## **IP(09)8**

Protection, Restoration and Enhancement of Salmon Habitat Focus Area Report

EU-UK (Scotland)

## EU-UK (SCOTLAND): FOCUS AREA REPORT ON PROTECTION, RESTORATION & ENHANCEMENT OF SALMON HABITAT

#### 1.0 Introduction

The Guidelines for the Preparation of North Atlantic Salmon Conservation (NASCO) 'Implementation Plans' and for Reporting on Progress, NSTF(06)10, adopted by the Council, indicate that reports to Special Sessions will provide an in-depth assessment of actions taken under the focus areas identified. The Council has agreed that the second focus area report (FAR) is on the protection, restoration and enhancement of salmon habitat.

This report provides an in depth assessment of salmon habitat, following the structure identified in document CNL(08)33<sup>1</sup>, with due consideration of Council document CNL(01)51<sup>2</sup>. Section 1 provides a description of the geographical distribution and characteristics of salmon rivers in Scotland. Section 2 quantifies the area of habitat and the quality of habitat that is available to salmon currently and historically. Section 3 describes the processes by which important salmon habitats are identified and designated. Section 4 describes the processes by which information on salmon habitat issues is exchanged. Section 5 describes the plans of work that will be undertaken to protect, restore or enhance salmon habitat. Section 6 describes current and historical habitat work and the processes by which the success of salmon habitat related work has been and will be assessed.

### 1.1 Salmon rivers in Scotland

Scotland forms the northern part of Great Britain lying between  $54^{\circ}38'$  and  $60^{\circ}51'$ N. It consists of the Scottish mainland and island archipelagos to the west and north. The combination of many islands and a highly indented west coast mainland gives rise to a very long coastline (3684 Km) given the size of the land mass (78772 Km<sup>2</sup>)<sup>3</sup>.

Scotland's geology, topography and largely maritime, temperate climate have resulted in a considerable number and variety of independent river systems, varying in size from tiny coastal streams to the River Tay with a catchment area of 5,260 km<sup>2</sup> and a mean annual discharge of 5.3 km<sup>3</sup> <sup>4</sup>. GIS analysis reveals 255 individual river catchments >25km<sup>2</sup> within Scotland (Fig. 1). With the exception of very small catchments, most Scottish rivers contain suitable habitat for salmon and consequently sustain local populations. Data provided for the NASCO Salmon Rivers Database suggest that there are 381 rivers (catchments draining to the sea) supporting salmon in Scotland, with many of these rivers supporting a variety of sub-populations with varying life-history types. Knowledge of the current distribution of salmon in Scotland is presented in Figure 2. With the exception of the Central Lowlands (see below), most river systems have retained salmon populations throughout documented history.

Scotland's river systems exhibit a wide range of physical and hydrological characteristics. However, in broad terms Scotland's rivers can be classified into three main geographic regions: (1) the Highlands and Islands; (2) the Central Lowlands; and (3) the Southern Uplands.

<sup>&</sup>lt;sup>1</sup> CNL (08)33 Focus Area Report on Protection, Restoration and Enhancement of Salmon Habitat

<sup>&</sup>lt;sup>2</sup> CNL(01)51 NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat

<sup>&</sup>lt;sup>3</sup> Anon (1993) Scotland in Profile. Factsheet 2, The Scottish Office Information Directorate. 16pp.

<sup>&</sup>lt;sup>4</sup> Soulsby, C. Tetzlaff, D. Gibbins, C.N. and Malcolm, I.A. (2009) British and Irish Rivers *In* Tockner, K.

Uehlinger, U. and Robinson, C.T. The Rivers of Europe, Academic Press Inc. ISBN: 978-0-12-369449-2

#### The Highlands and Islands

These rivers lie to the north and west of the country and include the highest ground associated with the North West Highland and Grampian mountain ranges (up to 1356 m). The main watershed lies to the west of the country, resulting in many small and relatively steep rivers to the west, often with limited accessibility to spawning salmon. In contrast, the topography is gentler to the east, resulting in rivers that are larger, less steep and with greater accessibility to adult salmon. In general, salmon in the larger east coast rivers can penetrate further inland and can spawn at higher altitudes, reaching over 600 metres at the extreme.

#### The Central Lowlands

The central lowland rivers are generally characterised by a more gentle topography with a number of lower hill ranges. There is a mix of larger and medium sized rivers. The distribution of salmon in these areas was extensive prior to industrialisation. However, this area is also the centre of Scotland's major industry and centres of population. The combined effects of domestic and industrial pollution of the lower rivers and upper estuaries, aggravated by the degradation of spawning and nursery areas and the obstruction of rivers by weirs, resulted in loss of populations in eight rivers during the 19<sup>th</sup> century. The demise of these rivers started in the 18<sup>th</sup> century with the low point for salmon distribution occurring in the 1950s. Fortunately, over the last 50 years improved treatment of domestic and industrial wastes and reductions in industrial discharges have resulted in sufficient improvements in water quality to allow salmon to re-establish, although they have not yet recovered their full pre-industrial ranges (Gardiner and McLaren, 1991; Doughty and Gardiner, 2003). The status of these rivers is recorded as restored in the NASCO database.

#### The Southern Uplands

The southern uplands, as the name suggests make up the south of Scotland. The rivers are generally medium to large in size and there is extensive natural accessibility. Although there have been local problems (some of which remain), none of the rivers in this region completely lost their salmon populations at any stage, and none are considered currently threatened with extinction.

#### General

Scottish rivers support some of the most diverse and important salmon populations in the species' range with adults running through all months of the year. Taken together, the salmon biodiversity and large number of healthy and productive rivers support a recreational rod fishery whose catch is one of the highest in the Atlantic salmon's range (92,000 salmon and grilse in 2007 of which 61% were released).

## Legend

Main River Catchments

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Figure 1. Map of major Scottish river catchments (> 25km<sup>2</sup>). The 15 largest catchments are named (Border Esk is reported elsewhere).

#### 2.0 The quantity and quality of current and historic salmon habitat in Scotland

NASCO defines salmon habitat as "spawning grounds, rearing areas, food supplies and migration routes on which Atlantic salmon depend directly or indirectly in order to carry out their life processes and maintain the productive capacity of each population" (CNL(01)51). However, NASCO also notes that "many habitat issues in the marine environment are beyond direct human control" (CNL(01)51). Consequently, this report focuses primarily on the freshwater environment where management can make a significant difference to productivity. For the purposes of this report salmon habitat is considered to include all areas of the freshwater environment where salmon are known to be present.

In order to determine the quantity and quality of salmon habitat a GIS approach was implemented that made maximum use of pre-existing data across Scottish Government and its agencies including Fisheries Research Services (FRS) and Scottish Environment Protection Agency (SEPA). The datasets used in this report include the FRS dataset on salmon distribution and barriers to migration and the SEPA datasets on water body status and environmental pressures (Water Framework Directive). By combining these datasets within a GIS it has been possible to quantify salmon habitat in terms of wetted area in still and running waters.

The FRS salmon distribution dataset contains the best available information on the current distribution of salmon, and natural and man made passable and impassable barriers. Data were initially collated from a variety of historical and contemporary data sources including FRS staff, District Salmon Fishery Boards, Fisheries Trusts and local angling clubs in the 1980s<sup>5</sup>. The last major update to the dataset was carried out in 2006. At this stage, the distribution data were digitised onto the Centre for Ecology and Hydrology (CEH) digital rivers network to identify the spatial distribution of salmon. These line data were subsequently allocated to Ordnance Survey Mastermap polygons in order to provide wetted areas.

The following section quantifies the wetted area of habitat currently (2.1) and historically (2.2) available to salmon in both still and running waters. The quality of available habitat is then assessed and reported using Water Framework Directive Classifications (2.3). Data are presented on the main environmental pressures degrading Scotland's salmon habitat using WFD classification data (2.4). Additional detail is provided on the environmental pressures and the causes of environmental pressures impacting salmon habitat (2.5). Due to paucity of historical information, no data are presented on the quality of historical habitat.

### 2.1 The quantity of salmon habitat currently available in Scotland

For the purposes of this report, current habitat was defined as those areas in the FRS salmon database where salmon were indicated as "present" or "probably present".

Figure 2 shows the present distribution of salmon based on the best information currently available. The wetted area available to salmon in Scotland is estimated at  $863,795,829 \text{ m}^2$ , consisting of 177,295,265 m<sup>2</sup> of river habitat and  $686,500,564 \text{ m}^2$  of loch habitat.

<sup>&</sup>lt;sup>5</sup> Gardiner, R. and Egglishaw, H. (1986). A Map of the Distribution in Scottish Rivers of the Atlantic Salmon, *Salmo salar* L. Department of Agriculture and Fisheries for Scotland, Freshwater Fisheries Laboratory, Pitlochry. 5pp + folded map. Scottish Fisheries Publication.

