

Ad Hoc Review Group

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Implementation Plan

European Union – UK (Northern Ireland)



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Fisheries Conservancy Board



**ATLANTIC SALMON MANAGEMENT STRATEGY FOR
NORTHERN IRELAND AND THE CROSS BORDER FOYLE AND
CARLINGFORD CATCHMENTS TO MEET THE OBJECTIVES
OF NASCO RESOLUTIONS AND AGREEMENTS**

2008 - 2012

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1. INTRODUCTION

Northern Ireland's Atlantic salmon management strategy is aligned to the agreement reached by NASCO and its Parties to adopt and apply a Precautionary Approach to the conservation, management and exploitation of the salmon resource and the environments in which it lives. NI, through the UK and EU, is a Party to NASCO.

The national (UK-NI) management strategy is based on the application of that approach consistent with the 3 main NASCO agreements which address:

1. Fishery management
2. Protection and restoration of habitat
3. Aquaculture, introductions and transfers, and transgenics (including diseases and parasites)

The strategy utilises datasets and reports trends compiled from work undertaken up to and including 2007. This provides the baseline against which to monitor and report progress in implementing the management approach set out in this strategy over the 5 year period from 2008 – 2013.

The Department of Culture, Arts and Leisure (DCAL) has overall policy responsibility to ensure implementation of the strategy. The Department liaises with the Department of Agriculture and Rural Development (DARD) which has responsibilities for aquaculture and fish health matters and with the Department of Environment (DOE) and its agency, the Environment and Heritage Service, which deal with broader water quality matters.

There are 2 fishery conservation and protection implementation bodies in NI. DCAL sponsor the Fisheries Conservancy Board *(FCB) whilst DARD sponsor the Loughs Agency of the Foyle, Carlingford and Irish Lights Commission# (the Loughs Agency). The functions of the FCB will be assimilated into DCAL in 2008.

Scientific research and monitoring is provided mainly by the Agri-Food and Biosciences Institute NI (AFBI), although Loughs Agency has capacity in this regard.

**The Fisheries Conservancy Board is a statutory Body with direct responsibility for the conservation and protection of salmon within all catchments except those in the Loughs Agency jurisdiction.*

#The Loughs Agency is an agency of the Foyle, Carlingford and Irish Lights Commission (FCILC), established under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ireland. The FCILC is legislated for by the North/South Co operation (Implementation Bodies) (Northern Ireland) Order 1999 and the British-Irish Agreement Acts 1999 and 2002. The Board of the FCILC who, in exercising the functions of the Body, are required to act in accordance with any directions given by the North South Ministerial Council, to which it also reports.

1.1 OBJECTIVES OF THE NATIONAL MANAGEMENT STRATEGY

1.1.1 Main National Objective

The main objective of the national Atlantic salmon management strategy is ***to conserve, enhance, restore and rationally manage salmon stocks in catchments throughout Northern Ireland through two Salmon Management Plans***. The Plans cover the two NI fishery districts, including the cross border Foyle and Carlingford catchments, managed by the FCB and the Loughs Agency.

The core concept of the Plans is to establish conservation targets at a river and regional level. ***The central aim of management will be to ensure that in most rivers in most years sufficient adult salmon are spawning to maximise output of smolts from freshwater and to monitor the river or catchment for salmon numbers and where levels are not attained to identify and address the problem.***

1.1.2 Other related objectives

- To continue the research into Atlantic salmon carried out at the River Bush Salmon Station. This project is a long-term study into the dynamics of a wild salmon population and investigates the factors influencing those dynamics on the long-term data series on survival of wild salmon during the freshwater and marine phases of the life cycle. It provides the key index on the status of Northern Ireland's salmon stocks.
- To use the information from the project to inform conservation requirements for salmon and to develop and support the Northern Ireland and cross border Salmon Management Plans.
- To use the data from the Salmon Management Plans and Salmon Research Project to contribute to the assessment of salmon stocks at international level, through the ICES and NASCO, to assist policy formulation and in determining marine survival levels.
- Through rational management, to optimise the social and economic value of the salmon resource in NI's coastal and freshwaters whilst ensuring the realisation of that value is sustainable.
- To fully consider the social and economic impact on communities of restrictive management measures.

1.2 NATURE AND EXTENT OF THE RESOURCE

1.2.1 Catchments and Production

The Fisheries Conservancy Board (FCB) has responsibility for catchments and coastal salmon fisheries in Northern Ireland, comprising the Lough Neagh catchments; the Erne catchment; the Co. Antrim and Co. Down coastal rivers and coastal waters.

The Loughs Agency has responsibility for catchments and coastal salmon fisheries in Northern Ireland and parts of the Republic of Ireland comprising the Foyle and Carlingford catchments, Lough Foyle, Carlingford Lough and coastal waters.

Following NASCO definitions, there are 27 salmon rivers in Northern Ireland, (Crozier et al. 2003), including the major tributaries in the FCB area comprising the Lough Neagh catchment and smaller coastal rivers and large tributaries in the Foyle area and small coastal rivers in the Carlingford area. One of these rivers is maintained, one is under restoration and there are no rivers believed threatened with loss (see Table 1).

The overall provisional salmon catch¹ for UK (N. Ireland) for 2006 was 29.3t (19.3t nets, 10.0t rods). Scientific sampling of the commercial fishery indicates that 1SW fish account for around 93% of the catch, the remainder being 2SW fish.

Table 2. Salmon catch statistics for UK(N. Ireland) for recent years.¹Catches represent FCB area catch, plus 50% of Foyle area catch.

Year	Total NI Net Catch		Total NI Rod Catch		Total NI Catch	
	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)
2002	23948	63817.9	7312.5	17573.1	31260.5	81391
2003	18770	45179.8	4486.5	11240.2	23256.5	56420
2004	13737	33983.29	5740	14292.94	19477	48276.23
2005	16006	38195	5732	13609.16	21738	51804.16
2006	8548	19256.5	4340	10010	12888	29266.5

¹ **(By agreement with the Irish authorities, Foyle area salmon catches are allocated to Ireland: N. Ireland on a 50:50 split for reporting purposes. Hence the total UK (N. Ireland) national catch reported to ICES and NASCO represents 50% of the Foyle area catch, plus all the FCB area catch. However, data given in this report for the purposes of description of the Foyle fishery, including licence numbers etc, have not been split in this way.)*

Estimates of national salmon production are available from modelling carried out by ICES, whereby pre-fishery abundance (the number of fish at sea on 1st January) is estimated for each smolt cohort. **These estimates have averaged 107,749 1SW fish and 15,636 2SW fish over the most recent 10 year period.**

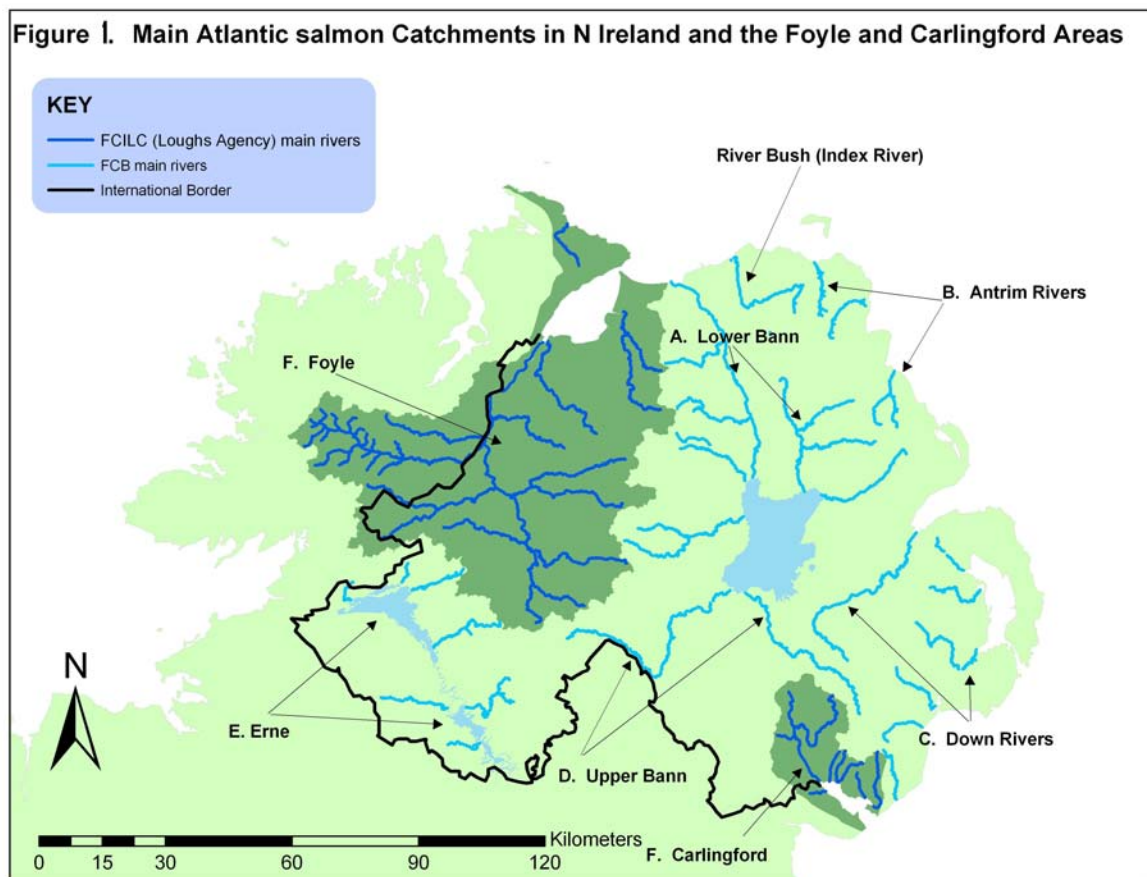
Table 1. Baseline National Datasets on wild salmon populations available for UK (NI)

