmon habitat has been degraded or lost, options for its restoration should be identified and prioritised. Priority should be given to management options that will have the greatest direct (increase in productive capacity) and indirect (overall value of ecosystem services, public relations aspects) benefits relative to the costs of the improvement work. Restoration activities should be evaluated to assess achievement of the objectives and to inform future activities.
- Wherever possible, restoration initiatives should include community participation. There is a need for consultations on the various options with stakeholders, including the authorities concerned with biodiversity issues.
- Restoration of habitat should generally take precedence over habitat enhancement.
- Restoration of salmon habitat requires restoration of the four key habitat components listed in section 2 above.

3.7 Maintaining Biodiversity

- Measures to protect existing salmon habitat should generally benefit other flora and fauna in the area concerned. However, where measures are taken to restore and, in particular, enhance salmon habitat, any potential risks to other species will need to be balanced with the benefits to the salmon. There will be a need for consultation and cooperation with the authorities responsible for biodiversity issues and with stakeholders.

3.8 Other biological factors influencing the stock(s)

- Factors other than habitat degradation may adversely affect productive capacity, and actions should be taken to identify and address these problems as part of an integrated approach to habitat management (see NASCO Guidelines on the Use of Stock Rebuilding Programmes in the Context of the Precautionary Management of Salmon Stocks, CNL(04)55). These factors could include parasites and diseases, predation, composition and abundance of fish communities, exploitation and aquaculture.

3.9 Socio-economic factors

- Transparent policies and processes should be in place to take account of socio-economic factors in making habitat management decisions and for consulting stakeholders (see paragraph 3.4 above).

3.10 Effectiveness of management measures

- Managers should assess the expected effects of management actions and the timescale in which they will occur prior to their implementation.
- Managers should also monitor the outcomes of the management actions to determine whether they have achieved the desired aims.

Further information on the measures being taken to protect, restore and enhance salmon habitat is available at www.nasco.int/habitat.html. The Focus Area Reports by each jurisdiction include references to more detailed guidance relating to particular aspects of habitat protection, restoration and enhancement.

Annex 4

IP(09)17

Comparative overview of approaches used to address challenges in the protection, restoration and enhancement of salmon habitat

1. Introduction

Wild Atlantic salmon have a complex life-cycle and, consequently, complex habitat requirements. Their conservation, restoration and rational management can only be achieved if existing habitat is protected and degraded habitat restored. There are many threats of a physical, chemical and biological nature to the salmon's habitat. They include barriers to migration, changes to cover, changes to substrate, changes in land management practices, changes in water quantity and quality, changes in species composition or abundance and introductions of diseases and parasites. Habitat protection, restoration and enhancement is, therefore, a broad, complex but vital area of NASCO's work. One of the complexities of this work relates to the wide range of stakeholders involved. There is, therefore, a need for efficient mechanisms for consultation among stakeholders and for information exchange.

The *Ad Hoc* Review Group (hereinafter referred to as the Review Group) has reviewed the FARs submitted to NASCO and has commented on the progress made by each jurisdictions in implementing NASCO's Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat, CNL(01)51, hereinafter referred to as the 'Plan of Action'. As part of its review, the Council also asked the Review Group to undertake a comparative overview of the habitat FARs highlighting common challenges and common management and scientific approaches to addressing these challenges in protecting, restoring and enhancing salmon habitat as reported in the FARs so as to facilitate the exchange of information and transfer of knowledge on habitat issues envisaged in the Strategic Approach.

While it is clear that historically a considerable amount of salmon habitat has been degraded there have been some notable successes in restoring habitat. For example, in England and Wales, there are now more catchments with salmon that at any time in the last 150 years following the decline of heavy and abstractive industries. However, many challenges remain and it has been noted that some pressures on habitat have been accelerating in the last 30 years, not least those associated with climate change.

2. Description of the current status of salmon habitat and specify, to the extent possible, the quantity and quality of salmon habitat (historic and current).