## Legend

------ Salmon Present / Probably Present



Figure 2. Map showing the estimated distribution of salmon in Scotland, based on a 2007 update of the original "Map of the Distribution in Scottish Rivers of the Atlantic Salmon, *Salmo salar* L." (Gardiner and Egglishaw, 1986)

#### 2.2 The quantity of habitat historically available to salmon in Scotland

For the purposes of this report historical habitat was defined as areas that would have been expected to be available to salmon pre-industrialisation. In practical terms, this included the current salmon distribution and the area upstream of impassable manmade barriers, up to 350m or the nearest known natural impassable barrier, depending on which came first. In the absence of better available information, the choice of 350m as an upstream cut-off was based on adult radio tagging data from the River North Esk which showed that salmon rarely spawned beyond this altitude. This report does not consider cases where the natural range of salmon has been increased by the easing of natural barriers. These areas will be included in both the current (above) and historical area totals.

Figure 3 shows those catchments that were historically available to salmon, but where physical barriers prevent access. Preliminary estimates of historical habitat areas that are no longer available to salmon are ca. 81,449,488 m<sup>2</sup> for still waters and 13,329,197 m<sup>2</sup> for running waters. This represents approximately 10% and 7% of the total historical area for still and running waters respectively. However, it is important to recognise that many areas that were historically running water are now still-water areas as a result of flooding by impoundment. These will have been classified as still waters and therefore the current GIS analysis will overestimate losses from still waters without further refinement.

## Legend



Figure 3. Catchments where man-made physical barriers exclude salmon from historically available habitat.

#### 2.3 The quality of salmon habitat

In most cases there are no data on the quality of salmon habitat pre-industrialisation. Consequently this report will focus on assessing the current quality of habitat. This is most readily achieved by applying EU Water Framework Directive (WFD) classification and pressure data to water bodies known to contain salmon as identified in sections 1 and 2.1 above. The WFD is a powerful piece of water management legislation which goes beyond consideration of water quality issues to also take account of environmental impacts from morphological or hydrological change<sup>6</sup>. Critically, WFD classifies water body status (quality) according to ecological quality elements (Phytoplankton, macrophytes, phytobenthos, invertebrates and fish), with water quality and hydromorphology (an integration of hydrology and morphology) acting as supporting elements. For WFD Good Ecological Status (GES) represents water bodies where relevant biological quality elements are only slightly changed from their reference conditions as a result of human activities and environmental quality standards are achieved for the relevant physico-chemical quality elements. It is generally considered that GES is synonymous with sustainable water resource management. In some cases where a water body has been significantly altered, for example a dam has been constructed for water supply or power generation, and this water body cannot attain good ecological status, a water body may be designated as a Heavily Modified water body. In these cases an alternative objective of Good Ecological Potential (GEP) is defined which is consistent with the best possible environmental conditions given the use of the water body. For further information on reporting frameworks for RBMPs see section 5, particularly section 5.4 below.

Where water body status is less than good (moderate, poor or bad) there are significant pressures acting on the freshwater environment and for the purposes of this report it can be considered that the habitat for salmon has been degraded. Where habitat is defined as heavily modified it can also be considered that it has substantially departed from the natural condition and therefore is likely to be degraded as a habitat for salmon.

Figure 4 shows a map of water body status for water bodies constituting salmon habitat. Table 1 shows the area of running water salmon habitat in each WFD status band. Table 2 shows the area of still water salmon habitat associated with each WFD class band. It can be seen that around 37% of the total area of current running water salmon habitat is at high or good status, while around 48% of current still water salmon habitat is at high or good status. Water bodies classified at less than good status tend to be associated with central belt, northern and eastern coastal fringes. Good and high status water bodies tend to occur in upper catchments, associated with less intensive land use activities, low population densities and low levels of industry.

<sup>&</sup>lt;sup>6</sup> <u>http://ec.europa.eu/environment/water/water-framework/info/intro\_en.htm</u>

## Legend



Figure 4 – Map showing the WFD status of water bodies supporting salmon in Scotland.

STATUS	Habitat (m <sup>2</sup> )
High	9,010,542
Good	67,701,762
Good Ecological Potential	18,331,913
Moderate	80,702,301
Moderate Ecological Potential	279,923
Poor	19,935,881
Poor Ecological Potential	3,543,821
Bad	5,472,350
Bad Ecological Potential	2,068,294

## Table 1. Areas of running water salmon habitat characterised by WFD Ecological status bands High-Bad and GEP-BEP (HMWB)

STATUS	Habitat (m <sup>2</sup> )
High	126,204,319
High Ecological Potential	1,157,882
Good	170,426,913
Good Ecological Potential	82,534,689
Moderate	176,755,312
Moderate Ecological Potential	198,708
Poor	16,550,404
Poor Ecological Potential	39,040,253
Bad	2,329,390

## Table 2. Areas of still water salmon habitat characterised by WFD Ecological status bands High-Bad and HEP-PEP (HMWB)

A detailed breakdown of water body WFD classification results is available on SEPA's web site<sup>7</sup>.

### 2.4 Environmental pressures on Scotland's salmon habitat

In order to improve understanding of the pressures affecting Scotland's salmon habitat, SEPA WFD environmental pressure data were extracted for those water bodies containing salmon. The pressure information is derived from classification tools and environmental standards developed for the first WFD River Basin Plan<sup>8</sup>. Many of these procedures are new, and will be subject to periodic review. However, in terms of identifying the dominant pressures on Scotland's salmon habitat the approach provides valuable insights. Due to technical constraints associated mainly with integrating data from WFD and other sources, the analysis presented below is based on water-body numbers rather than water body area (as presented above); consequently care is required in interpretation. The status of water bodies may be less than good because of the effects of one or more failing parameters. A summary of the pressures causing failure is presented in Tables 3 (running water) and 4 (standing waters). The classification results indicate that the dominant environmental problems affecting the rivers and lochs that support Atlantic salmon in Scotland are (1) changes to the quantity of water (including temporal variability); (2) changes to physical habitat (geomorphology), including barriers to fish migration; and (3) nutrient enrichment.

<sup>&</sup>lt;sup>7</sup> <u>http://gis.sepa.org.uk/rbmp/MapViewer.aspx</u>

<sup>&</sup>lt;sup>8</sup> http://www.wfduk.org/UK Environmental Standards/



Table 3. Breakdown of the number of running water bodies containing salmon habitat that are failing environmental standards due to particular pressures. The Diatom parameter indicates sites where analysis of diatom assemblages indicates a nutrient pressure associated with phosphorous.



Table 4. Breakdown of the number of still water bodies containing salmon habitat that are failing environmental standards due to particular pressures.

## 2.5 Activities and industry sectors causing failure of environmental standards in water bodies containing salmon habitat

There are a number of activities and industries that can cause a failure of environmental standards and consequently impact on salmon habitat. The following section identifies the percentage of water bodies impacted by a particular pressure and the causes of that pressure. The assessment of pressures is based on environmental standards and tools approved by the UK Technical Advisory Group (UKTAG) for WFD.

## Hydrology

Hydrological impacts on habitat integrity result from abstraction and flow regulation. These activities occur in order to provide drinking water supply, irrigation and power generation among other factors. The classification data for 2007 show that over 20% of surface waters are failing to meet good status (are degraded) because of impacts on hydrology.

	Number of water	% of water bodies affected by:						
	bodies (length/		Electricity generation		Water supply		Agricultural irrigation	
area) Water failing body parameter category in 2007	Abstraction	Flow regulation	Abstraction	Flow regulation	Abstraction	Flow regulation		
Rivers (no) km	<b>287</b> 3380	27%	21%	33%	21%	25%	0%	
Lochs (no) km2	<b>25</b> 136	28%	32%	32%	28%	0%	0%	

# Table 5. Percentage of water bodies affected by alteration to hydrological regime, broken down by industry sector.

Table 5 shows that the top three sectors (electricity generation, water supply and agricultural abstraction) cause hydrological impacts in more than 25% of water bodies containing habitat that supports salmon. The hydrology of Scotland's rivers and lochs is affected by other sectors (including distilleries and paper mills) but to a lesser degree.

### Water quality

The classification results (Table 6) show that the main water quality impacts relate to elevated nutrient levels (which affect 20% of Scottish rivers and lochs) and specific pollutants<sup>9</sup> (which affect almost 5% of Scottish rivers). In terms of elevated nutrient levels the most significant contributors are agricultural diffuse pollution, which affects more than 60% of rivers and estuaries and almost 40% of lochs, and sewage pollution which affects almost 50% of rivers and 10% of lochs. The agriculture and sewage treatment sectors also contribute to pollution of water bodies by specific substances. Other sectors causing nutrient pollution include urban drainage, forestry, mining and quarrying.

		Number of water	% of water bodies affected by					
Parameter	Water body catego ry	bodies (length/ area) failing parameter in 2007	Diffuse pollution from agriculture	Point source from sewage	Diffuse pollution from urban development	Diffuse pollution from mining and quarrying	Diffuse pollution from forestry	Point source from aquaculture
Diatoms	Rivers	313	64%	45%	11%	6%	2%	n
(phosphorus)		(3,746km)						/
								a
Phosphorus	Lochs	53 (171km <sup>2</sup> )	38%	11%	n/a	n/a	11%	8%
Specific	Rivers	82	24%	46%	10%	10%	n/a	n/a
pollutants		(935km)						

Table 6. Percentage of water bodies affected by water quality problems broken down by industry sector.