Data Type	Number	Quality	Comments
Total No. salmon rivers	27		Includes FCB and LA areas
No. of rivers lost	0		
No. of rivers maintained	1		Erne
No. of rivers restored	1		Lagan
No. of rivers threatened with loss	0		
No. of rivers not threatened with loss	25		
No. of rivers status unknown	0		
Rivers with Biological Data on salmon			
Juvenile densities	20	2-5	Mostly semi-quantitative electric fishing surveys
Smolt counts	3	3-5	
Adult counts	13	3-5	Bush, Lagan, Faughan, Roe, (Foyle tributaries; Mourne, Strule, Owenkillew, Camowen, Finn), Clanrye, Main, Blackwater, Glendun, Moneycarragh, Garvary.
Smolt age structure	2	5	Bush, Lagan, Faughan, Finn
Adult sea age composition	2	5	Bush, Lagan, Foyle
Genetic status assessed	23	5	Most rivers via allozyme and DNA screening
SR information	3	5	Bush, Mourne, Faughan
Rivers with habitat data;			
Indirect or inferred	0		
Direct in river habitat survey	12	3-5	Bush, Lagan, Erne, Crumlin, Sixmilewater, Clanrye, Main, Blackwater, Shimna, Moneycarragh, Glendun, Roe, Faughan, (All main Foyle tributaries; Mourne, Strule, Derg)
Monitored Rivers with data on survival			
Annual exploitation data available	2	5	Bush, Lagan
Nets	1	5	Bush
Rods	1	5	Bush
Rivers with rod catch statistics	27	3-4	All available to some extent through carcass tagging scheme
Biological monitoring programme in Commercial fisheries	Yes	2	Regular sampling includes occurrence of farm escapees and sea lice

1.2.2 Extent of the resource by catchment

This section identifies all rivers in NI at a finer (sub-catchment) level than in Table 1 above to provide for a full inventory for local management purposes. This is to facilitate the aim of management at river/ tributary level which shall be appropriate in some circumstances.

The main salmon catchments are shown in figure 1 and reports on the nature and extent of the resource are set out below.



A. Report on the number and size of stocks and special designations in the Lower Bann Catchment.

The Lower Bann area includes five main sub-catchments including the Articlave, Macosquin, Agivey, Ballymoney and Clady. Recent electric fishing surveys have indicated the presence of juvenile salmon stocks in all these catchments with the exception of the Ballymoney River.

A relative count of adult escapement to the Lower Bann/Lough Neagh catchment is available at Portna, Kilrea on the main stem of the Lower River Bann.

There are no special conservation designations within the region.

B. Report on the number and size of stocks and special designations in Antrim Rivers.

The Antrim coastal rivers represent a diverse grouping of 14 river catchments draining off the Antrim Plateau. The major catchments in this group include the Bush, Ballycastle, Glendun and Glenarm whilst smaller rivers include the Glendall, Glenarriff, Glencloy, Ballygalley, Inver, Glynn, Kilroot, Copeland, Woodburn and Threemilewater. Recent electric fishing surveys have indicated the presence of juvenile salmon stocks in all the major catchments and all of the smaller rivers except the Glencloy, Ballygalley, Glynn and Kilroot.

Presently two index rivers are available in this area (Bush and Glendun) where tools are in place to monitor stock status.

There are no special conservation designations within the region.

C. Report on the on the number and size of stocks and special designations in Down Rivers.

The Down region of the FCB area extends from Belfast Lough to the Mourne Mountains and includes 11 significant catchments including the Lagan, Enler, Strangford Blackwater, Quoile, Blackstaff, Ardilea, Moneycarragh, Carrigs, Shimna, Annalong and Kilkeel. Recent electric fishing surveys have indicated the presence of juvenile salmon stocks in all catchments except the Enler and the Strangford Blackwater.

Two index rivers are available in this area on the Lagan and the Moneycarragh, although the Lagan population represents an anthropogenically restored stock which had been extinct for decades.

There are no special conservation designations within this area.

D. Report on the number and size of stocks and special designations in the Upper Bann (Lough Neagh) Catchment.

Eight main river catchments drain into Lough Neagh, these include the Moyola, Ballinderry, Blackwater, Lower Bann, Glenavy, Crumlin, Sixmile and Main. Recent electric fishing surveys have indicated the presence of juvenile salmon stocks in all these catchments with the exception of the Glenavy.

Presently two index rivers are available in this area (Blackwater and Main)
There are no special designations within the region.

E. Report on the number and size of stocks and special designations in the Erne Catchment.

Ten main rivers flow into Lough Erne within the FCB (NI) boundary, these include the Garvary, Termon, Waterfoot, Bannagh, Kesh, Ballinamallard, Colebrook, Swanlinbar, Arney and Sillees. Recent electric fishing surveys have indicated the presence of juvenile salmon stocks in all of these catchments with the exception of the Sillees.

It should be noted that large scale stocking of hatchery salmon is undertaken on the Erne system as a compensatory measure against a hydro-electric station at the outfall of the Lough. It is not possible at present to differentiate between wild and stocked populations.

An index river was commissioned in 2006 (Garvary) which will encompass a fish counter and annual juvenile surveys against a background of discontinued stocking.

There are no special conservation designations within this region. Lough Melvin in the adjacent catchment straddling the border with the Republic of Ireland is a designated Special Area of Conservation (SAC) under the European Commission Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (The Habitats Directive). The Atlantic salmon population is an Annex II species qualifying feature. The Lough is further designated as an Area of Special Scientific Interest (ASSI).

F. Report on the number and size of stocks and special designations in Foyle/Carlingford Catchment.

There are eleven main sub catchments within the Foyle area. Recent genetics work would indicate that each of these have a uniquely identifiable stock (Crozier et al., 2004). While in several of the catchments studied there would appear to be additional stock structuring.

The Loughs Agency operates five fish counters on the major tributaries in the Foyle area (R Finn, R Roe, R Faughan, Owenkillew R and the R Mourne) to monitor the achievement against conservation limits. These would indicate that these stocks are meeting CLs on a regular basis.

Electro-fishing data from approx 500 sites in the FCILC area indicate the presence of salmon in all catchments in the Foyle area including those with no fish counters.

The River Foyle and tributaries is a designated Special Area of Conservation (SAC) under the European Commission Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (The Habitats Directive). The Atlantic salmon population is a primary reason for designation of the site.

The River Roe and tributaries is a candidate SAC also by virtue of the status of its salmon population(s).

The River Derg and River Finn are joint SAC designations between Ireland and the UK where salmon are a qualifying feature.

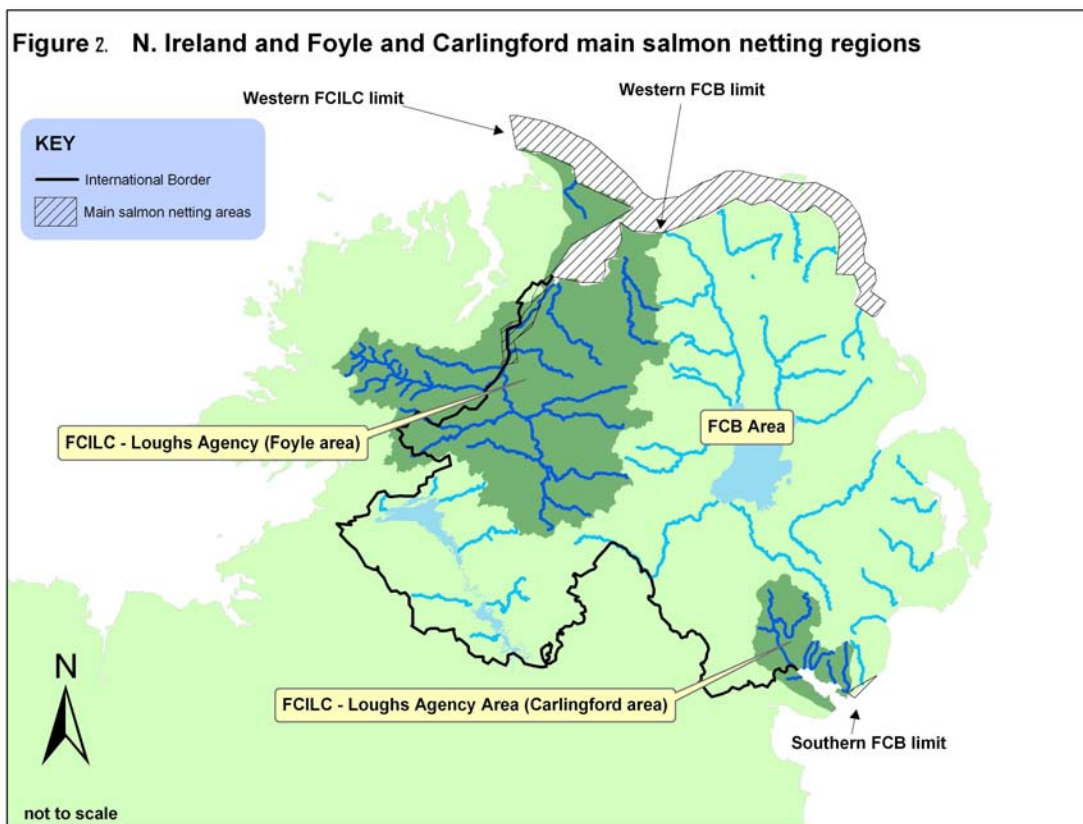
The extent of designation of NI's rivers under the Habitats Directive by virtue of their salmon populations is under review (see section 4. below).