The overall objective of the Plan of Action is to maintain and, where possible, increase the current productive capacity of Atlantic salmon habitat. A vital step in assessing progress towards this goal is to quantify the habitat that is currently available and that which has been lost. Quantifying the current habitat alone is a significant undertaking, posing considerable challenges particularly, for example, in very remote areas, as highlighted in the FARs for Canada and Russia. Some FARs do

not include estimates of either current or historical habitat while others (e.g. Ireland, UK – Scotland and the US) have provided both. In some FARs, the information is presented as river lengths or catchment areas while other FARs provide estimates of the area of suitable salmon habitat either in total or that which is accessible to salmon.

- The FARs for Ireland, UK (Scotland), and the USA refer to the use of Geographical Information Systems (GIS) in deriving habitat estimates, both current and historic. Where estimates of lost habitat have been derived it is clear that significant areas remain unusable by salmon. Thus, for example in Ireland, Scotland and the US a total of almost 100 million m^2 of riverine habitat is estimated to remain lost for salmon production.

The information on quantity of salmon habitat estimates for each jurisdiction is tabulated below and some of the approaches to assessing habitat quality follow this table.

Jurisdiction	Habitat estimate	Comments
Canada	More than 700 rivers in eastern Canada. Areas of both river and lake habitat estimated but no details given. Northern rivers not surveyed but conservation requirements based on index river data.	Estimated in 1989 that net loss of 16% of habitat since 1870 offset by 2% gain due to fish passage improvements.
Denmark	No habitat estimate given but details of the number of rivers and their status provided.	Of the 9 original salmon rivers only 4 still have wild stocks. The remaining rivers are maintained by stocking.
Finland	50 million m^2 of production area in Rivers Teno and Nataamo	Largely pristine with little human impact
France	14.85 million m^2	
Iceland	3,500 km of salmon habitat	Current estimate 27% higher than historic due to opening impassable waterfalls
Ireland	Total river habitat 159 million m^2 Total river habitat accessible to salmon 111million m^2 Total lake habitat 1,052 million m^2 Total lake habitat accessible to salmon 443 million m^2 Habitat upstream of large-scale hydro plants 40 million m^2	
Norway	No habitat estimate given but details of the number of rivers and their status provided.	450 rivers that sustain or once sustained wild salmon stocks
Sweden	2.37 million m^2 and an additional 422,000 m^2 of potential habitat	
Russia	Information is presented on the length of salmon rivers and catchment areas by region as follows: Murmansk: river length 4,569 km; area 120,616km^2 Archangelsk: river length 19,237 km Komi: river length 3,935 km: area 813,900 km^2 Karelia: six rivers of lengths between 100 – 200km	
UK – England & Wales	Total accessible wetted area of 118.3 million m^2	Estimate for the 64 principal salmon rivers
UK – N.Ireland	No estimate of habitat given but surveys conducted and habitat composition given for each catchment	
UK -	177 million m^2 of river habitat accessible to salmon	Historical habitat was estimated

Scotland	686 million m^2 lake habitat accessible to salmon 13 million m^2 river habitat lost to salmon 81 million m^2 lake habitat lost to salmon	as the current habitat plus the area upstream of impassable man-made barriers
USA	For Gulf of Maine: 75.8 million m^2 historical salmon habitat 39.4 million m^2 accessible today (i.e. 52%) Of currently available habitat, 23% relies on 'trap and truck' operations.	Estimates derived using a GIS-based habitat prediction model using data (e.g. slope, drainage area) derived from surveys

- The FAR for Ireland indicates that the quality of the accessible riverine habitat has been classified using gradient. Most of the habitat (~82%) was assessed as being of low gradient with only around 8% being of medium gradient with the highest productive capacity for salmon. Water quality is assessed from 3,000 sites using a macro-invertebrate index and the data are presented in the FAR by fishery district and as trends through time.
- The FAR for UK (Northern Ireland) indicates that a Life-Cycle Unit approach was used to classify habitat according to type (nursery, holding, spawning) and quality (1: excellent; 4: marginal). Information on the lengths of rivers that comply with the EU Freshwater Fish Directive and changes with time is presented together with information on phosphorus levels, and a quality assessment based on organic pollution and biological monitoring.
- The FAR for UK (Scotland) indicates that no data on quality of habitat pre-industrialization are available. However, the use of the Water Framework Directive's classification system to assess the quality of salmon habitat is described. In total, 37% and 48% of salmon habitat in rivers and lochs, respectively, was classified as high or good status and the salmon habitat was, therefore, not considered to be degraded.
- The US FAR notes the difficulty of assessing habitat quality but an indirect assessment was made for the Gulf of Maine Distinct Population Segment (GOM DPS) rivers using a scoring system which ranked qualitative features such as temperature, water quality, biological communities, substrate and cover as being highly suitable, suitable, marginally suitable or not suitable for salmon.