<sup>&</sup>lt;sup>9</sup> <u>http://www.wfduk.org/UK Environmental Standards/LibraryPublicDocs/final specific pollutants</u>

### Geomorphology

Changes to physical habitat include the straightening and deepening of rivers, building of embankments, removal of river bank vegetation and the reinforcement of banks among other impacts. Morphological impacts occur at 32% of surface water bodies, with 687 running water bodies (7,220km) and 62 still water bodies (364km<sup>2</sup>) failing the morphology standards in 2007. Table 7 shows that 45% of the rivers and 37% of the lochs impacted by changes to the physical habitat (morphology) are affected by multiple pressures.

#### Table 7. Percentage of water bodies affected by morphological impacts.

		Number of			% of water	bodies affecte	d by:		
Parameter	Water body category	water bodies (length/ area) failing in 2007	Multipl e pressur es	Historical engineering activities	Urban development	Electricity generation	Water supply	Agricultural activities	Forestry
Morphology	Rivers	687	45%	17%	3%	8%	7%	8%	18%
(physical habitat)		(7,220km)							
Morphology (physical habitat)	Lochs	62 (364km <sup>2</sup> )	37%	11%	0%	26%	31%	2%	15%

#### 3.0 The processes for identifying and designating habitat for salmon

At a broad scale it is possible to categorise the processes for identification and designation of habitat into 2 main groups: (1) national initiatives which are normally strategic and statutory; (2) local initiatives which usually operate at a regional or local scale and are often (though not always) non-statutory. Taken together these processes cover the full range of habitat issues important to salmon management. In recent years, these processes are increasingly being integrated through the structure and planning cycle of the WFD which provides a useful planning, monitoring and investment framework.

#### 3.1 National initiatives

#### Salmon map of Scotland

The FRS salmon map of Scotland was first produced in 1986 in paper format. It includes information on salmon distribution and natural and man made obstructions to salmon passage (see Section 2). The map was subsequently updated in an electronic format in 2006 using data provided under contract from local salmon fisheries boards' and trusts' biologists. This is a definitive and valuable record of the distribution of salmon in Scotland providing a valuable resource for assessing the salmon habitat at the national level.

#### NASCO river database

Information was provided to NASCO in 1995 on the location and status of salmon rivers in Scotland. FRS has periodically updated the database where changes in river status, omissions or errors have been identified. The basic data (on river locations and their status) are regarded as accurate given current knowledge. In common with the salmon map, the NASCO river database is a valuable resource in identifying salmon habitat at the national scale.

#### European Water Framework Directive

The WFD was transposed into domestic law in Scotland at the end of 2003 through the Water Environment and Water Services (Scotland) Act 2003. The Directive establishes a legal framework for the protection, improvement and sustainable use of surface waters, transitional waters, coastal waters and groundwater across Europe (see Section 2.3). In order to service Scotland's commitments under WFD a programme of fish monitoring is currently being undertaken, and a "fish tool" is being developed to provide an ecological classification. This will assist in identifying salmon habitat that is failing, while at the same time identifying the likely causes through monitoring, classification and reporting against environmental standards.

River Basin Management Planning is the process by which problems with aquatic habitat are identified and actions prioritised to deliver improvements at the national scale. Each River Basin District (of which there are three in Scotland – one mainland/ island plan, and two cross-border plans covering the Solway and Tweed catchments) will have a River Basin Management Plan (RBMP)<sup>10</sup>. These RBMPS have been established in a participative and consultative manner involving the statutory salmon fisheries management bodies in Scotland (District Salmon Fisheries Boards (DSFBs)) along with the network of Fisheries Trusts and FRS. SEPA is charged with leading and developing this new river basin planning process in Scotland and has worked with stakeholders to produce effective and deliverable plans. Delivering the Programme of Measures relies on a number of organisations, individuals and other plans.

The RBMPs include 10 Area Management Plans (AMPs) which are effectively the regional 'chapters' of the national plan. These are operated by Area Advisory Groups which include local salmon fisheries management representation (DSFB and Fisheries Trust). It is through these AAGs that issues important to salmon habitat are identified to inform habitat protection, restoration and enhancement issues. Actions can then be prioritised and fed into the regional and then national plan.

<sup>&</sup>lt;sup>10</sup> <u>http://www.sepa.org.uk/water/river\_basin\_planning.aspx</u>

SEPA is also establishing a Fish Advisory Group which will consider fish and fisheries issues that arise through the WFD River Basin Planning process. Specifically the group will provide comments on regulatory issues as required and strategic views on fish monitoring, classification and policy issues as triggered by the WFD.

### European Habitats Directive

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora forms the cornerstone of Europe's nature conservation policy<sup>11</sup>. It is built around two pillars: the Natura 2000 network of protected sites (which is comprised of sites designated under both the European Habitats and Birds Directives) and a strict system of species protection. The Atlantic salmon is listed under Annex II and Annex Va of the Habitats Directive. In Scotland a total of 17 Special Areas of Conservation (SACs) have been designated under the Directive where the Atlantic salmon is a qualifying feature. These are listed in Table 8.

Based on catch figures, these sites account for approximately 42% of the total Scottish Atlantic salmon resource. The Scottish salmon population is important in a European context, and this has influenced the selection of SACs. Site selection has focused on the identification of rivers holding large salmon populations across the geographical range of the species in the UK. Site selection has also taken into account the considerable variation in the ecological and hydrological characteristics of salmon rivers, and in the life-cycle strategies adopted by the salmon within them. Spawning and nursery requirements are well-represented in all the selected sites, and the river systems selected include the main tributaries where significant redds occur.

Conservation measures intended for other protected species and habitats such as for Freshwater Pearl Mussels (*Margaritifera margaritifera*) are also likely to be of benefit to salmon.

Berriedale and Langwell Waters	River Oykel
Endrick Water	River Naver
Langavat	River Teith
North Harris	River South Esk
Little Gruinard River	River Spey
River Borgie	River Tay
River Bladnoch	River Thurso
River Moriston	River Tweed
River Dee	

### Table 8. Scottish SACs where Atlantic salmon are a qualifying interest.

#### Freshwater Fish Directive

The EC Freshwater Fish Directive (2006/44/EC) was originally adopted on 18 July 1978 but consolidated in 2006. The Directive seeks to identify and protect fish habitat by the application of water quality standards to those fresh water bodies identified by Member States as suitable for sustaining fish populations. Physical and chemical water quality objectives are set separately for salmonid and cyprinid waters. The Directive will be repealed in 2013 by the WFD. Member States are required to designate appropriate waters within their territory and to put specific measures in place to maintain and improve the quality of their designated waters (habitat). In Scotland some 36,500km of rivers (almost 72% of the total length) are designated under the Directive, of which over 98% comply with the mandatory water quality standards. There are 113 waters designated for salmonid protection and two for cyprinids.

<sup>&</sup>lt;sup>11</sup> <u>http://ec.europa.eu/environment/nature/natura2000/index\_en.htm</u>

## 3.2 Local initiatives

## Fisheries Management Plans under the stakeholder developed Strategic Framework for Scottish Freshwater Fisheries

In July 2008, the Scottish Government, on behalf of the multi-stakeholder partnership group - the Scottish Freshwater Fisheries Forum, published a Strategic Framework for Freshwater Fisheries<sup>12</sup> which is intended as a comprehensive 'road-map' for all freshwater fisheries management activities over the next 10 years. The Framework is divided into a number of 'themes' in which specific projects have been identified. One of the key projects is the provision of a national structure for the development and implementation of regional fisheries management plans to be developed and implemented by Rivers & Fisheries Trusts of Scotland (RAFTS). To date (early 2009) this has resulted in 22 regional fisheries management plans which cover a large part of Scotland. Many of these operate at single catchment level (eg. for larger rivers such as the Tay, Tweed and the Aberdeenshire Dee). Others, particular in the smaller groups of catchments on the West Coast, operate with natural groupings of rivers according to administrative areas. Although of varying quality depending on data availability and resources, all the plans will identify salmon habitat issues to some extent including information on access, water quality & quantity and physical habitat quality and quantity.