1.3 OVERVIEW OF FISHERIES

1.3.1 Fishery Management Regime

The FCB and Loughs Agency are responsible for licensing, enforcement and the introduction of salmon fishing regulations in their respective jurisdictions.

An overview of the coastal commercial fisheries and rivers where angling takes place is shown in Figure 2 below. **It should be noted that the extent of the commercial fishery (netting) reflects the position in 2006 (the baseline year for this report) and that this is under active review (see section 4 below).**



1.3.2 Fishing methods, effort and regulation

Details of fishing effort and the management regime are tabulated below.

The Fisheries Conservancy Board area:

<i>Fishery location:</i>	<i>Fisheries Conservancy Board Area. Catchments A to E (see fig 1)</i>
<i>Gear types:</i>	<i>2 Drift Nets, 2 Draft Nets, 1 Bag Net in 2006</i>
<i>Magnitude of fishery (e.g. catch or effort):</i>	<p>a) Commercial 2,404 salmon caught in 2003 2,592 salmon caught in 2004 3,239 salmon caught in 2005 2,460 salmon caught in 2006</p> <p>(b) Angling 2,026 salmon caught in 2003 3,283 salmon caught in 2004 1,926 salmon caught in 2005 1,344 salmon caught in 2006 (provisional)</p>
<i>Current management restrictions:</i>	<p><i>FCB Byelaws</i></p> <p><i>Commercial exploitation requirements:-</i> <i>licencing regime; season 18th March – 15th Sept; in-season weekend closure 8am Saturday – 8am Monday; Net type and dimension restrictions; restriction of fishing near the mouth of a river.</i></p> <p><i>Angling exploitation requirements:-</i> <i>Licencing regime; various close seasons within the range 1 February to 31 October. Catch and release to 31 May and two salmon daily bag limit thereafter.</i> <i>Tagging and logbook system applies to both commercial and angling exploitation</i></p>
<i>Outline pre-agreed procedures (or provide references)</i>	<i>The salmon management plan has been established to provide biological reference information with which to assess the conservation status of stocks and to direct management in the FCB area. A conservation limit has been derived for the River Bush and provisional conservation limits have been established for five other index rivers based on ground truthed habitat surveys and the application of stock recruitment data from the River Bush project.</i>
<i>Principal river stock(s) exploited:</i>	<i>Lower River Bann and Lough Neagh tributaries, Co. Antrim/Down coastal rivers, Lough Erne Catchment and Northern Area of Lough Melvin.</i>
<i>Other fisheries exploiting stock(s)</i>	<i>Donegal Area, Loughs Agency (LA) Area</i>
<i>Other information:</i>	<i>The management and direction of policy for salmon fisheries in the FCB area of Northern Ireland lies with the Department of Culture, Arts and Leisure. The FCB enforces fisheries legislation and is responsible for the protection and conservation of salmon in inland and coastal waters. The River Bush Project and research and development into salmonid biology is undertaken by the Agri- Food and Bioscience Institute NI (AFBI).</i>

The Loughs Agency area:

The majority of the salmon fishery is carried out in the Foyle catchment (see Fig 2), and details are outlined below:

<i>Fishery location:</i>	<i>Loughs Agency (cross-border Foyle/Carlingford system) Catchment F (see fig 1)</i>
<i>Gear types:</i>	<i>91 Drift Nets, 53 Draft Nets,</i>
<i>Magnitude of fishery (e.g. catch or effort):</i>	32,732 salmon caught in 2003 22,290 salmon caught in 2004 25,534 salmon caught in 2005 12,176 salmon caught in 2006 (b) Angling 4,921 salmon caught in 2003 4,914 salmon caught in 2004 7,612 salmon caught in 2005 5,992 salmon caught in 2006 (provisional figure)
<i>Current management restrictions:</i>	<i>Lough Agency Byelaws</i> Commercial Exploitation requirements:- <i>Six week season for the commercial nets. Drift nets fish for 4 days each week (6am-6pm) Draft nets 5 days (are restricted also by tides); Net mesh and size restrictions.</i> Angling Exploitation Requirements:- <i>Various close seasons within the range 1 March to 31 October. One salmon daily bag limit to 31 May and four salmon daily bag limit thereafter. Tagging and logbook system applies to both commercial and angling exploitation</i>
<i>Outline pre-agreed procedures (or provide references)</i>	<i>The Loughs Agency manages the commercial and recreational exploitation of salmon through the application of a real time management regime. If counts (using electronic counters) do not reach defined in-season targets (based on available nursery habitat) then the fisheries may be closed, or extended if the conservation limit is achieved.</i>
<i>Principal river stock(s) exploited:</i>	<i>Mainly River Foyle and tributaries but also fish from north coast of Ireland</i>
<i>Other fisheries exploiting stock(s)</i>	<i>Donegal Area, Fisheries Conservancy Board area, ROI drift nets</i>
<i>Other information:</i>	

1.4 MANAGEMENT ENTITIES

The Department of Culture, Arts and Leisure (DCAL) has overall policy responsibility for salmon fishery management within Northern Ireland and is the lead Department in delivering European Union and international requirements including this strategy.

Northern Ireland comprises two fishery areas with respect to Atlantic salmon as outlined previously (see Fig. 2). The Fisheries Conservancy Board (FCB) is a statutory Non Departmental Public Body reporting to DCAL and has direct responsibility for the conservation and protection of salmon within all catchments except those in the Loughs Agency jurisdiction. DCAL currently has joint responsibility with the FCB in delivering strategic management plans, habitat improvements and restoration in those catchments in the FCB jurisdiction. Under a Review of Public Administration in Northern Ireland reporting in 2006 the FCB is to be abolished and its functions transferred to DCAL (see section 4).

The Loughs Agency has direct responsibility for the conservation and protection of salmon and habitat improvements and restoration in the cross border Foyle and Carlingford catchments. The FCILC's sponsoring Departments are the Department of Agriculture and Rural Development in Northern Ireland and the Department of Communications, Marine and Natural Resources in the Republic of Ireland.

The Department of the Environment (DOE) is responsible for the implementation of the EU Habitats and Water Framework Directives in Northern Ireland.

1.5 FISHERY MANAGEMENT TOOLS

Salmon fisheries in Northern Ireland are regulated by legislative provisions made under 2 key pieces of primary legislation; the Fisheries Act (NI) 1966, and the Foyle Fisheries Act 1952. These provide for the making of regulations and byelaws, annually as required, that specify:

- a licensing regime
- close seasons
- bag limits,
- carcass tagging schemes

Further, there are provisions in the primary legislation regarding illegal capture (poaching), the protection of juvenile salmon, eggs and spawning areas and the free passage of migratory fish.

Regulations on the sale of rod caught salmon are being progressed (see section 4).

In addition many angling clubs are introducing voluntary regulations. These include catch and release and voluntary bag limits.

More detailed information on the various types of regulatory measures is provided in the tables in paragraph 1.3.2.

2. STATUS OF STOCKS

2.1 CONSERVATION LIMITS AND MANAGEMENT TARGETS

FCB area

The most comprehensively developed conservation limit for N. Ireland at present is that for the R. Bush, derived from a whole river stock/recruitment relationship, based on estimates of ova deposition and smolt counts. In 2006 83% of target egg deposition was achieved from wild spawning which represented an improvement on the previous year when 66% of target egg deposition was achieved from wild spawning (Fig. 3). It also represents an increase compared to the previous 10-year average (60%). The CL on this river has been reached or exceeded only once in the last 10 years.

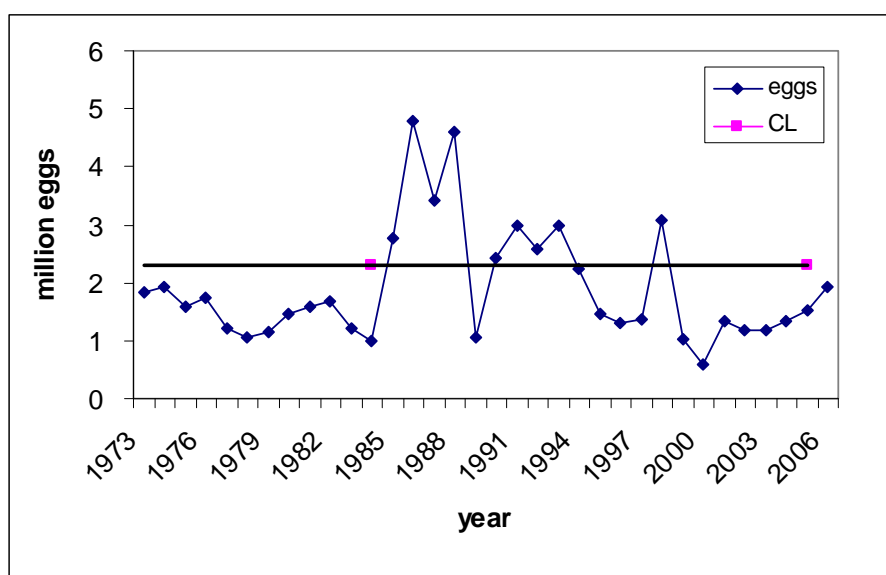


Fig. 3. Wild salmon ova deposition for the River Bush in relation to Conservation Limit.

Conservation limits have now been established for a number of important index rivers in the FCB area of Northern Ireland. A habitat inventory was compiled for each of the rivers including the Rivers Main, Blackwater, Glendun, Moneycarragh and Shimna. Conservation limits were determined through the transport of optimal productivity metrics measured from the River Bush stock recruitment study to measured habitat parameters from each index river. Counters were installed on these rivers to assess compliance with the CLs and have been operated since 2002. The Shimna River has no fish counter station currently and rod catch has been utilised to assess spawning escapement. The mean five year compliance against conservation limit, after angling, in the index catchments has been 42%, 47%, 53%, 46% and 54% for the Blackwater, Main, Glendun, Moneycarragh and Shimna respectively.