Many FARs did not include information on the quantity and quality of current habitat, a vital benchmark for assessing progress, and the Group encourages all jurisdictions to provide such information, and where possible historical habitat, in the next habitat FARs. Inclusion in all FARs of an overview of salmon rivers with a map showing their location, management jurisdictions etc. would also be useful.

3. Description of the process for identifying and designating priority/key habitat areas or issues to be addressed.

The Plan of Action states that there should be a general strategy for the protection of habitat for all salmon rivers including measures to minimise impacts and identify and prioritise requirements for restoration. The Plan of Action also states that priority or key habitats for improvement should be identified and designated. Some examples of approaches used follow:

- The FARs for several EU Member States refer to the Water Framework Directive which has as its objectives the prevention of any further deterioration in the classification status of aquatic ecosystems, the achievement of at least good status for all waters and the conservation of habitats and species that are directly dependent upon water. River Basin Management Plans will detail where the aim is to achieve good water body status and good potential by 2015 or the reasons why these cannot be achieved. In addition, the EU Habitats Directive allows for the designation of Special Areas of Conservation with salmon as a qualifying species which requires Member States to maintain or restore habitats and species to favourable conservation status. Thus, for example, in France 80 sites have been designated.
- The Danish FAR indicates that the four rivers that still have their original wild salmon populations are designated under the National Salmon Rehabilitation Plan.
- In Norway a system of 52 national salmon rivers and 29 salmon fjords in which the Atlantic salmon is afforded special protection was established in 2003. In the designated rivers, no new enterprises or activities are permitted that could damage wild salmon and in the fjords no new salmon farms will be permitted and existing farms will be subject to more stringent standards for containment and disease control. This protection applies to about 75% of Norwegian salmon production.
- The US FAR indicates that salmon in the GOM DPS are afforded significant protection under the Endangered Species Act (ESA) both in terms of the listed species and its habitat. The authorities have recently proposed extending the ESA protection to the salmon populations in the Androscoggin, Kennebec and Penobscot Rivers. In the rivers outside Maine, the restoration programmes aim to maximize smolt production through stocking programmes which prioritize those areas with habitat believed to be best able to produce smolts. However, all salmon habitat is protected from degradation by federal and state laws irrespective of the priority afforded to it for stocking.

While the Group recognises the very strong habitat protection measures applying to certain designated rivers, it wishes to highlight the requirement in the Plan of Action for a general strategy for the protection of habitat for all salmon rivers.

4. Description of the activities and approaches used to share and exchange information on habitat issues, and best management practices, between relevant bodies within the jurisdiction.

As noted previously, one of the complexities of protecting and restoring salmon habitat is that a wide range of interests is involved. The Plan of Action states that the process of decision-making will need to be transparent to all the other parties involved and that consultation and education may be significant factors in achieving the Plan's aims. A variety of approaches is being used to share and exchange information at local, regional and national levels including the establishment of stakeholder fora, publications (including technical guidelines, scientific papers, annual reports and management plans), use of websites, and symposia and workshops. The following are some examples of the approaches being used:

- The FAR for Canada indicates that a Council of Fisheries and Aquaculture Ministers serves to foster cooperation and communication among the federal,

provincial and territorial governments on managing fisheries and protecting fish habitat. Partnering agreements have also been developed between Fisheries and Oceans Canada and other federal departments and provincial agencies.