#### River Management Plans

In addition to the fisheries management plans described above there are a wide range of other historical river management plans that are variably comprehensive but many of which are high quality planning documents which clearly identify salmon habitat and management issues. It is important the value of these plans is not lost in the processes listed above and over time it is hoped that the key content of these plans will be synchronised with the WFD planning process. Plans currently exist for the following rivers: Tweed, Tay, South Esk, Dee, Deveron, Spey, Conon, Hope, Polla, Rhiconich, Inver, Laxford, Badna Bay, Bhadain Daraich, Duart, Culag, Kirkaig, Garvie, Keodale Limestone Lochs, Kanaird, Dundonnell, Balgy, Ling, Gruinard, Ewe, Broom, Carron, Hamnavay, Creed, Aray, Fyne, Kinglass, Awe, Orchy, Bladnoch & Cree. Many of these plans are available on Fisheries Trusts websites which can accessed through the RAFTS website.<sup>13</sup>

### 4.0 Knowledge transfer

Information on salmon habitat in Scotland is disseminated and shared through a wide range of mechanisms. Although there are considerable overlaps between areas, in general terms it is possible to categorise knowledge exchange into four categories: written (4.1), verbal (4.2), web based (4.3) and organisational facilitation (4.4).

### 4.1 Written knowledge transfer

#### Peer reviewed publications

Arguably one of the most important forms of knowledge transfer is through scientific publication which goes through a peer review process. This information is normally widely available through libraries or increasingly in electronic form. Because this information has been peer reviewed it is normally associated with a high level of scientific rigour and often enables information to be used beyond the area in which it was collected. Scotland produces high quality peer reviewed publications on salmon habitat related issues from universities including Aberdeen, Glasgow and Stirling and also from dedicated government research facilities such as FRS and the Macaulay Institute. Peer reviewed papers are also produced by local fisheries biologists employed by the DSFBs and Fisheries Trusts as well as by SNH, often in collaboration with one of the aforementioned organisations. Peer reviewed publications are one of the primary mechanisms by which Scotland exchanges knowledge with the

<sup>&</sup>lt;sup>12</sup> http://www.scotland.gov.uk/Publications/2008/06/26110733/0

<sup>&</sup>lt;sup>13</sup> www.rafts.org.uk

rest of the world, ensuring that our knowledge is up to date and that scientists and managers elsewhere are aware of the high quality work carried out on salmon habitat in Scotland.

#### Reports (the so-called "grey literature")

Grey reports are typically produced by government and other statutory organisations (e.g. FRS, SEPA, SNH) and research institutes (e.g. Macaulay Institute) to disseminate information which is of scientific value, but which is not suitable for publication in peer reviewed journals. The reports often contain information which may be of a more routine nature, local interest or technical detail that does not bring overall advancement in scientific understanding associated with journal publication. Examples of recent topics covered by grey reports include the quality of salmon spawning habitat<sup>14</sup>, methods for assessing hydraulic habitat<sup>15</sup> and Site Condition Monitoring<sup>16</sup>

#### Public facing literature

In addition to the scientific literature identified above, FRS, SNH, SEPA, RAFTS (Rivers and Fisheries Trusts of Scotland), the Atlantic Salmon Trust (AST), Fisheries Trusts and various other organisations produce high quality public facing documents, where information on salmon habitat is provided in a format that is readily comprehensible to a wider audience, including members of the general public. Examples of public facing literature include local Fisheries Trust reports, District Salmon Fisheries Boards reports, local Fisheries Management Plans (See Section 4.2. below) the AST Newsletter<sup>17</sup> and reports<sup>18</sup>, RAFTS newsletters<sup>19</sup>, FRS information leaflets<sup>20</sup>, SNH<sup>21</sup> and SEPA reports<sup>22</sup>. In addition to publications produced by individual organisations, occasional collaborative reports are produced to deal with important issues. Good examples of such collaboration include "The Forest and Water Guidelines"<sup>23</sup> and "Managing River Habitats for Fisheries: a Guide to Best Practice"<sup>24</sup>.

In recent years SEPA have consulted extensively on habitat issues in relation to WFD<sup>25</sup> and provided summary reports<sup>26</sup>. These reports have been made available in hard copy and from the SEPA website.

#### Strategic plans

There are a number of strategic plans and documents which contain valuable information on salmon habitat including Scotland's River Basin Management Plans (see above) and the Strategic Framework for Freshwater Fisheries.

The Strategic Framework for Scottish Freshwater Fisheries is a significant development which contains information of importance to salmon habitat management. However, it also has a significant role in communicating and sharing information. Under the umbrella of the Framework the following projects will be delivered that are relevant to salmon habitat include:

<sup>&</sup>lt;sup>14</sup> http://www.marlab.ac.uk/FRS.Web/Uploads/Documents/1906.pdf

<sup>&</sup>lt;sup>15</sup> http://www.frs-scotland.gov.uk/FRS.Web/Uploads/Documents/Collab%2004-08.pdf

<sup>&</sup>lt;sup>16</sup> www.jncc.gov.uk

<sup>&</sup>lt;sup>17</sup> http://www.atlanticsalmontrust.org/news/newsletters.html

<sup>&</sup>lt;sup>18</sup> http://www.atlanticsalmontrust.org/publications/publications.html

<sup>&</sup>lt;sup>19</sup> http://www.rafts.org.uk/publications/newsletter.asp

<sup>&</sup>lt;sup>20</sup>http://www.marlab.ac.uk/Delivery/Information resources/information resources view documents.aspx?resou rceId=23700&parentId=41&parentName=Information%20Leaflets <sup>21</sup> http://www.snh.org.uk/pubs/default.asp

<sup>&</sup>lt;sup>22</sup> http://www.sepa.org.uk/about\_us/publications.aspx

<sup>&</sup>lt;sup>23</sup> www.forestry.gov.uk/pdf/FCGL002.pdf/\$FILE/FCGL002.pdf

<sup>&</sup>lt;sup>24</sup> http://www.scotland.gov.uk/Publications/2002/04/14606/3644

<sup>&</sup>lt;sup>25</sup> http://www.sepa.org.uk/about\_us/consultations.aspx

<sup>&</sup>lt;sup>26</sup> http://www.sepa.org.uk/water/water\_publications.aspx

- **Project 1.1** Commits the Forum membership to developing a national code of good practice (CoGP) in fisheries management techniques. This will be produced by 2011. The CoGP will enshrine available current and appropriate salmon habitat protection, restoration and enhancement techniques and aims to become a central authoritative source of information for this subject.
- **Project 1.4** The Fisheries Management Plans which were published at the end of 2008 and early in 2009 are public documents subject to local consultation and therefore fulfil a useful information dissemination role.
- **Project 2.3** Aims to establish a national web portal for all aspects of fisheries management in Scotland. This is planned to commence in 2009.
- **Project 2.4** Gives priority to forging relevant international links throughout the salmon management world.

The RBMP process provides a strategic plan for maintaining and improving freshwater habitat across Scotland. Details of the RBMP process are provided throughout this document. However, in terms of information dissemination Scotland's River Basin Management Plans provide information on the current status of Scottish freshwater habitat, the influence of pressures and future management actions that will be taken to improve habitat.

### 4.2 Verbal knowledge transfer

Meetings and conferences are a valuable way of rapidly exchanging information and ensuring that Scotland's understanding of salmon habitat related issues is current and world leading. Scotland's scientists, Agency staff and salmon managers attend a broad range of meetings from international conferences organised by groups such as American Fisheries Society, European Geosciences Union, American Geophysical Union, Ecohydraulics, Fisheries Society of the British Isles and British Hydrological Society through to national meetings organised by groups such AST and the Association of Rivers Trusts (ART - the English sister organisation to RAFTS). RAFTS and the Scottish Fisheries Coordination Centre (SFCC) (see section 4.4) also have annual meetings focussing particularly on salmon management issues.

FRS organised a one day workshop in October 2008 bringing together a wide range of interests including representatives from the academic, governmental and statutory bodies and fisheries managers to report on and disseminate information on current and recent research of key relevance to salmon and freshwater fisheries management. Further work on prioritising research needs for the Freshwater Forum's membership will be taken forward as part of Project 8.1 of the Strategic Framework for Freshwater Fisheries.

#### 4.3 Knowledge transfer through websites

Scientists, practitioners and the members of the general public are increasingly using electronic media for finding and disseminating knowledge. The following list of Scottish based websites (which is not exhaustive) provide useful information on issues related to Atlantic salmon habitat:

FRS http://www.marlab.ac.uk/

SFCC http://www.sfcc.co.uk

AST http://www.atlanticsalmontrust.org/

RAFTS http://www.rafts.org.uk

ASFB http://www.asfb.org.uk SNH http://www.snh.org.uk/

SEPA http://www.sepa.org.uk/

Northern Rivers Institute (University of Aberdeen) http://www.abdn.ac.uk/~wpg027/index.php

In addition to these institutional websites, important project related websites also provide valuable information on salmon habitat. Examples of these sites are:

The Strategic Framework for Scottish Freshwater Fisheries http://openscotland.gov.uk/Publications/2008/06/26110733/3

Conservation of Atlantic Salmon in Scotland (CASS) http://www.snh.org.uk/salmonlifeproject/cass.asp

#### 4.4 Facilitating groups and organisations

Several organisations and collaborative projects provide, or have provided, valuable opportunities to bring together groups of government policy makers, scientists, fisheries managers and land managers to exchange salmon habitat related information. Information on these groups is provided below.