Table 3. Percentage compliance 2002-2006 with conservation limits for five monitored rivers in the Fisheries Conservancy Board area of UK (N. Ireland).

River	Fishery Year				
	2002	2003	2004	2005	2006 ²
Blackwater	54.5	38.9	44.7	37.6	35.0
Main	45.6	40.1	49.5	53.6	45.6
Glendun	56.6	45.3	72.8	42.2	56.6
Moneycarragh	68.1	16.5	56.9	44.8	40.3
Shimna	53.4	15.6	87.4	60.7	n/a

A counter at Portna on the mainstem of the Lower River Bann provides a yearly index, albeit relative, of escapement into the Neagh/Bann catchment. It also provides useful information on run timing indicating the peak migration periods (which can be established from relative data) and helps to indicate the lag time between peak passage in the Lower River Bann and movement throughout the upstream counters on the Rivers Main and Blackwater.

Loughs Agency Area

A spawning target based management system has been operating in the Foyle fishery area for many years, based on a 1975 scientific study of stock and recruitment relationships in the system. This was revised in 1998 and is now based on juvenile salmonid habitat assessments. Associated management targets are operated on the basis that, if, at certain dates during the season, target numbers of fish have not been achieved at Sion Mills Weir (R. Mourne), and at two other rivers (R. Faughan & R. Roe) then specified closures of the angling and/or commercial fisheries take place. Conversely, if the in-seasonal management targets have been met by the normal end of the commercial netting season, an extension is granted.

The management targets for these 3 index rivers (with the possible exception of the River (see below) have been met only after the closure of the commercial netting season in 2005, 2006 and 2007 and consequently no extensions or closures were initiated in these years.

Table 5. Percentage compliance 2002-2006 with conservation limits for four monitored rivers in the Loughs Agency cross border area.

River	Fishery Year				
	2002	2003	2004	2005	2006 ³
Mourne	162	152	128	117	117
Finn	106	119	70	158	106
Roe	298	223	105	159	81
Faughan	536	387	357	531	453

² 2006 figures remain provisional until 2007.

³ 2006 figures remain provisional until 2007.

2.2 ABUNDANCE

2.2.1 Abundance indices

Data on catches, exploitation rates and on returns to Northern Ireland's rivers of wild salmon are used each year to produce estimates of stock status at national aggregate level, derived from run-reconstruction modelling carried out by ICES (Figure 4).

For all years in the time series, returns have exceeded conservation requirements indicating an exploitable surplus of fish in the national stock. After accounting for exploitation, the estimates of spawners indicate that in most years spawners exceeded aggregated conservation requirements. Returns have trended downwards during the time series, whereas spawners have remained relatively stable for most of the time, but have increased somewhat in recent years. This reflects a trend for reductions in exploitation rates in coastal fisheries.

The most recent 5 year average of the estimated spawning stock in Northern Ireland's rivers in 2006 was 38,315 fish of all sea ages. It is noted that, while the overall national stock status assessment is instructive, it does not illustrate the variation in stock status across areas and individual rivers.

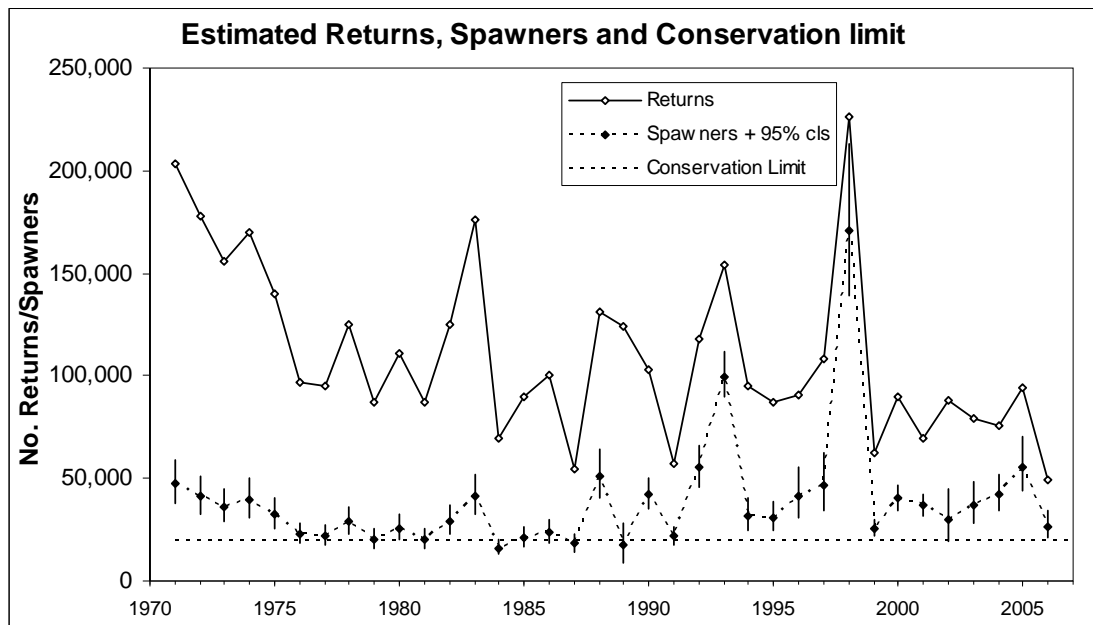


Figure 4. *estimated returns of wild salmon to the coast, estimated spawning stock after fisheries and aggregate conservation limit for N. Ireland.*

FCB Area

Total trapping of upstream migrating adults indicated that wild adult salmon numbers returning to the R. Bush in 2006 (1,074) were down on the previous year 2005 (1,151) but above the 2004 figure (878). The 2006 wild run was similar to the average for the previous 10 years (1,220).

The most complete, longest term measures of juvenile abundance are available for the R. Bush. These measures include an annual index of juvenile salmon (summer 0+) abundance determined from electric fishing surveys conducted throughout the river. Additionally smolt counts are available which are based on total trapping of down-migrating wild smolts.

In 2006 the smolt count was composed of 18,729 fish which was down in comparison to the previous two years (22,792 in 2005 and 22,389 in 2004) but represented an improvement on the previous 10 year average (16,533). Wild smolt counts on the river showed a general decline in the 1980-1990's. These reductions were thought to be related to reduced numbers of spawners and declining habitat quality through-out the catchment. Improving smolt figures in the 2000's are thought to reflect enhancement stocking carried out on this river; in particular stocking of under utilised and under performing habitat. Fry have been stocked since 1997 and stocking with summerlings has been undertaken since 2001 with 5 year average (2002-06) stocking intensity of 260,000 fry and 147,000 summerlings.

The semi-quantitative index of R. Bush wild juvenile (0+) salmon numbers from the electric fishing surveys of unstocked areas of the river was 10.0 (no./5 min⁻¹) in 2006. This illustrated an increase on the figure recorded for 2005 (6.6) and represented an improvement on the previous 10 year average of 8.08.

Juvenile abundance surveys have been undertaken on a wide range of other rivers throughout N. Ireland, using similar methodology to that used in the R. Bush. In the FCB area 5 year datasets are presently available for three river catchments which have been collated and referenced using GIS-based systems. The fry indices fell on all three monitored rivers in 2006 (see table 5) in comparison to the previous year and represented the lowest figure on all the catchments since 2002. These are being collated and referenced using GIS-based systems, to facilitate data linkages to habitat, water quality and other data to aid interpretation.

On the River Bush, egg to smolt survival from the most recent fully-recruited ova deposition (2003) at 1.01% was below the figure for both 2002 (1.06%) and 2001 (1.54%) but was in excess of the previous 10 year average (0.88%). Survival during the freshwater phase of the life cycle was significantly lower throughout the 1980s and 1990s, compared to the 1970s, and this was thought to reflect progressive habitat degradation (in particular siltation/compaction of spawning gravels) and additional effects of mammalian and avian predation. However, significant enhancement stocking carried out in recent years may be partly contributing to this very recent improvement, by boosting smolt production. It is emphasised that under stocking conditions the indicated

survival from egg to smolt is not a true measure of survival during the freshwater phase, as the equivalence between naturally deposited eggs and fish stocked as fry or summerlings cannot be assessed. It is also important to note that stocking does not address the factors contributing to the underlying decline in survival, thus particular emphasis has also been placed on in-river habitat rehabilitation works and predator control measures during the period.

Table 5. Juvenile salmon (0+ summer) abundance indices (no. 5mins⁻¹) for three monitored rivers in the Fisheries Conservancy Board area of UK(N. Ireland).

River	Survey Year				
	2002	2003	2004	2005	2006
Blackwater	4.0	4.3	7.7	8.0	2.1
Main	4.8	9.0	5.8	5.9	4.1
Glendun	5.4	10.9	5.6	12.4	3.5

Loughs Agency Area

In the Loughs Agency area all the index rivers, with the exception of the River Roe exceeded the established management targets in 2006. A technical difficulty may have impacted the Roe counter and this is being investigated before the compliance status of the catchment is finalised. Juvenile surveys in 2007 will be used to assess spawning success in 2006.

In general salmon escapement in the Foyle area in 2006 was fairly similar to previous years. The River Mourne count in 2006 (9,352) was very similar to the previous year (9,352) but down slightly on the previous 5 year average (10,207). The count in the R. Faughan for 2006 (3,625) was down on the 2005 figure (4,245) but exceeded the previous 5 year average (3,189). The River Finn count was down on the high figure recorded in 2005 (8,571) at 5,748 in 2006.