- A number of the FARs for EU Member States (Finland, Ireland, Sweden, UK (England and Wales, Northern Ireland and Scotland)) refer to the establishment of management structures for River Basin Districts created under the Water Framework Directive that allow for broad participation of stakeholders involved in the protection of the freshwater environment. In Sweden, habitat restoration workshops are carried out twice annually so as to encourage the river owners to undertake habitat restoration work. In the UK (England and Wales) a River Restoration Centre has been established as a focus for exchange of information and expertise and 'Agricultural Ambassadors' have been appointed to assist farmers in addressing diffuse water pollution.
- The Norwegian FAR refers to local, regional and national initiatives. At the national level, salmon advisory and consultation meetings are held twice a year and allow for the involvement of a wide range of stakeholders including those representing fishing rights holders, fishing interests, the aquaculture and hydro-power industries and the relevant authorities.
- In the US, a recent development is the establishment of the Diadromous Species Restoration Research Network to improve networking among those involved in the different aspects of river use and to identify research priorities for diadromous fish restoration.
- A number of FARs refer to the production of guidance on best practice. These include Guidelines for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador, and Guidelines for Planning and Construction of Culverts for Fish Passage in Quebec (Canada); 'Forest and water guidelines' (UK); 'Managing river habitats for fisheries: a guide to best practice' (UK – Scotland); a training manual on habitat enhancement (Ireland); and 'Best Farming Practices' and 'Think Soils' (UK – England and Wales).

The Review Group believes that there might be benefits from jurisdictions making available to the Secretariat relevant guidance on best practice on habitat issues so that it can be made available or referenced on the NASCO website.

5. Description of work undertaken and/or planned to establish comprehensive salmon habitat protection, restoration, and enhancement plans

Under the Plan of Action, NASCO's Parties and relevant jurisdictions should establish comprehensive salmon habitat protection and restoration plans that aim to: identify potential risks to the productive capacity and develop procedures for implementation, in a timely fashion, of corrective measures; place the burden of proof on proponents of an activity which may have an impact on habitat; balance the risks and the benefits to the Atlantic salmon stocks with the socio-economic implications of any given project; maintain biodiversity; and take into account other biological factors affecting the productive capacity of Atlantic salmon populations, including predator-prey interactions.

5.1 Identification of impacts and potential risks to the productive capacity

A range of impacts and risks to the productive capacity of salmon habitat has been highlighted although the FARs for Finland and Iceland indicate that the pressures are limited and the rivers largely pristine in nature. There are also clear regional differences within jurisdictions e.g. in Canada salmon habitat in the Maritime Provinces is more affected than that in Quebec and Newfoundland. The most commonly identified impacts relate to obstacles to migration (including those associated with hydro-electricity generation), changes to water quality (including those due to acidification, sewage and industrial effluents, and diffuse pollution from agriculture), changes to water quantity (including water abstraction and flow regulation), changes to channel morphology (including those due to transportation infrastructure) and forestry practices (including logging).

- The FAR for Ireland describes in tabular format the impacts and potential risks for each of Ireland's 148 salmon rivers. The most significant factors in 2008 were agricultural enrichment, forestry related processes and poor water quality resulting from inadequate sewage treatment. For each impact factor there is a useful description of the issues and the approach being taken to address them.
- The FAR for EU (Sweden) also provides in tabular form details of the habitat measures required to increase the productive capacity for each salmon river under the headings altered water regulation, elimination of migration barriers, habitat restoration, increased buffer zones and liming operations. It is estimated that a 17.8% increase in habitat could be achieved through elimination of barriers to migration and habitat restoration.
- The FAR for Norway provides a graphical overview of the frequency of adverse human impacts affecting salmon rivers. Acidification, hydro-electricity generation and other habitat deterioration are the main areas of focus (in addition to fisheries, escaped farmed salmon, sea lice and *G. salaris*).