#### Scottish Fisheries Coordination Centre (SFCC)

The Scottish Fisheries Co-ordination Centre (SFCC) is a partnership between Scottish Government, FRS and 22 Fisheries Trusts and Boards. It provides a data management system which enables salmon habitat and population information to be collected to common standards and then collated and analysed using GIS tools. These data are collected to agreed protocols established by the SFCC which offers an excellent opportunity for information exchange between fisheries managers throughout Scotland.

#### Association of Salmon Fishery Boards (ASFB) and Rivers and Fisheries Trusts Scotland (RAFTS)

The Association of Salmon Fisheries Boards and RAFTS provide links between a similar group of organisations as the SFCC although their remit is markedly different. Both the ASFB and RAFTS provide the opportunity to share information through their extensive membership as identified in sections 4.1, 4.2 and 4.3 above.

#### Freshwater Fisheries Forum

The Scottish Freshwater Fisheries Forum brings together Government, Agencies and stakeholders from a range of organisations representative of the freshwater fisheries sector. As such the forum offers the opportunity to widely disseminate information on salmon habitat related issues. The Forum Steering Group was also responsible for prioritising work in relation to freshwater fisheries, the main relevant outputs of which are identified above in Section 4.2.

#### River Basin Planning for WFD

The RBMP process both acts as a strategic plan (see Section 4.1) and a facilitating group for knowledge transfer. In the development of AMPs and RBMPs, knowledge on salmon habitat (including important areas for salmon and areas requiring improvement) is exchanged between Government Agencies, fisheries managers and other interested parties.

#### Conservation of Atlantic Salmon in Scotland (CASS)

One of the most successful projects for facilitating information transfer on salmon habitat was the recently completed Conservation of Atlantic Salmon in Scotland project. This was a 5 year project involving collaboration between the ASFB and Scottish Natural Heritage which resulted in a successful bid to the European Commission's financial instrument for the environment ("LIFE"). The

project was the single most significant salmon conservation project ever undertaken in Scotland, with 17 partners and nine co-financiers in addition to the EC. The project partners included the statutory bodies responsible for conservation of salmon stocks (District Salmon Fishery Boards), and also the public agencies responsible for population monitoring, SACs and species protection, natural heritage conservation and the management of forested catchment areas in public ownership. The project achieved a wide variety of objectives listed in Section 6, Table 11. The project had considerable lasting information transfer outputs in the form of a website<sup>27</sup>, newsletters, conference, guidance notes and inter EU exchanges.

### 5.0 Plans for the protection, restoration and enhancement of salmon habitat

The following section describes work planned or undertaken in relation to salmon habitat. Information is provided at both national (Section 5.1) and local (Section 5.2) scales. The extent to which the plans identify risks to salmon production (Section 5.3), implement measures in a timely fashion (Section 5.4), place the burden of proof on those impacting salmon habitat (Section 5.5), balance the risks and benefits of protecting salmon over other socio-economic considerations (Section 5.6), consider the effects of habitat activities on biodiversity (Section 5.7) and consider other biological factors (Section 5.8) is dealt with in subsequent sections.

### 5.1 National Plans

#### River Basin Management Plans under WFD

As discussed previously, the RBMP process has provided an organisational umbrella for legislation and activities (statutory and non-statutory) that aim to protect and improve Scotland's freshwater habitats (although WFD also extends to estuarine and coastal areas). Scotland has created two river basin districts to deliver the aims and objectives of the WFD; Scotland, and the Solway Tweed. The geographical area of a river basin district (RBD) is defined by law and made up of one or more river basins (the area drained by a river), their associated estuarine (transitional between freshwater and seawater), coastal and ground waters. SEPA has recently produced a draft RBMP for the Scotland RBD, and has worked in conjunction with the Environment Agency to produce a draft plan for the Solway Tweed RBD. A consultation on these plans is currently under way.

The draft RBMPs describe the current condition of the water environment, which by definition includes salmon habitat, and identify areas for protection and improvement. As part of the process the plans identify where current or historic activities are constraining the quality of the water environment and the biodiversity it supports, detail the actions required to ensure waters of special value (including biodiversity) are up to standard and maintain the quality where they already meet those standards. The plans also identify the actions needed to deliver environmental improvements over the next 6 years, and longer. For the first time, statutory agencies, private & public sector organisations and individuals have worked together to produce a plan that looks at all aspects of Scotland's water management.

SEPA has further divided the country into 10 regions that are managed by the Area Advisory Groups (referred to above). The combination of output of the Scotland's Water Management Issues report<sup>28</sup> and local consultation with key stakeholders and the general public has resulted in a series of regional 'chapters' of the plan having been constructed to ultimately produce the Scotland plan.

Setting of environmental objectives for the water environment is central to the River Basin Planning process. Environmental objectives are set on a water body by water body basis for the duration of the RBMP. The first plan identifies objectives until 2027 but the focus is on what can be achieved by 2015. In setting the objectives for the first RBMP a series of planning assumptions have been used to help assess the degree of improvement that might be expected from national measures such as Water Environment and Water Services (Controlled Activities) (Scotland) Regulations 2005 (CAR) and the diffuse pollution General Binding Rules (GBR) under CAR, powerful and wide ranging pieces of regulation designed to objectively manage use of the freshwater environment.

<sup>&</sup>lt;sup>27</sup> http://www.snh.org.uk/salmonLIFEproject/

<sup>&</sup>lt;sup>28</sup> http://www.sepa.org.uk/water/water\_publications/swmi.aspx

Scotland's aim is to achieve good status for all water bodies by 2027. The objectives for 2021 and 2027 currently represent the best estimate of the potential for improvements based on available measures and information. It is expected that additional measures will be identified during the development of the second and third river basin management plans which will help to achieve this aim. The improvements in the overall status of water bodies Scotland expects to be achieved by 2015 and 2027 as a result of proposed improvements are summarised in Figures 5 and 6 respectively.



Figure 5. Predicted improvements in water body status for rivers and lochs that support Atlantic salmon from 2007- 2015.



## Figure 6. Predicted improvements in water body status for rivers and lochs that support Atlantic salmon from 2007- 2027.

These summaries give only a partial picture of the extent of improvements to be delivered. This is because the actions taken to improve some water bodies will result in their condition being significantly improved without their overall status changing. For example, it may be possible to reduce pollution to an estuary and so significantly improve chemical water quality by 2015. However, other environmental problems such as improvements to morphology may have to be phased over a longer period of time. As a result the improvements in pollution will not be reflected by an improvement in overall status for 2015.

Information on the improvement objectives for individual water bodies can be accessed from the interactive map on the SEPA website<sup>29</sup>, and summarised information is available in the Scottish and Tweed & Solway River Basin Plans, and their associated Area Advisory Group reports. The results of the environmental objective setting for Scotland's water bodies indicate that 67% of surface water bodies will be at good or high status (indicating that habitat will be at or only slightly removed from a pristine reference condition) by 2015, giving an overall environmental improvement of 7% from conditions in 2007. Twenty eight per cent of water bodies will remain at less than good status in 2015.

In order to deliver the objectives identified above, steps will be taken to improve water body status through actions in the areas identified below. These actions (or measures) will result in marked improvements to salmon habitat by improving water quality, minimising impacts on hydrology and improving morphological conditions. Full details of the mechanisms by which these improvements will be made are detailed in the RBMPs and as such are not replicated here. This report provides a summary of the areas identified for improvement and the expected outcomes.

### Abstraction and flow regulation from electricity generation

SEPA and the hydropower sector have identified options for delivering important improvements and preventing deterioration in the water environment. Over the next year SEPA will work with operators and other users of the water environment to develop these options. This work will focus on providing flows in rivers that are currently nearly dry and thus allow for fish migration. As well as improvements in ecology this work will lead to potential benefits for salmonid fisheries resulting from the opening up of rivers as nursery areas which will increase recruitment of fish. Defining objectives for the period from 2015 to 2027 is difficult given the limitations in the data held by hydropower operators and SEPA. Indicative lists of sites where measures should be taken will be developed over the period up to the production of the final river basin management plan.

#### Abstraction for agriculture

There are currently 369 rivers in the Scotland river basin district that do not achieve the environmental standards for hydrology; of these approximately 28% are affected by abstraction for agricultural irrigation. Scotland's River Basin Plan sets an objective to reduce the amount of water licensed to current operators by 20% in each planning cycle in locations where this will result in environmental improvement. Current projections indicate that, by 2015, this work could contribute to the improvement of almost 1,800km of river in terms of improved hydrological conditions.

### Diffuse pollution from agriculture

Reductions in diffuse pollution from agriculture will be delivered through a combination of financial incentives to pursue good practice and general binding rules (GBRs) under CAR. The GBRs' aim is to minimise soil erosion and nutrient leaching from agricultural land. Projections of the rate of improvement delivered by the measures proposed by SEPA in the River Basin Plans indicate a 10–20% improvement in pollution by 2015. If the measures detailed in this plan are delivered, they will contribute to a projected reduction in nutrient levels in over 600km of river as well as preventing the deterioration of all water bodies. Through the implementation of measures presented in the River Basin Plans there will be an overall improvement of river and loch water quality, but also specifically in relation to Atlantic salmon there will be a reduction in the erosion and loss of soil from agricultural land, reduced in-redd mortality and improved juvenile habitat.