Other indices of production include semi-quantitative electric fishing at 400 sites in the Foyle area and approx 100 in the Carlingford region. From these over all juvenile stocks would appear to be good. Smolt trapping and coded wire tagging (CWT) also occur on the River Finn and the River Faughan. A crude estimate of smolt production has been calculated for the River Faughan at approximately 30,000.

2.3 SURVIVAL INDICES

2.3.1 General indices

The longest term measures of survival for salmon in Northern Ireland's rivers are available for the River Bush. These comprise indices of juvenile salmon (summer 0+) numbers throughout the river from electric fishing surveys, smolt and adult counts based on total trapping and a micro-tagging and tag recovery programme to evaluate annual exploitation rates from commercial fisheries and angling.

2.3.2 Survival to Homewaters

FCB Area

Estimates of survival of wild and hatchery origin River Bush fish returning to homewaters in 2006 are available from tagging studies. The return rate of wild 1SW River Bush salmon to the Irish coast in 2006 (5.9%) was down on both 2005 (6.8%) and 2004 values (6.77%) representing the lowest level observed in the entire time series (see Fig. 5). This trend continues a period of greatly reduced survival, which started with fish returning in 1998. Prior to this, survival had been high and relatively stable, varying between 25% and 35% over a 10-year period. This continuing reduction in survival gives great cause for concern, especially when the previously noted reductions in freshwater survival are still causing ongoing problems for smolt recruitment in this population.

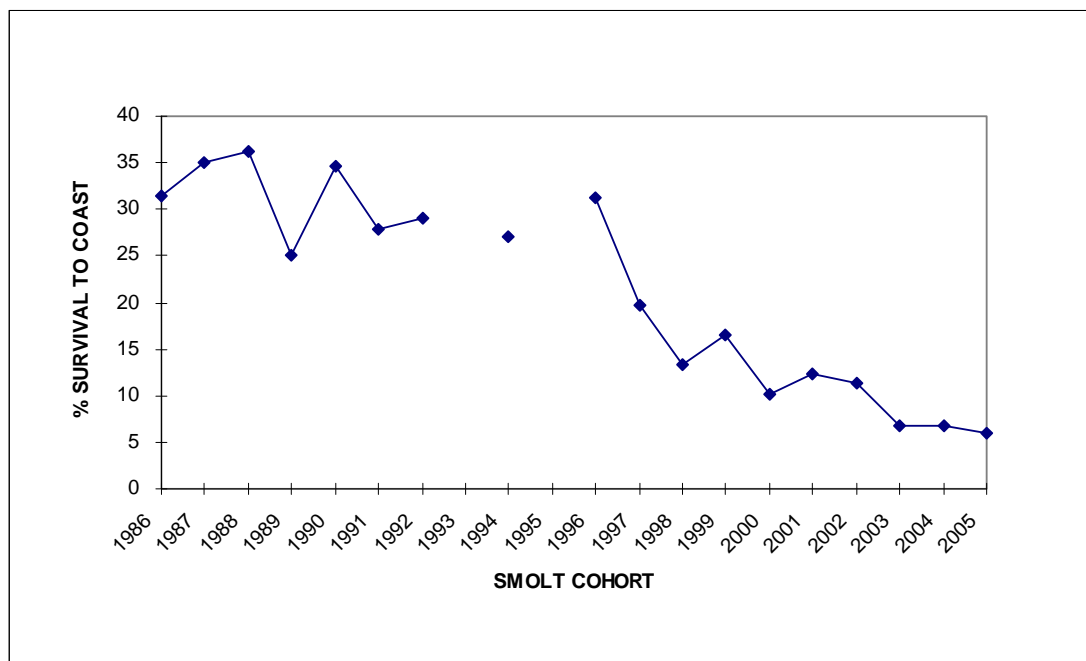


Figure 5. Estimates of survival to homewaters of River Bush wild 1SW fish (smolt release to return to the coast).

Hatchery reared fish exhibited lower survival at sea than wild fish. Survival of 1+ hatchery smolts to homewaters in 2006 (1.79%) was higher than the previous year (0.71%) but lower than the previous 10 year average (1.98%). 2+ smolts exhibited lower survival in 2006 (1.67%) than both the 2005 (1.89%) and previous 10 year average (3.21%) levels.

The hatchery produced smolts have also shown a reduction in survival over the monitoring period on the River Bush. Mean survival to the coast for 2+ (and 1+) hatchery smolts has dropped from 13.99% (9.66%) in the 1980's to 5.24% (3.31%) in the 1990's down to 2.39% (1.53%) in the 2000's.

It is also noted that survival of hatchery reared smolts is much more variable than wild smolts, partly reflecting variations in condition, and in method and timing of release to sea. However, a general reduction in survival of hatchery reared smolts appears to have taken place since the early 1990's, preceding the more recent reductions in marine survival of wild smolts.

Loughs Agency Area

The agency commenced a study on the development of a Pre-Fishery Abundance (PFA) model for the Foyle in late 2005, this is ongoing and is intended to report at the end of 2008.

While the Loughs Agency has initiated a CWT programme no data is available as yet to give an indication of survival to home waters.

2.3.3 Survival to freshwater

FCB Area

Survival of wild 1SW salmon to the R. Bush (after exploitation at sea) was 4.17% in 2006. This represented a decline on the 2005 figure (4.6%) and a reduction on the previous 10 year average (7.09%). Survival of 2SW fish to freshwater was 0.44% in 2006 reflecting an increase on the previous year (0.34%) but a reduction on the previous 10 year average (0.84%).

Survival of hatchery produced 1+ smolts to the River Bush as 1SW salmon was higher (1.16%) than the previous year (0.47%) and than the previous 10 year average (0.63%). Survival of 2+ hatchery smolts returning as 1SW salmon in 2006 (1.11%) represented a decline in the returns rates recorded in 2005 (1.46%) and the previous 10 year average (1.54%).

Loughs Agency Area

While the Loughs Agency has initiated a CWT programme no data is available as yet to give an indication of survival to freshwater.

2.4 DIVERSITY

2.4.1 Age composition and migration

FCB Area

Age composition and run timing of returning mature salmon are assessed from catch returns, fish counter data and scale readings. The adult run is dominated by 1 SW grilse with relatively low numbers of larger MSW fish. The commercial fishing effort in the FCB region extends from 18th March – 15th September. Commercial logbook returns indicate that peak exploitation is concentrated in June and July and focuses mainly on the 1 SW stock component

The largest salmon producing catchment in the FCB region, the Lower Bann catchment, illustrates peak migration of salmon between June-July, although penetration upstream to the Lough Neagh spawning tributaries often lags into the autumn. Late summer/autumn run salmon are an important component of Glendun River stock (Antrim Rivers) and often constitute the majority of the population, scale reading indicate these are principally large late running 1 SW fish. A small number of large (MSW) fish are detected by fish counters principally during the spring months on the Main (Lower Bann), Blackwater (Upper Bann) and the Glendun Rivers, however, numbers are limited and constitute less than 5% of the total seasonal migration.

Loughs Agency Area

The River Finn in the Foyle catchment has a spring multi-seawinter run and also a 1 sea winter run usually entering freshwater late May /early June although these timings appear to have become later in recent years. The River Mourne also has a reasonable multi sea winter spring run but the majority of the fish run as 1 sea winter salmon during June, July tailing off substantially in August but with a relatively constant return of fish until December. The River Roe which enters Lough Foyle directly tends to get a 1 sea winter run from July generally peaking in August/September.

2.5 *THREATENED OR ENDANGERED STOCKS*

2.5.1 *Assessment of stocks*

The achievement of Conservation Limits is used by management to assess if stocks may be threatened or endangered. Data from individual rivers are detailed above (Table 1).

3. THREATS TO STOCKS AND CURRENT MANAGEMENT MEASURES

3.1 EFFECTS OF ALL SALMON FISHERIES AND FISHERIES TAKING JUVENILE OR ADULT SALMON AS A BY CATCH (INCLUDING FISHERIES IN DISTANT AND HOME WATERS)

The wild salmon stock estimate (returns to home waters) and estimated spawning stock after fisheries is illustrated in Figure 3 above.

In the FCB area the 5 year average 2002-2006 of exploitation by commercial fishermen was estimated at 2852 salmon while in the Loughs Agency area the 5 year average catch is approximately 26,700 salmon. The estimated total return to NI coastal waters, averaged over the same period, is over 70,000 salmon.

The effect of commercial fisheries on the FCB stocks has been reduced considerably since 2002 due to the buy out by DCAL of 90% of the salmon fishery capable of operating in the FCB area. Due to a reduction in fishing effort and other factors the commercial catch in the Loughs Agency area had also decreased.

The national policy in both jurisdictions is to phase out all mixed stock interceptory fisheries and to introduce legislation to control all other commercial fisheries where they impact on rivers not achieving Conservation Limits.

Research based on the coded wire tag programme at the River Bush has indicated levels and patterns of exploitation in homewater and other fisheries on Northern Ireland's 1SW stock since the mid 1980's. Overall, exploitation rates of the Bush stock in coastal fisheries have ranged from 28% to 89%, but have declined in recent years, averaging 41.5% in the period 1998-2006 compared to 63% during 1988-1997. Most of this exploitation takes place in Northern Ireland's fisheries, mainly in the FCB area where the River Bush is located, however significant exploitation has been recorded in some years in other Irish fisheries.