5.2 Procedures for implementation, in a timely fashion, of corrective measures

Under the Plan of Action, where risks to productive capacity are identified procedures for implementation in a timely fashion of corrective measures should be developed. A number of FARs refer to the planned timescale of restoration programmes including the aim under the Water Framework Directive to achieve good ecological status or good ecological potential by 2015 through a programme of measures. The following are examples of approaches to responding specifically when problems are detected:

- In UK (England and Wales), the principal salmon stocks are assessed in relation to achievement of their conservation limits and those stocks with a high probability of failing to meet the objective are given a higher priority for action with exploitation control measures being put in place as an interim measure. In Scotland, a cost-benefit approach is used where the priority for restoration work is linked to the likely impact on smolt output.
- The Russian FAR indicates that it is a requirement of discharge consents that the companies conduct chemical analyses of discharges relative to control sites in the watercourses and where pollution levels exceed permitted levels stronger restrictions are imposed.

5.3 Placing the burden of proof on proponents of an activity which may have an impact on habitat

Under the Plan of Action, each jurisdiction's habitat plan should aim to place the burden of proof on proponents of an activity which may have an impact on salmon habitat. This means that there is a requirement for proponents of an activity to demonstrate by weight of evidence that an activity would not significantly degrade the productive capacity of the resource.

- A number of FARs indicate that impact assessments are required for projects that could damage salmon habitat and that mitigation measures or compensation arrangements are put in place.. There may be a threshold above which an impact assessment is required but even for smaller projects an impact statement may be needed in some countries.
- The Norwegian FAR states that in National Salmon Rivers permission will not be given to any new enterprises or activities that might harm wild salmon and in National Salmon Fjords no new salmon farms will be established and existing farms will be subject to more stringent standards to prevent escapes and control diseases.
- The US FAR indicates that to receive an incidental take statement the proponent of an activity that may impact salmon in the GOM DPS must describe the activity, the level of impact anticipated and the conservation measures to be implemented to minimise impacts. A similar consultation process also occurs within areas designated as essential fish habitat. In making a determination on the proposal there is a requirement to use the best scientific information and err on the side of the species.

The Review Group considers that while most FARs provided some details on how this important aspect of the habitat plans is addressed, further clarification on how the burden of proof is placed would be useful in the next habitat FARs.

5.4 Addressing how the risks and the benefits to the Atlantic salmon stocks are weighed with the socio-economic implications of any given project.

The NASCO Plan of Action states that the habitat plans should balance the risks and the benefits to the Atlantic salmon stocks with the socio-economic implications of any given project. The Agreement on Adoption of a Precautionary Approach states that priority should be given to conserving the productive capacity of the resource where the likely impact of resource use is uncertain. However, these documents do not make it clear how habitat management decisions are to be taken when there are conflicts between socio-economic and conservation issues. Most FARs failed to provide a clear indication of how socio-economic factors are incorporated into decisions concerning the management of salmon habitat.

- The FAR for Iceland indicates that the income to Fisheries Associations is one of the major factors weighed against the benefits from activities that could impact salmon habitat. Due to the high value of the salmon fisheries environmental impacts on salmon rivers have been relatively minor (e.g. from hydro-electricity generation).

- The FAR for Russia states that any economic activity planned on or close to salmon rivers requires approval by the authorities and it must not damage salmon habitat. If damage is caused then compensation payments are required that are directed to habitat enhancement activities and restoration works.
- The FARs for UK (England and Wales) and UK (Scotland) indicate that while the default objectives under the EU Water Framework Directive is to achieve 'good status' or 'good potential' by 2015 there is recognition that this may not always be possible and that alternative objectives (e.g. an extended deadline or less stringent objective) may be set in order to take into account other issues such as social and economic priorities. This approach recognises that the cost/benefits of achieving good status may be too high or there may be an overriding societal benefit from such activities continuing.
- The FAR for UK (Northern Ireland) provides data on a cost-benefit assessment related to restoring 17.5km of degraded habitat in the River Main. This involved assessing the cost of the remedial works package in relation to the likely value of increased fish production (over 25 years). The assessment showed a net benefit from the restoration project.
- The US FAR states that ESA listing determinations do not consider socio-economic issues. Thus, if a species was determined to be endangered as a result of an economic activity, the ramifications of the listing for any industry would not be considered. If a project is determined to jeopardise the continued existence of a species the agencies cannot authorise a take and an alternative project must be identified. However, socio-economic issues are carefully weighed when designating critical habitat since the economic costs of designation must be evaluated for those activities that will need to be modified to avoid adverse modification of critical habitat. In the case of the GOM DPS the biological benefit of critical habitat designation was assessed to outweigh the economic cost.