#### Diffuse pollution from forestry

Improvements in diffuse pollution from forestry will largely be delivered through adherence to the Forest and Water Guidelines. It is not anticipated that benefits will be seen during the first River Basin Planning cycle due to the long recovery time required. However, improvements should come into effect by the second RBMP with up to 25% of affected water bodies showing improvements in status.

<sup>&</sup>lt;sup>29</sup> <u>www.sepa.org.uk/water/river basin planning.aspx</u>

#### Geomorphology

Historical engineering, agriculture and forestry are the factors causing the greatest impacts on the geomorphological integrity of salmon habitat. Measures undertaken to improve the morphology of rivers and lochs will remove fish barriers, improve riparian structure, stabilise river banks and prevent bank erosion. Buffer strips will also reduce nutrient leaching and fine sediment erosion, transport and depositions that causes water quality problems for salmon.

#### Special Areas of Conservation (SACs)

Although WFD provides an umbrella framework under which many activities and legislation now sit, SAC designation under the European Habitats Directive remains important in the management of a significant proportion of salmon habitat. SAC designation affords Atlantic salmon within these watercourses (and by implication the habitat in which the salmon live) an additional level of statutory protection; the Habitats Directive prescribes a procedure which all competent authorities must follow when considering any plan or project which has the potential to affect an SAC. This is transposed into domestic law in Scotland by the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) (the Habitats Regulations). Any plan or project not directly connected with or necessary to the management of a SAC and which is likely to have a significant effect on the site (either alone or in combination with other plans or projects) must be subject to appropriate assessment of the implications of the proposal for the site in view of the site's conservation objectives. A competent authority can only agree to a proposal after having ascertained that it will not adversely affect the integrity of a SAC (subject to regulation 49 of the Habitats Regulations). Member States are also required to take appropriate steps to avoid the deterioration of natural habitats in Special Areas of Conservation and the habitats of species as well as disturbance of the species for which the areas have been designated.

In Scotland, the condition of designated sites is assessed against the benchmark conditions set through the site condition monitoring (SCM) programme; Cycle 1 of this process started in 1999 and is repeated on a six-year cycle which corresponds to the reporting cycle used for the EC Habitats Directive. Cycle 2 of the SCM programme is currently underway. The SCM programme forms the basis for identifying whether the features of a site are at risk of failing to meet their conservation objectives. In addition to assessing the current status of the feature itself, SCM identifies threats occurring on or near the site which may be driving features into unfavourable condition or preventing them from achieving favourable condition. It also allows the development of management measures which may result in improvements to the condition of features or maintain features in favourable condition.

Every six years, Member States of the European Union are required by Article 17 of the Directive to report on implementation of the Habitats Directive that includes an assessment of the conservation status of all habitats and species of Community interest.

In recognition of the status of Scotland's Atlantic salmon in Europe, the CASS project (described previously in this report) was recently funded under the European Commission's financial instrument for the environment ("LIFE"). This project was the single most significant salmon conservation project ever undertaken in Scotland with a value of over £3 million.

#### Species Action Framework

Established by Scottish Natural Heritage (SNH) in 2007, the Species Action Framework (SAF) is a five-year action plan covering the following four themes: species conservation; invasive non-native species; conflicts of interest involving native species; and sustainable use of species. SNH has committed £800k for the first year of the SAF. The Atlantic salmon is not included in the SAF as a feature in its own right but freshwater pearl mussels (*Margaritifera margaritifera*), a species whose lifecycle is inexorably linked with Atlantic salmon and other salmonids, have been included within this list. Improvements in freshwater pearl mussel population habitat will inevitably result in the maintenance or improvement in salmonid habitat. Both North American Signal Crayfish (*Pacifastacus leniusculus*), and American mink (*Mustela vison*) are included under the invasive and non-native theme of the SAF. The former can cause a direct predation risk to juvenile salmonids and can also cause habitat damage to riparian and in-stream habitats. The latter is a significant predator of juvenile and adult salmon which may be significant in areas of compromised salmon populations.

## Quality & Standards (Q&S)

Q&S is a national investment programme for Scottish Water, the sole provider of municipal water and waste treatment services in Scotland (unlike in the rest of the UK where these services are in the private sector). The Q&S programme includes environmental improvements which are included in the RBMP through a 6 year rolling investment plan in infrastructure. This has and will continue to have a profound impact on water quality throughout the salmon rivers of Scotland, through investment in water quality and supply, reduction in leakage, improving waste water treatment and the provision of new water supplies. Particular areas of expected improvement of Atlantic salmon habitat are in fish passage through Scottish water installations (dams and weirs) and improved waste water treatment, particularly in urban areas. This latter objective has had a notable positive impact on salmon habitat in post-industrial recovery rivers (e.g. Clyde, North Ayrshire and Forth Estuary) from which stocks were almost eradicated and which are now showing strong signs of recovery.

## 5.2 Local Fisheries Management Plans

The Fisheries Management Plans referred to in Section 3.2 were commissioned by the Scottish Government through FRS and have been produced by DSFBs/Fisheries Trusts according to common protocols. The plans vary in their content depending on available information and resources, but generally use the basic structures identified in Table 10, which include consideration and planning of salmon habitat management. Information from the plans has been used to inform RBMPs and will be used to identify and prioritise habitat related issues for salmon. These plans are, at the time of writing, being consulted on through contact with a wide variety of stakeholders and publication dates are listed below in Table 9. All these plans will be available on the RAFTS website (rafts.org.uk) in 2009. These plans have no legal status and resources available against identified actions may not yet have been identified.

Fisheries Management	Date of issue	Closing date of	Approx date for	
Plan / Trust		consultation	final plan	
Argyll	01/12/08	19/12/08	31/12/08	
Ayrshire	Week of	31/12/08	31/01/09	
	17/11/08			
Clyde	15/12/08	30/01/09	20/02/09	
Loch Lomond	05/01/09	25/02/09	15/03/09	
Galloway	Pre-xmas	Early Feb	Early March	
Lochaber	13/10/08	6/12/08	22/12/08	
Wester Ross	10/10/08	10/12/08	18/12/08	
West Sutherland	18/09/08	27/10/08	01/12/08	
Outer Hebrides	07/11/08	15/12/08	31/01/09	
	(estimate)	(estimate)		
Cromarty Firth	14/10/08	01/12/08	30/12/08	
Kyle of Sutherland	01/10/08	31/10/08	31/12/08	
Don	13/11/08	20/12/08	31/01/09	
Dee	17/11/08	18/12/08	22/12/08	
Deveron, Isla and Bogie	28/11/08	31/12/08	12/01/09	
Тау	22/12/08	30/01/08	20/02/09	
Tweed	02/06/08	01/11/08	01/12/08	
Forth	22/12/08	31/01/09	28/02/09	
Annan	15/11/08	15/12/08	31/12/08	
Nith	04/11/08	28/11/08	31/12/08	
Spey	14/11/08	12/12/08	19/12/08	
Ness and Beauly	14/11/08	15/12/08	31/12/08	
Esks	04/11/08	04/12/08	31/12/08	

Table 9: Schedule for preparation of, and consultation on, local Fisheries Management Plans

Introduction	Current Management Structure
	Aims and Objectives
Description of the Catchment	Physical Characteristics
Description of Fish	Salmon
Species & Their	All other fish species
Fisheries	
Limiting Factors and	Diffuse Pollution
Management Actions	Climate Change
(salmon habitat related	Human Exploitation
in red)	Man-made Obstructions
	Abstraction
	Education
	Impacts on Morphology
	Invasive Allen Species
	Access & Recreation
	Point Source Poliution Produtors
	Preudiois
	Over-grazing
	Specifics eq) Muirburn/Aquaculture/Commercial
	Coniferous Forestry
	Riparian Woodland Management
Economic Development	Improving the Infrastructure
of Fisheries	Improving Provision of Information
	Development of River Staff
	Attracting Newcomers to Angling
	All Fish Species
	Delivery of the Fisheries Development Plan
Monitoring and Research	Monitoring Salmon and Sea Trout Populations
Requirements	Research Activities
	Contract Research Work
	Data Collection Standards
<b>0</b> , <b>(</b> ), <b>1</b> , <b>1</b>	Timetable & Manpower Requirements
Staff Levels and	Staff (full/part time)
Development	Professional development
	H&S/Employment etc
Budget Projections	Fishery Board
	Fisheries Trust
Deview Dreesse	Other projects
Review Process	Annual Review
	Six Voor Doviow
	Dix I cal r(cview)
Glossany	Terms used in plan
Consultation	Neture and extent of concultation
Consultation	INALUTE AND EXTENT OF CONSULTATION

Table 10. The structure of local Fisheries Management Plans. Items in red indicate key applicability to this report.