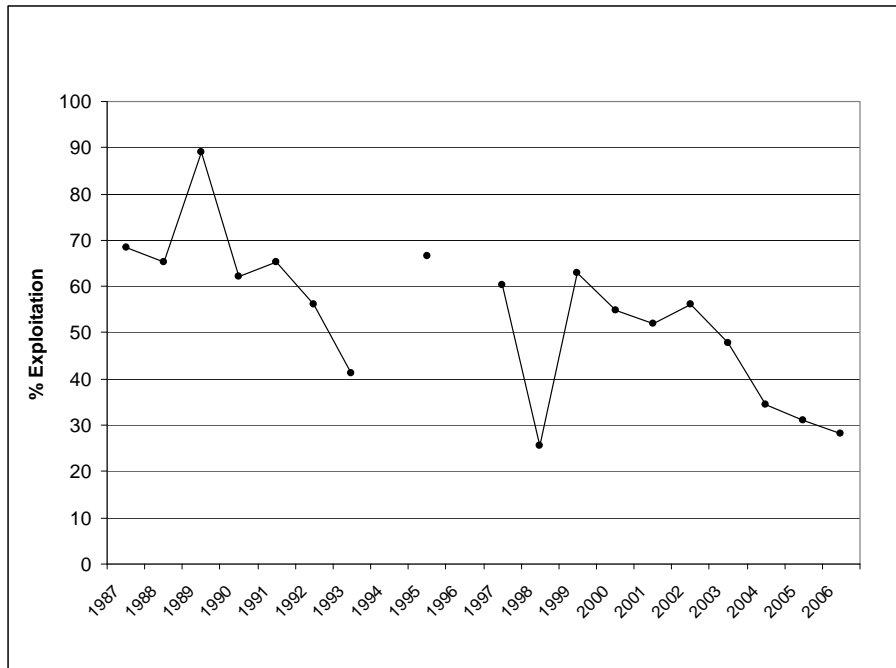


Fig 6. Marine exploitation of wild River Bush 1 Sea Winter salmon from 1987-2006

Exploitation rates of this grilse stock in distant water fisheries have been very low, at 1% or less, even when significant fisheries were operating at West Greenland and Faroes. No tag returns from fishing at West Greenland have been noted in recent years and there has been no fishery at Faroes since 2001.

Concerns have been raised about potential for exploitation of southern European salmon post-smolts and older fish in pelagic, mainly mackerel, fisheries operating in the Norwegian Sea and other sea areas including to the north and west of the British Isles. ICES has examined available evidence, and concluded that significant numbers of salmon by-catch in these fisheries was unlikely, due to the nature of the gear and the fishing methods, however this is being further investigated. Estimates of salmon by-catches available so far suggest that these are insufficient to impact pre fishery abundance or returns to home waters.

3.2 FACTORS AFFECTING ESTUARINE AND FRESHWATER SALMON HABITAT

A number of local and regional habitat factors impact on salmon stocks in Northern Ireland. Indeed, the majority of surface waters are predicted to be ‘at risk’ of failing to meet the EU Water Framework Directive’s environmental objectives. Whilst these objectives cover a much broader suite of parameters than those impacting salmon directly, this analysis reflects that the many salmon rivers face a number of impacts that constrain optimal freshwater conditions for salmon production.

For rivers, 59% are ‘at risk’ and 39% are ‘probably at risk’. The risks can be attributed to a range of pressures: point source pollution, especially by sewage; diffuse source pollution, especially from agriculture; and morphological alterations. This represents 99% of the land area of Northern Ireland.

Flood protection schemes and drainage maintenance works, and barriers to migration notably abstraction weirs, continue to impact salmon. Flood control sluices on the Lower River Bann are used to maintain Lough Neagh within statutory levels and recent studies suggest some problems for salmon passage. This is being assessed.

Lakes, of which 63% are ‘at risk’ and 33% are ‘probably at risk’ are similarly affected by these pressures.

Estuaries (transitional water bodies) have provided important sites for industrial and urban development, and, as such, have over the years been subjected to extensive morphological alterations, and also ongoing activities. Water quality problems are also significant as water drains to the sea from our rivers and from more local discharges. Assessments have identified 57% as ‘at risk’ and 43% as ‘probably at risk’.

Coastal waters are at risk from point source discharges because of inadequate levels of sewage treatment, and activities leading to morphological alterations, giving 60% as ‘at risk’ and 35% as ‘probably at risk’.

While only a relatively small percentage (22%) of groundwater bodies are identified as ‘at risk’ or ‘probably at risk’, this represents 44 % of the land area. This is predominantly due to intensive agriculture around Lough Neagh and Strangford Lough, and urbanisation and concentrated abstraction in the area around Belfast. The method for delineating groundwater bodies, based on hydro-geological considerations, means that in border areas some groundwater bodies extend into Ireland. For those cross-border bodies, consideration has also been given to risk assessment results available for the portion of the body falling within Ireland.

In many cases the trend and future pressure information is uncertain. Changes in land use, coastal use, future development pressure and the increased use of renewable energy sources are some examples of pressures that may result in risks to the water environment and hence to salmon populations.

Land use changes

Following the Biodiversity Convention at the Earth Summit in Rio de Janeiro in 1992, the UK Biodiversity Action Plan set out a programme of action to conserve and enhance biological diversity throughout the UK. A classification of 'broad habitats' was defined as a context for priority habitats and species requiring conservation, and to facilitate habitat comparison within the UK. A study was conducted by EHS to determine the net changes in broad habitats between the early 1990s and 1998. The main changes in Northern Ireland broad habitats in the 1990s were an increase in the area of Improved Grassland, and decreases in the areas of Natural Grassland and Arable and Horticulture habitats. To assess changes at a regional Northern Ireland scale and to inform decisions on sustaining biodiversity, Primary Habitats were also assessed. There was no net change in Agricultural Grassland and Crops but the area of Semi-natural Vegetation decreased, while Woodland and Scrub increased. Buildings and Roads cover increased, particularly in upland landscapes, built primarily over Agricultural Grassland and Crops. This was indicative of urban and rural land use change.

The common agricultural policy (CAP) has been the major influence on land use changes over the last 30 years. The increased stocking levels and pesticide and fertiliser use associated with agricultural intensification has resulted in increased pressures and impacts on the water environment. CAP reform may lead to benefits for water quality, landscape and biodiversity. The resulting changes in farming patterns and management practices are likely to reduce overall water pollution levels. However, the changes may lead to fewer, larger enterprises, particularly in the dairy sector, that could have negative effects on the water environment, unless measures are in place to ensure that no deterioration occurs. Land use decisions and management practices can affect water quality. Diffuse pollution can arise from urban areas, roads, forestry and agricultural land. Many of these problems are currently being addressed through, for example, sustainable urban drainage systems and agricultural best management practices. In areas where these types of land use changes continue, measures will need to be put in place to ensure that no deterioration in status occurs.

Coastal Use Changes

A number of pressures in the coastal environment have potential implications for future implementation and compliance with the Directive in transitional and coastal waters. Coastal development in response to population expansion is likely to increase, particularly in the region of Belfast, which may include expansion of ports and harbours. Changes in land use practise will result in variation in the quantity and composition of sediment, nutrients and contaminants that ultimately are transported to transitional and coastal waters.

Future Development Pressures

Northern Ireland has one of the fastest population growth rates in Europe and it is estimated that there will be a regional need for an additional 160, 000

dwellings by 2015. These are expected to be concentrated in the Belfast metropolitan area, around Londonderry, and to a lesser extent in the Antrim, Ards, Down, and Newry and Mourne areas. There are also a number of strategic road improvements indicated by the Proposed Regional Strategic Network Transport Plan 2015. The schemes include proposed bypasses, link roads, slip roads and junction improvements.

These future development pressures will need to be considered when programmes of measures are established to protect salmon populations.

Increased Renewable Energy Sources

Following the Framework Convention on Climate Change, 1997 (the Kyoto Protocol), the UK Government set a target for the increased use of renewable energy sources. The target set is that 10% of electricity should be generated from renewable energy sources by the end of 2010, with the figure rising to 20% by 2020. The publication of 'Vision 2010– Energy Action Plan' indicated that Northern Ireland would be contributing to the UK targets. The target set for Northern Ireland is that by 2012, 12% of all electricity consumed is generated from renewable sources. For Northern Ireland this contribution may come from a number of renewable sources such as hydro-electric plants, terrestrial and offshore wind farms, tidal current turbines, and solar, geothermal and biomass based technologies. HEP causes some local problems currently for salmon passage, and may be the most worrying renewable energy development for salmon populations in the future.

Climate Change

Climate change is likely to impact the water environment. However, it is uncertain as to what the exact impacts will be and where they will occur. The United Kingdom Climate Impacts Programme (UKCIP) has published a number of scenarios for climate change over the next 80 years. These are based on low, medium and high levels of greenhouse gas emissions, with high levels representing the worst case scenario.

It is predicted that the average annual temperature will increase, with the increases greatest in summer and autumn. Winter precipitation is likely to increase and summers may become drier. In addition, the frequency of intense weather incidents is likely to be higher. Relative humidity may decrease slightly and there is likely to be a large decrease in winter snowfall. The wind speed is also likely to decrease, especially on the east coast. Increased temperatures could lead to raised surface water temperatures, resulting in changes in the rate of biochemical processes that determine water quality. There would be an impact on dissolved oxygen, biochemical oxygen demand and nutrient levels in the water leading to detrimental impacts on indigenous flora and fauna including salmon. The problem would be further exacerbated in nutrient rich water bodies due to increased algal growth.

Drier summers would increase the periods of low river flows, reducing the capacity to dilute effluent discharges. This would necessitate more stringent

effluent discharge consents. There could be a greater risk of stratification in lakes and reservoirs due to increased temperatures and incident solar radiation, and slightly reduced wind driven mixing in spring. This could encourage algal growth and changes in the rates of biochemical processes as for rivers. In all surface waters, the increase in temperatures could lead to changes to biological populations suited to warmer waters.