The Review Group recommends that for future reporting it would be useful if a clearer indication of how socio-economic aspects are taken into account in decisions concerning habitat protection, restoration and enhancement could be provided.

5.5 Considering the effects of habitat activities on biodiversity in the area affected

The NASCO Plan of Action states that habitat protection and restoration plans should aim to maintain biodiversity but few FARs reported in detail on this aspect. In general, measures to protect and restore salmon habitat should benefit other flora and fauna and this benefit is noted in some FARs. It is, perhaps, most important to assess the impact of habitat activities on biodiversity when planning salmon habitat enhancement work which may involve providing access for salmon to habitats that they have not previously occupied. Some examples of FARs that did refer to biodiversity issues are given below:

- The FAR for Ireland indicates that there is a legal requirement for Fisheries Boards to consider the implications of habitat rehabilitation schemes on natural heritage, including biodiversity, and to comply with the National Biodiversity Plan. A process of liaison has been established with agencies responsible for other aspects of biodiversity to ensure that salmon rehabilitation plans maximize biodiversity benefits. The Rural Environmental Protection Scheme is being

implemented nationally and through fencing of rivers has the potential to maintain and restore ecological diversity along river channels.

- The Icelandic FAR indicates that the effects of activities such as river improvements on river biodiversity are considered as part of the licensing process.
- The FARs for UK (England and Wales, Scotland and Northern Ireland) refer to the requirement to assess the effects of habitat activities on Natura 2000 sites identified under the Habitats and Birds Directives. The Salmon Action Plans developed in England and Wales are subject to Strategic Environmental Assessment designed to integrate wider environmental considerations into specific plans and the Environment Agency has a duty to review biodiversity needs in any of its actions. In Scotland habitat restoration initiatives require authorization and are required to show that there is no collateral damage to other habitat interests.
- The US FAR notes that there is a requirement under the Endangered Species Act to recover the listed species and the ecosystems on which they depend.

The Review Group recommends that for future reporting the jurisdictions provide additional information on how the effects of habitat restoration and enhancement on biodiversity are taken into consideration.

5.6 Taking into account other biological factors affecting the productive capacity of Atlantic salmon populations.

The NASCO Plan of Action states that each jurisdiction's habitat protection and restoration plan should take into account other biological factors affecting the productive capacity of salmon. Most FARs failed to address this issue in any detail, possibly because it was felt that this would be addressed in the FARs dealing with other aspects of the Implementation Plans. Examples of FARs that detailed how other biological factors are taken into account are given below:

- The Irish FAR indicates that habitat rehabilitation plans are prioritized on rivers where other biological factors such as, diseases and parasites (sea lice infestation of post-smolts), competitors and predators, invasive species and fish farm escapees will least impede the success of salmon restoration efforts.
- In Sweden, in order to minimize impacts on wild stocks and prevent spread of diseases, there are strict control on stocking and aquaculture activities e.g. a prohibition on any new aquaculture establishments in rivers.
- The FAR for UK (Scotland) indicates that through RBMPs, the Species Action Framework and local Fisheries Management Plans all significant in-river biological factors should be taken into consideration. The FAR for UK (England and Wales) states that the Environment Agency's sea trout and salmon strategy aims to protect against introduction of high risk species including diseases and parasites e.g. *G. salaris*. Both FARs also refer to the opportunities to kill predators such as seals and fish-eating birds under licence when serious damage to fisheries can be shown to be occurring.
- The US FAR notes that Atlantic salmon may require healthy and abundant populations of other native diadromous species in order to complete their life-cycle. Priority is given to restoration options that will have the greatest net benefit for the ecosystem in terms of restoration potential for river herring, American shad and other species. Furthermore trends in marine survival of salmon have

been considered in determining if sufficient habitat had been designated in order to facilitate recovery.