## 5.3 The extent to which plans identified above assess impacts and potential risks to the productive capacity

The RBMP and catchment based Fisheries Management Plans are becoming increasingly integrated in terms of the environmental pressures being identified and the cycle over which they operate (6 yrs). Fishery Boards and Trusts have been actively involved in the Area Advisory Groups and in the construction of the RBMP plan 'chapters' to the extent that Fishery Boards and Trusts were commissioned by SEPA to identify for the RBMP the key 'pressures' and 'impacts' on salmon and other fish populations. Therefore most of the key salmon habitat issues are now integrated into the RBMP and at a finer scale are now clearly articulated in the Fisheries Management Plans through the processes outlined in the table above.

## 5.4 The extent to which the plans identified above include procedures for implementing measures in a timely fashion

The vast majority of salmon habitat improvement in Scotland will be delivered through the RBMPs. RBMPs have a 6 year planning cycle with provision to deliver actions over a longer timescale. This first round of draft RBMPs aim to meet good water body status and good potential by 2015 but, where these targets cannot be met by 2015, the reasons for this are clearly identified. These include issues in relation to technical feasibility, disproportionate cost, or the time scales required for environmental recovery.

The Fisheries Management Plans offer a finer scale approach to habitat restoration but are inevitably subject to prioritisation and funding constraints as identified above. Fisheries Trusts and Boards are increasingly using cost/benefit approaches whereby the quantity of restored habitat is linked with the likely increased smolt output and the cost to establish a hierarchy of priorities to ensure funding is directed at projects from which most benefit will be derived (e.g. River Dee Board and Trust employ an Obstacle Removal Prioritisation Process). Funding is being provided by SEPA (to help meet WFD objectives) and the European co-funded Scottish Rural Development Programme (SRDP). The SRDP aims through cross-compliance to ensure that primary (agriculture and forestry) industry grant money from CAP and other sources meets a variety of environmental and social objectives.

## 5.5 The extent to which the plans identified above place the burden of proof on proponents of an activity which may have an impact on habitat

A variety of planning procedures operate in Scotland to protect salmon habitat. Within RBMP, a process is used to help identify or confirm the sectors which may be contributing to particular environmental problems and pressures, the measures that could be used to tackle problems and the mechanisms that exist to bring about an action. RBMP also considers where the same measure could be implemented via more than one mechanism and compares the likely effectiveness of measures. WFD has also led to the implementation of CAR licences which, for the first time, have required water users to apply for a licence and, where granted, pay for (depending on impact) and comply with conditions of water use. This has resulted in a much more rigorous and accountable system of water use in Scotland than previously existed and as the planning cycle proceeds and CAR licences are reviewed, there will be regular opportunities to place greater control on activities where it can be demonstrated they are having adverse impacts on salmon habitat.

In addition, as described in section 5.1 where Atlantic salmon are a qualifying interest of a SAC designation, the Atlantic salmon (and by implication the habitat in which they live) is afforded an additional level of statutory protection whereby the potential impacts of any plan or project which has the potential to affect a SAC must be considered by the competent authorities in accordance with the requirements of the Habitats Regulations.

District Salmon Fishery Boards also have powers to ensure free passage of fish and the protection of spawning grounds which can be used in the event that an activity may be expected to have an impact on salmon habitat.

## 5.6 The extent to which the plans identified above address the risks and benefits associated with protecting Atlantic salmon stocks over socio-economic considerations

The default objectives of the WFD for surface waters are 'good status' or 'good potential'. Avoiding deterioration in water bodies of high and good status is also a WFD objective. However, it may not be possible to achieve these objectives by 2015 for a variety of reasons. Certain catchments in Scotland are impacted by industrial processes e.g. hydropower generation. In these circumstances WFD recognises that the achievement of "good status" in such areas is not possible. These water bodies are then identified as "Heavily Modified Water Bodies" (HMWB) and have a different standard of objective setting defined as "Good Ecological Potential" (GEP) (see section 2). This recognises either that the cost/benefit ratio of achieving "good status" in certain water bodies would be too high or where there is an over-riding societal benefit to having such activities continue e.g. electricity generation. HMWBs have alternative objectives which are determined through the wider process of measures appraisal and objective setting. This process is at the heart of River Basin Planning, and includes technical assessments (including consideration of the technical feasibility of measures), economic assessment (to consider issues of disproportionate expense) and public consultation. The use of the alternative objectives is the mechanism which the WFD provides for considering, amongst other things, alternative environmental, social and economic priorities alongside water management priorities.

In the case of the Habitats Directive, there is a high degree of protection against damaging impacts on salmon, regardless of whether an impact takes place within or out with the designated area. Any plan or project not directly connected with or necessary to the management of a SAC and which is likely to have a significant effect on the site (either alone or in combination with other plans or projects) must be subject to appropriate assessment of the implications of the proposal for the site in view of the site's conservation objectives. A competent authority can only agree to a proposal after having ascertained that it will not adversely affect the integrity of a SAC. If this is not the case and there are no alternative solutions the proposal can only be allowed to proceed if there are imperative reasons of overriding public interest.

## 5.7 The extent to which the plans identified above consider the effects of habitat activities on biodiversity in the affected area

Each RBMP will require an assessment of its likely effect on any Natura 2000 sites and protected areas under the WFD. Whilst it is unlikely that any parts of the plan will have a significant effect, an initial assessment will determine if the objectives and actions contained within the RBMP pass a number of tests. These tests will look at whether the RBMP contains actions to support the achievement of objectives for Natura 2000 sites in the time required; that the objectives within the RBMP are not less stringent than those already used to determine consents and licences as part of previous Habitats Directive assessments; and that the plans contain no exemptions, derogations or less stringent objectives for Natura 2000 sites other than those that are compatible with the Habitats and Birds Directives. If the RBMP does not pass these tests and does not appear to be meeting its obligations for Natura 2000 sites, then a fuller assessment may be required. As mentioned above 17 salmon rivers in Scotland are protected by this provision.

Fishery Boards and Trusts in Scotland conduct a wide variety of salmon habitat improvement work which requires consultation with other interests and which, in many cases, require authorisations of their own. The implementation of the CAR licensing system applies as much to habitat restoration initiatives as any other and appropriate risk assessments are required to ensure there is no collateral damage to other habitat interests. The CAR licensing system does include a 'derogation' for the activities that can be demonstrated to be providing 'environmental services'. This ensures that legitimate salmon habitat projects have a degree of risk assessment associated with them but that licensing costs are reduced or are not charged. As indicated previously, habitat improvements in SACs are subject to a greater degree of scrutiny. Where a plan or project is likely to have a significant effect on the qualifying interests of a SAC (even if ultimately it will be of benefit to Atlantic salmon) an appropriate assessment must be carried out. In addition Boards and Trusts, through the consultation process on their Fisheries Management Plans and through regular dialogue with other stakeholders in the catchment, would generally ensure that risks associated with habitat projects are managed sensibly.

## 5.8 The extent to which the plans above take into account other biological factors affecting the productive capacity of Atlantic salmon populations.

The combination of the RBMP and its chapters, together with the Species Action Framework and well integrated local Fisheries Management Plans, should ensure that all significant in-catchment biological factors are properly integrated into the plans. RBMP considers potentially impacting non-native species although it is recognised that many issues will almost certainly be beyond the capacity of local fisheries management organisations or even national bodies to have a significant impact on. These issues are referred to in Fisheries Management Plans and in the RBMP whilst acknowledging the limited capacity any one organisation or current regulations to deal with such issues.

Although not explicitly dealt with within the plans identified above, Scotland has licensing schemes in place to reduce the number of predators impacting on salmon populations including piscivorous birds and seals. In the event that local salmon managers can make an adequate scientific and management case for reducing predator numbers the Scottish Government may issue appropriate licences.

## 6. Historical, current and future habitat work and the processes by which success will be / has been assessed.

#### 6.1 Current and future habitat work (including assessment of progress)

As stated previously, the vast majority of habitat improvement work to be carried out in Scotland will be delivered through the RBMPs, which include in their objectives investment from a broad range of initiatives. Additional work may be carried out in support of the objectives of local Fisheries Management Plans, but this work would be dependent on local salmon managers identifying, or obtaining additional, financial support for these activities. The RBMP, Fisheries Management Plans, programmes of investment from industry and objectives under the Habitats Directive relate strongly to each other. In the case of the RBMP and Fisheries Management Plans, these also now operate on the same 6 year planning cycle. The objectives for salmon habitat restoration are now largely set and Scotland will now be moving in to an implementation phase. A variety of projects are underway to help meet the RBMP objectives but it is also worth mentioning the considerable habitat protection benefits afforded by the CAR licensing system which applies a much higher degree of scrutiny to water use than existed prior to the Water Environment and Water Services (Scotland) Act 2003<sup>30</sup>. These licences are progressively reviewed and Scotland expects the habitat protection bar to be raised over time.