Increases in autumn and winter precipitation intensities would increase the risk of physical damage to river channels. The resultant soil erosion and sedimentation could adversely affect invertebrate and fish populations, notably salmonids.

Increased heavy precipitation events could also cause combined sewer overflows to operate more frequently. This would result in spills of highly polluting sediments built up during periods of drier weather. Changes in precipitation patterns may have implications for groundwater resources influencing when and how much recharge occurs and what loadings of contaminants leach from soils to the underlying water table.

The risk of saline intrusion into coastal aquifers would be increased by a future rise in sea level. In some cases, for example increased rainfall, it may be more likely that environmental objectives will be achieved, as pollutants will receive more dilution. Conversely, it may be more difficult to achieve objectives if there are prolonged periods of drier weather.

The Directive states that temporary deterioration in the status of water bodies is allowable if this arises from exceptional circumstances such as extreme floods and prolonged droughts but less severe weather changes may still impact on the water environment making it easier or harder to achieve the objectives and protect salmon populations.

3.3 IMPACTS OF AQUACULTURE, INTRODUCTIONS AND TRANSFERS AND TRANSGENICS (INCLUDING DISEASES AND PARASITES)

There is only one salmon farming business in Northern Ireland operating at two sites both of which are based in the open sea off the County Antrim coast. Accordingly, the overall risk to the Northern Irish salmon stock from aquaculture is low and localised.

A 1990 study described genetic changes in the salmon population in the adjacent Glenarm River resulting from the spawning of escaped farmed salmon. A further follow-up sample was taken from the river in 1997 to assess the genetic status of the wild population two generations after the original hybridization between the wild population and the farmed strain. Overall genetic variation across eight polymorphic allozyme loci indicated that the wild population remained significantly different from the pre-escape population and from the immediate post-escape population, the presence of an allele not having been previously detected in this population suggesting that further incursion(s) of farmed salmon may have taken place (Crozier, 2000).

Monitoring of the occurrence of presumed escaped farmed salmon has been carried out by experienced fishermen in the FCB fishery area since 1991, with escaped fish being identified by external morphological features and noted on daily log sheets at each netting station. During this period, occurrence of presumed escapees has also been recorded at the R. Bush trap, this providing one of the few long-term sources of information on occurrence of farmed salmon in fresh water in the British Isles.

Data obtained from fishermen on presumed escaped farmed salmon in the fishery in the FCB area indicated that occurrence in 2006 (285 fish out of 2459 fish examined; 11.6%), was lower than in 2005 (15.3% and 2004 (13.8%). This appeared to be associated with escape incidents at the local salmon farm, as nets closest to the salmon farm had the highest occurrence of escapees (the two netting stations closest to the farm reported 241 and 295 escapees, respectively).

Excluding years when there were known escapes from the local salmon farm, this leaves a time series average of 2%, which is presumed to represent a background level for this fishery. It is also noted that due to the few remaining commercial salmon fishing nets in the FCB area being in the vicinity of the single salmon farm in Northern Ireland, the records of escapees will be skewed upwards, compared to data pre buyout.

Only 1 escapee was noted in the River Bush trap in 2006. In general, the occurrence of escapees in the monitored freshwater location has been much lower than in the coastal fishery, averaging 0.6% of adult runs in the River Bush. There have been no reports of escaped farmed salmon in the Foyle area.

The salmon farm suffered a stock collapse in late 2007 and there is a consequent reduction of risk as there are currently no fish in containment in the marine environment. For the purpose of this document it is assumed that there will be future production at the marine site from year 2009.

Lice (*Argulus spp.*) infestations on wild salmon in the area of the farm sites are regularly checked. Data collected from wild fish does not indicate the salmon farm influences lice numbers in the wild population given that there is no significant difference between lice numbers on wild fish recovered from areas adjacent to the farm and fish from further afield. In addition the nature of the high energy marine site does not support high lice infestation amongst the farm population.

The farm is not authorised to treat for sea lice, and the farm product is not troubled by infestation of *Argulus spp.* Given the history of production at the sites, an increase in lice infestation is not foreseen and neither treatment nor prophylaxis are permitted.

Concerns have been expressed in 2007 about the prevalence of the “herring worm” (*Anisakis spp.*) in wild salmon. There have been several reports of bleeding vents and this has been observed in the trap at Bush Salmon Station.

The threat posed by *Gyrodactylus Salaris* (GS) is of course a cause for concern. Measures implemented by the Department of Agriculture and Rural Development aim to prevent introduction although contingency in the event of an outbreak is in place.

There is a history of stocking salmon into Northern Ireland rivers. Indeed stocking with fish from the DCAL facility at Bushmills was widespread until relatively recently as compensation for habitat degradation and fish kills. There is little pre stocking data to indicate how successful or harmful past stocking practices may have been. A genetic study of the River Roe population in 2003 indicated that substantial stocking with fish from the River Bush hatchery in previous years was unsuccessful. The native stock had recovered such that introduced genes were absent suggesting they had been purged as the native “fitter” population re-established.

There are 11 hatcheries operated mainly on a small scale by angling clubs. However, their stocking protocols are now controlled consistent with the Williamsburg Resolution. Current monitoring of managed stocking on the River Bush is reported above.

3.4 OTHER INFLUENCES AFFECTING SALMON ABUNDANCE OR DIVERSITY (INCLUDING MARINE ENVIRONMENT)

Exploitation by mammalian and avian predators is thought to impact significantly on salmonid populations in localised regions of Northern Ireland. No estimates of the impact of seal predation have been carried out, although anecdotal evidence suggests that this can be intense at localised netting sites. Cormorant predation on smolts in the River Bush has been shown to be intense at the time of the smolt run, potentially removing over 50% of the annual smolt run (Kennedy & Greer, 1988). Fisheries owners may apply for licences to cull cormorants attacking their fisheries. However, as many of the predators are themselves protected species predation is difficult to control.

Marine survival has shown a consistent downward trend since the late 1990s. Micro-tagging work on the River Bush has indicated that returns of wild River Bush salmon to the Irish coast was 5.9% in 2006 and 6.8% in 2005, a significant decline from the long term average of 25-35% survival experienced through the 1980-90s. There is some evidence that climate change may be implicated in this (see also above). The annual smolt migration now occurs several weeks earlier than two decades ago, apparently as a result of milder winters and wetter springs, and this change in run timing is being investigated in relation to the downturn in marine survival.

Recent work on the Foyle catchment examined the effect of the North Atlantic Oscillation (NAO) in winter on returning salmon catches using a long data series (Boylan & Adams, 2006). This highlighted the importance of oceanic conditions in predicting salmon returns. When the NAO index was negative returns were generally high but when it was positive this relationship decoupled. With global warming climate prediction models indicating an increasingly positive trend for the NAO in the future, it appears unlikely that the previous high abundances seen in the late 1960's or early 1970's are likely to recur.

4. MANAGEMENT APPROACH – FUTURE MANAGEMENT PRIORITIES

The following sections provide an outline of the management approach for the 5 year period 2008 – 2013.

The section on future management priorities in particular is set out as concise action points for the purposes of clarity and focus and to enable reporting on them going forward. Further detail shall be provided in future Focus Area reports under each of the 4 headings set out in section 3 above and consistent with the main NASCO agreements.

It should be noted that the overall management regime for Northern Ireland is not determined by reference to this period. Management measures shall aim to be flexible within current and evolving legislative and policy frameworks. The approach outlined should therefore be considered to be ongoing but shall necessarily change in response to legal and policy drivers and management information collected on the salmon resource and the environments in which it lives.

It should be further noted that the approach is dependent on identifying and securing funding. This is likely to be restrictive during the period of this Plan and so some of what is described can be considered to be aspirational. This will be qualified as such below where appropriate.

Key factors that may restrict or frustrate planned activities shall be data deficiency due to research and monitoring limitations and the emerging political landscape in Northern Ireland, specifically decisions informed by the socio-economic implications of proposed actions.

4.1 MANAGEMENT OF FISHERIES

4.1.1 Regulatory controls

Regulatory controls consistent with Decision Structure (SCPA (02) 16) are outlined in section 1.3.2 above. The development of these control and monitoring measures has underpinned the application of the precautionary to date, as follows:

FCB Area

The Salmon Management Group, which manages the Salmon Management Plan, meets regularly to review the Plan and Conservation Limits. The Group reviews existing regulations and where appropriate makes recommendations to the statutory authorities for modification or the introduction of new controls based on the management information. Management information is compiled from habitat analysis, fish counter information, annual electric fishing surveys and a tagging scheme which provides data on exploitation. The information is held on a Geographical Information System (GIS) database which is maintained and expanded on an ongoing basis. The GIS and counter databases provide the mechanism to monitor compliance against Conservation Limits and trigger management actions to address impacts on the stocks.

Loughs Agency

The Loughs Agency spawning target based management system is described in section 2.1 above and has been the basis to managing the Foyle fisheries for some 30 years. Additional information is gathered through habitat surveys, juvenile stock assessment, the monitoring of returning adults through logbook returns from commercial and recreational fishers, fish counters and redd counts. This information is collated and managed on a GIS which can then be queried to identify areas where agency resources may be targeted more effectively, e.g. towards water quality problems or degraded habitat.

Recent key fishery management measures

FCB Area

Ninety percent of licensed commercial salmon fishing engines in the FCB area were removed from the fishery in 2003/04 through the introduction of a DCAL sponsored voluntary buy-out scheme. This left only 2 commercial drift nets, 2 fixed bag nets and 1 tidal draft net in operation in 2006.