The Review Group recommends that all jurisdictions should include a brief overview of biological factors affecting the productive capacity of Atlantic salmon populations the next time habitat FARs are developed.

6. Overview of Ongoing Habitat Activities

The purpose of including this overview in the FARs is to provide an opportunity for jurisdictions to demonstrate progress in implementing the salmon habitat protection, restoration and enhancement plans and, where possible, to quantify the extent to which habitat has been restored or enhanced, or to describe other criteria used to evaluate progress. The objective of NASCO's Plan of Action is to maintain and, where possible increase, the current productive capacity of salmon habitat. It is clear from the information provided that there have been some notable successes to date. Some examples follow that relate to improving access, water quality and instream habitat.

6.1 Improvements to access

In Canada, the removal of dams and installation of fishways in the Miramichi River have resulted in more than 1,000km^2 of river being re-opened for salmon. In Finland improvements to access have been made in five tributaries of the Teno following lowering of culverts and installation of structures to reduce the water velocity in the culverts. In France, a comprehensive inventory of dams and weirs has been developed revealing around 50,000 structures that are obstacles to migration or cause flooding of spawning or nursery areas. Studies are underway to assess the feasibility of removing barriers to migration. In UK (England and Wales) a prioritization model is being developed to identify where the greatest benefit lies from removal of barriers to fish migration (2,500 have been identified for all fish species) or installation of fish passes. Furthermore, between 1995 – 2005, the members of the Association of Rivers Trusts (excluding the Eden Rivers Trust) spent a total of £11 million on their work which contributed to the removal or easing of 630 obstacles making 3,078 km of river available. In addition, fencing was erected and banks protected. In UK (Scotland) over the last 15 years, removal of obstacles to migration in the River Tweed has opened up 1,359 km of river, more than half of which was in the main stem. The Scottish Environment Protection Agency makes available funding of approximately £1 million annually to remove or ease barriers to upstream migration. For 2009, projects that would open up 264 km in nine rivers have been submitted for funding. Through a major public/private partnership project aimed at restoring habitat in eight Special Areas of Conservation designated for salmon in Scotland, 125 km of habitat was opened up to salmon and approximately 70,000 m^2 of degraded juvenile and spawning habitat has been improved. In the US, the Penobscot River Restoration Project plans to remove the two lowermost dams on the river and construct a fishway around a third. To date, the dams have been purchased at a cost of $25 million and fund-raising is ongoing to allow the removal work to proceed. Similarly, the Merrimack Village Dam, on the Merrimack River, has been removed and monitoring is being conducted to assess the effectiveness of the removal. Project SHARE (Salmon Habitat and River Enhancement) focuses on fish passage issues in Downeast

Rivers in Maine. In 2007, 13 stream habitat connectivity projects were completed in four rivers.

6.2 Water quality improvements

In UK (Scotland), through improvements in treatment of domestic and industrial waste and reductions in industrial discharges, salmon have progressively reestablished themselves in rivers draining into the Forth and Clyde estuaries from which populations had been lost. In UK (England and Wales), the England Catchment Sensitive Farming Delivery Initiative aims to tackle diffuse water pollution from agriculture through a range of advice and incentives to reduce soil, nutrient and pesticide run-off.

In Canada, the Nova Scotia Acid Rain Campaign Committee has been developing a long-term liming strategy and setting out criteria for prioritizing rivers. In 2005, at a cost of more than $250,000 a lime doser was installed in the West River, Sheet Harbour and monitoring suggests increased abundance of invertebrates since liming began. In Sweden, liming is carried out annually in 21 of the 23 rivers to improve water quality. It has been estimated that 50 – 75% of the natural salmon smolt production would have been lost in these rivers in the absence of liming. In Norway, 22 acidified rivers are treated with lime at a cost of £4.5 million annually. The catch of salmon in the treated rivers has increased from 5 tonnes prior to liming to about 40 tonnes in recent years.