In addition to the ongoing work of the Fisheries Trust and Board network which raises and spends about £5m per annum from the private sector on a wide variety of salmon management initiatives, the Scottish Government has made £1.2m available to Fisheries Trusts (£400,000 per annum for 3 years) to support the Fisheries Management Planning process. This first phase of plan preparation is now largely complete and the remaining £800K over the next 2 years is to be targeted at implementation. This will be focussed on priority areas identified in the plans, many of which are habitat related. Additional sources of funding are also becoming available to help restore salmon habitat and these will be pursued as opportunities permit. Potential funding areas include EU funding (LIFE+ under consideration), Scottish Rural Development Programme funding and specific projects including bio-security and invasive species projects. In the case of the latter, approximately £300,000 will be provided by SNH and the Esmee Fairbairn Foundation over the next 3 years to develop invasive management and prevention protocols<sup>31</sup>.

In the future, the success of habitat improvement activities will largely be assessed through SEPA's extensive monitoring programme under WFD, with progress against objectives reported in future RBMPs. However, where projects are undertaken by local fisheries management groups, progress against objectives will be identified through site specific monitoring appropriate to the work and an audit of work completed will be reported in future Fisheries Management Plans.

<sup>&</sup>lt;sup>30</sup> <u>http://www.opsi.gov.uk/legislation/scotland/acts2003/asp\_20030003\_en\_1</u>.

<sup>&</sup>lt;sup>31</sup> http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/InvasiveSpecies,

### 6.2 Salmon habitat restoration to date

Although this FAR has been necessarily forward focussed, Scotland has achieved considerable and impressive improvements in salmon habitat over the past forty years through a range of measures that have improved water quality and physical habitat, and removed obstacles to fish passage. Examples of habitat restoration (drawing on a range of previously existing plans that have now been superseded) give an indication of the sort of work and improvements in salmon habitat that Scotland has seen in recent decades and plans in the future. The projects are ordered to demonstrate historical, current and future salmon habitat restoration.

#### (1) Recovery of the Rivers Forth and Clyde

Figure 7 shows the historical decline and recovery of salmon in the Central Belt of Scotland where many salmon populations were lost during the 18<sup>th</sup>, 19<sup>th</sup> and early 20<sup>th</sup> century as a result of the domestic and industrial pollution of the lower rivers and upper estuaries. This was aggravated by the degradation of spawning and nursery areas and the obstruction of rivers by weirs with inadequate or no provision for upstream passage of spawning adults. The low point as regards salmon presence in this area occurred in the 1950s. Since then as a result of improved treatment of domestic and industrial wastes and reductions in industrial discharges salmon have progressively re-established themselves in the river stems which had lost their populations, although they have not yet recovered their full pre-industrial ranges.



Figure 7. Maps showing the recovery of salmon in the Rivers Forth and Clyde. Improvements in habitat were brought about through removal of barriers, improvements in water quality and physical habitat. Maps adapted from Doughty and Gardiner (2003)<sup>32</sup>

<sup>&</sup>lt;sup>32</sup> Doughty, R. and Gardiner, R. (2003) The return of salmon to cleaner rivers: a Scottish perspective. In: *Salmon at the Edge*. Blackwell, Oxford. 175-185

#### (2) Habitat accessibility in the River Tweed

The Tweed Fishery Board (Tweed Commissioners) and Tweed Foundation have developed a sophisticated programme of obstacle assessment and removal over the last 15 years. This has led to dramatic improvements in the habitat area available to salmon. The results of this programme of work are shown in Figure 8, with Figure 9 identifying areas which remain obstructed. The total area of habitat opened up to salmon migration in the last 15 years has been 1359 km, of which 730 km is main channel. The total cost of obstacle removal projects from 1994-2000 was £183,052.



Figure 8. Map demonstrating the success of barrier removal in the Tweed catchment



Figure 9. Map illustrating areas that remain inaccessible to salmon in the Tweed catchment.

## (3) Conservation of Atlantic Salmon In Scotland (CASS)

As described previously (Section 4.4), the CASS project was a major public/private sector partnership project aimed at restoration projects on 8 Scottish salmon SACs. The results and attainment levels are list in the table below. This was one of the most ambitious programmes to be directly targeted at salmon restoration in Scotland, with perceptible benefits for the long terms sustainability of salmon habitat.

Threat to Atlantic salmon addressed by project	Aim	Progress (% completed)
Commercial exploitation by netting	Purchase/lease 7 netting stations on 2 rivers	86%
Reduced connectivity of habitat due to man-made obstacles	Ease 25 obstacles to open 187km habitat	67% (125km)
Instream habitat degraded	Improve 39060m2 of juvenile and spawning habitat	180%
Slow natural recolonisation of newly restored stretches of river	Restocking on 2 rivers	100%
Unrestricted grazing leading to degraded riparian habitat and siltation	Control grazing by fencing 52km riverbank	100%
Siltation of spawning and juvenile habitat from surface runoff and eroding banks	Stabilise 500m of eroding bank. Reduce surface runoff by installing 60 silt traps	100%
Inappropriate afforestation and management	Extend and diversify woodland on 4 rivers	92%
Loss of spawning and juvenile habitat due to gravel extraction and dredging	Produce guidance for gravel extraction in Scottish salmon rivers	Published
Public appreciation of Natura and salmon conservation is limited	Raise awareness of Natura and salmon conservation	Ongoing

Table 11. Summary of achievements of the CASS project. Items in red indicate applicability to this report.

#### (4) SEPA Restoration Fund

SEPA announced in 2008 the availability of £1m annually for removal and easing of upstream blockages to migration to contribute to compliance with WFD objectives identified in the Scotland RBMP. This has resulted in a number of projects being submitted, to be considered in early 2009 (Table 12). Cost per Km - £4000

Water body	Structure	Upstream Habitat Accessed
Culter Burn – Dee	Denmill Weir	50 Km
River Gairn – Dee	Vehicle fords	5.2 Km
Allachy Burn - Dee	Ford	2.2 Km
Goval Burn – Don	Weir	11.8 Km
Esset Burn – Don	Weir	50 Km
Leochel Burn – Don	Weir	50 Km
Alt Veannaich -	Weir	30 km
Don		
Kelly Burn – Ythan	Weir/falls	27 Km
Chapel & Davidston	Culverts	10 Km
Burns – Deveron		
Farigaig – Ness	Bridge apron	5 km
Rule Water – Tweed	Cauld	5 Km
Euchar	Dam	4 Km
Coyle	Concrete sill	14 Km
Tyne	Various weirs	Under assessment
Total		264 Km

## Table 12. Projects submitted for funding for removal and easing of upstream blockages to migration

#### (5) Other local examples of restoration projects

The River Dee Fishery Board and Trust, over and above the successfully completed programme under the CASS Project mentioned above, has an ongoing rolling programme of obstruction removal and habitat restoration. In recent years this has included:

- The Crynoch Burn 10 km now made accessible to salmon
- Mill of Cammie and Cammie Burns (2 obstructions in series): 6 km of habitat now made accessible to salmon
- The Gairn Burn 1 km of habitat now made accessible to salmon
- The Drumwheels Burn 1 km of habitat now made accessible to salmon
- A further six additional obstructions are currently being applied for, including the Culter Dam which would allow access to 125 km of inaccessible spawning and nursery areas.

In addition to this an application is in process to the Scottish Rural Development Programme to install 12 km of buffer strips in 2009. Plans are also being drawn up for the Upper Dee Riparian Woodland Project in conjunction with the Cairngorms National Park for a feasibility study to install 40 km of riparian trees to ameliorate climate change and improve fish habitat.

The River Annan Fishery Board has had an extensive programme of riparian habitat restoration underway for the last 10 years. Until 2007 the Annan Board had riparian fenced 45,000m of river channel. In February 2007 the Board was awarded £400,000 for a restoration project under the UK Heritage Lottery Fund which, by April 2009, should have achieved 26,000m of fencing of river channel in the Annan catchment. The full target of 40,000m of fencing of the river channel should be achieved by 2010.

### 7.0 Summary

The freshwater habitat in Scotland is amongst the most important for Atlantic salmon across the species range. Scotland's nominal catch accounts for ca. 50% of the total for the UK (ICES WGNAS). During the industrial revolution Scotland's salmon populations suffered from reductions in habitat associated with pollution and loss of connectivity. In recent decades this loss of habitat has been reversed through programmes of investment that have removed barriers and improved water quality and physical habitat.

Future habitat improvement will be delivered through a structured programme, involving a range of organisations from local fisheries management groups through to national government agencies. The European Water Framework Directive and the RBMP process allows salmon habitat management to be included in national investment plans where the vast majority of future improvements are likely to be made through large scale regulation under CAR and investment from industries such as agriculture, water supply providers and hydropower. Scotland has clearly developed plans for improving freshwater habitat for areas containing Atlantic salmon, and measures planned, delivered and in many cases monitored under the umbrella of River Basin Planning are likely to deliver substantial improvements in coming years.

Scottish Government Marine Directorate January 2009