6.3 Instream and riparian habitat restoration

- In Canada, a $30 million Atlantic Salmon Endowment Fund was established in 2007 to fund projects that contribute to salmon restoration and conservation. As a result of projects funded under the Nova Scotia 'Adopt a Stream' initiative, approximately 110,000 km^2 of instream fish habitat has been restored and 66,000 m^2 of riparian habitat protected. In Finland, erosion protection work conducted by both Finland and Norway has been completed on 16km of river bank in the Teno catchment area. In Ireland, a 'Salmon Conservation Stamp Fund' has been established as a means of funding rehabilitation of salmon rivers not meeting their conservation limits. The sale of angling and commercial licences in 2007 raised more than Euro 637,000 for the fund which supported thirty projects including protection of river banks; creation, rehabilitation and improvement of spawning grounds; in-stream works and removal of trees and obstacles. This work has significantly improved the capacity of the rivers to achieve their conservation limits. Habitat enhancement programmes conducted during 1996 – 2001 at a cost of IR£15 million led to the enhancement of 300 km of river channel through bank stabilization, restoration of degraded channels, spawning area improvements etc. In Sweden, there is a range of ongoing activities to restore habitat including measures to increase water flows downstream of hydropower stations. One such measure in the River Savean was estimated to increase smolt production by 560 fish per annum. In UK (Northern Ireland) habitat activities that have been or will be conducted include initiatives to improve spawning grounds and holding habitat for salmon, bank protection, installation of fish passes and measures to prevent damage by livestock. In UK (Scotland) riparian habitat restoration works carried out in the River Annan catchment have resulted in the installation of 26,000km of fencing. In UK (England and Wales) reference is made to initiatives to

improve shade cover and encourage the accumulation of woody debris to mitigate the impacts of climate change. The Norwegian FAR refers to a habitat restoration programme commencing in 2006 with a number of components including restoration of fish ladders (commencing 2008), habitat restoration in National Salmon Rivers (commencing in 2010) and habitat restoration in 80 other rivers (commencing in 2011). In addition, an Action Plan for liming acidified rivers applies to the period 2004 – 2010 with a budget of £4.5 million per annum. In northern Norway a programme of river restoration work is underway focusing on bank restoration and erosion protection.

7. Conclusions

7.1 One of the purposes of the 'Next Steps' process is to facilitate information exchange among the jurisdictions. The Review Group has made recommendations that should facilitate improved information exchange the next time the Council focuses on habitat issues and the Group believes that these should be made available to the jurisdictions prior to development of the next habitat FARs. The Guidelines developed by the Review Group should, if adopted, assist subsequent reviews of the FARs and the assessment of the consistency of the measures taken with NASCO's agreements. The Review Group also believes that it would be useful if the next time the focus area is habitat protection, restoration, and enhancement the FARs could consider the issue of climate change, its expected impacts on salmon habitat and particularly the approaches being considered or implemented to mitigate its impacts.

7.2 A large amount of the historically available salmon habitat was degraded or lost particularly following the Industrial Revolution but considerable restoration efforts are underway. However, where estimates of habitat lost to salmon production have been provided it is clear that significant areas of habitat remain unavailable for salmon production. Obstacles to migration (including those associated with hydro-electricity generation), changes to water quality and quantity, and changes to channel morphology continue to pose challenges that will need to be addressed if the full productive capacity of salmon habitat is to be restored. There is, however, also much encouraging news on salmon habitat and there have been some notable gains. For example, in Iceland there has actually been a net increase in habitat of 27% due to opening up previously inaccessible habitat above waterfalls. At a time when abundance of salmon all around the North Atlantic is low due to poor marine survival, where habitat is restored the salmon stocks can rebuild. Some notable examples include the return of salmon to major river systems such as the Tyne, Tees, Thames and Clyde in the United Kingdom and the Seine in France even if the numbers in some of these rivers are low at present. The management goal must be to maximize the ability of salmon habitat to produce smolts while ensuring that harvests in fisheries reflect both the abundance and diversity of the stocks. A major scientific and management challenge will be to maintain the habitat's productive capacity in the face of a changing climate which is likely to have a significant effect not only on the environmental conditions experienced by the salmon but also on the impacts of human activities on aquatic ecosystems.