This fishery, mainly around the North Antrim coast (see figure 2) had provided significant economic benefits to the fishermen and their crews and a livelihood for many. The fishery was a part of the culture and social fabric of this marginal rural area. Accordingly, it was operated as a voluntary scheme where fishermen

received a valuation of their asset(s) and a sum in compensation for these and for lost catch revenue derived from track record of catch. Those fishermen who chose to remain in the fishery did so.

A review of catch and particularly of stock composition of catch by the remaining commercial fisheries in the FCB area was undertaken in 2007 against ongoing concern about the status of stocks intercepted by these nets as shown by monitoring since 2004 described in summary in section 5. A management approach to this review is under consideration (see below).

Loughs Agency Area

Consultation on the draft Foyle and Carlingford Fisheries (NI) Order 2007 ran from 17th November 2006 to 15th January 2007. This Order amends the Foyle Fisheries Act (Northern Ireland) 1952 (the 1952 Act) by providing the Foyle, Carlingford and Irish Lights Commission with the powers to licence and develop aquaculture in the Foyle and Carlingford Areas in accordance with the requirements of the North/South Co-operation (Implementation Bodies) (Northern Ireland) Order 1999. It also updates a number of the existing provisions of the 1952 Act relating to the conservation and protection of inland fisheries and makes a number of minor amendments to the Fisheries Act (NI) 1966 and other fisheries legislation.

In 2007 the Loughs Agency introduced regulations to prohibit drift net fishing seaward of Lough Foyle. As conservation limits are being met in all the Loughs Agency's catchments a small number of drift nets will be allowed to operate inside Lough Foyle to fish for the surplus. A voluntary scheme was introduced for the draft net fishery. These changes were implemented prior to the commencement of the 2007 commercial season and 18 drift net licences were issued for the Lough with 10 draft nets to fish in the main river.

The Agency has produced Catchment Status Reports for the Roe and Faughan catchments. These form the basis of management strategies for the fisheries in the catchments and a means of engaging the stakeholders in formulating and implementing these. The information these are based on is compiled on the agency's GIS. This information includes annual electric fishing, redd counts and habitat information.

Measures to restrict the commercial fishery in the Republic of Ireland in 2007 have complemented the above approach in the FCB and Foyle areas and has provided for a significantly precautionary response to stock status around the island of Ireland.

4.1.2 Future Management Priorities

FCB Area

- Develop proposals in 2008 to further restrict remaining commercial fisheries in the FCB area, particular those identified as intercepting mixed stocks or stocks from rivers failing to achieve Conservation Limits (see main national objective above)
- Pursue legislative amendments to ban the sale of rod caught salmon by 2009.
- Develop further conservation and management targets (Conservation Limits (CL's)) and Catchment Management Plans (CMP's) for specific rivers on a rolling basis as set out in the schedule below:

2008	2009	2010	2011	2012	2013
Bush Main and tributaries	Blackwater and tributaries Glendun Moneycarragh Garvary	Bann Upper Clady Shimna	Sixmilewater Agivey Glenarm and other Antrim rivers Ballinderry	Inver Moyola Quoile Enler Lagan Lower Bann	Crumlin /Glenavy Ballymoney/ Ballycastle Ballinamallard Kesh

- CMPs will aim to provide a scientific evaluation of each salmon population and its habitats at catchment or sub catchment level including a CL, an evaluation of quantity and quality of habitat units, identification of impacts and threats, and prioritisation of management actions in consultation with stakeholders.
- Investigate the use of growing datasets on rod catch from carcass tagging schemes as a basis to reporting population size estimates on selected rivers without fish counters in line with the above timetable. This will provide an assessment of recruitment to inform CMP's and provide further information to report in section 1.2.2 above.
- Introduce angling regulations to support Catchment Management Plans to include measures such as catch and release, use of barbless hooks, early closures and shortened seasons. These measures will be introduced as necessary in line with the above CMP timetable.
- By 2014, refine and model the data from the adult counter on the Lower River Bann (which provides only a partial enumeration of migration into the Neagh/Bann basin) to provide an estimate of escapement into the basin. This will, resource permitting, include upgrading the counter infrastructure as part of planned improvements to fish passage at the site (see below).
- Secure resource and permissions to install an adult fish counter on the Clady River by end 2010 and on the Moyola River by 2012.
- Complete a DNA based study in 2009 to determine the genetic structure of salmon populations in the FCB area at catchment/ sub catchment level. This

will aim to complement other studies of Irish populations and so complete a “genetic baseline” of the island’s populations .

- Undertake annual reviews of CMP’s and regulatory controls.

Loughs Agency Area

- Introduce the Foyle and Carlingford Fisheries (NI) Order 2007 by 2009.
- Introduce real time management (RTM) strategies and replicate Catchment Status Reports for the Roe and Faughan catchments for the rest of the tributaries within the Foyle and Carlingford as set out in the schedule below.

2008	2009	2010	2011	2012	2013
CSR Roe Faughan	CSR Finn Owenkillew Glenelly	CSR Derg Mourne	CSR Camowen Drumragh Fairwater Owenreagh	CSR Burndennett Clanrye Whitewater	RTM Finn Owenkillew

- These reports will provide a scientific evaluation of each salmon population and its habitats at catchment or sub catchment level including a CL, an evaluation of quantity and quality of habitat units, identification of impacts and threats, and prioritisation of management actions for consultation with stakeholders.
- Monitor and review existing commercial fisheries on an annual basis
- Introduce regulations annually as necessary to support Catchment Status Reports including catch and release, use of barbless hooks, early closures and shortened seasons.
- Undertake annual reviews of catchment management plans and regulatory controls
- Report on development of a Pre Fishery Abundance (PFA) model for the Foyle by end 2008.

4.2 PROTECT AND RESTORE SALMON HABITAT

4.2.1 Current approach

FCB Area

As described elsewhere in this document, the FCB area Salmon Management Plan seeks to monitor stock status and assess the effectiveness of conservation and management measures in a number of index catchments. The plan is composed of several core GIS conservation databases, including habitat inventories to assess salmon habitat units and quality and identify habitat related production bottlenecks. This informs where habitat management, refurbishment or enhancement works are required.

A comprehensive Salmon Habitat Action Plan was drawn up in 2001 for all major salmon catchments in both the FCB and Loughs Agency areas and an economic appraisal carried out that supported the project. However no funding has been available to implement the full Plan to date.

The Salmon Management Group explores funding opportunities for habitat restoration and improvement. Funding has been acquired through both the EU Peace Fund and the Financial Instrument of the European Economic Area (EEA), and habitat restoration and improvement works have been implemented in both the Loughs Agency and FCB areas. The EEA project was completed in 2007.

Some £5m of EU and national funds under the Peace 1 measure was allocated to a Salmon Enhancement Programme. Guidance was provided to applicants availing of awards under this programme and approximately £3 million was allocated to salmon habitat management and refurbishment. A guidance leaflet on habitat construction was produced by DCAL for the guidance of applicants. A similar Programme, the Angling Development Programme funded under the Peace 2 Measure offered similar opportunities for habitat restoration projects. It is estimated that £2 million has been allocated to these projects which will be completed in 2007. DCAL provides advice to those applicants carrying out habitat improvement works.

A review of current Area Development Plans and strategy documents was carried out to determine proposed future regional development. The Planning Service is currently engaged in a substantial development plan programme, with thirteen plans either published or under review.

The Nitrates Action Programme (NAP) Regulations (NI) 2006 and the Phosphorus (Use in Agriculture) (P) Regulations (NI) 2006 were introduced on 1 January 2007 to improve the use of nutrients on farms and as a result improve water quality. The Nitrates Directive is one of the Cross Compliance Statutory Management Requirements, therefore, farmers claiming Single Farm Payment and other direct payments are required to comply with the NAP Regulations. Measures relating to the P Regulations are not Cross Compliance Verifiable Standards. However, adherence to both sets of Regulations is required by law. A

Guidance Booklet on requirements to comply with the NAP and P Regulations has been sent out to all farm businesses in 2007.

Potentially adverse impacts on salmon habitats are addressed through a number of work programmes and agreements including the following:

- DCAL works closely with the statutory drainage and flood defence authority for Northern Ireland to provide advice and guidance, under the terms of a Service Level Agreement, to mitigate the impacts of drainage maintenance works on habitat. This requires that all drainage works must include mitigation and, where funding permits, fishery rehabilitation measures under the direction of DCAL Fisheries Technical Officers.
- Appropriate water quality standards are set by EHS for consents to discharge into watercourses under the provisions of the Water (Northern Ireland) Order 1999;
- A new licensing scheme for water abstraction and impoundment administered by the EHS (the Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006) was introduced in 2007;
- Modern fishery protection measures are required at all water abstraction sites under provisions in the Fisheries Act (NI) 1966 administered by DCAL. A comprehensive guidance document for persons applying to abstract water, modify a weir or build or modify a fish pass was prepared in 2004;
- A public salmon hatchery was developed at the River Bush Salmon Station in 1991 that offers facilities to culture indigenous juvenile stock for restocking into those parts of catchments where juvenile abundance is demonstrably low or absent and where the causes of poor natural recruitment to these habitats cannot be easily or quickly resolved. Stocking programmes are managed consistent with the Williamsburg resolution.

Loughs Agency Area

The Agency has a comprehensive management strategy built around the attainment of CLs and Management Targets. In order to increase the opportunity of achieving these the agency works towards the optimising of smolt production using the data (instream habitat surveys, electrofishing, water quality, macroinvertebrate info) gathered by scientific staff and field crews, and stored on the GIS, to highlight areas where remedial action can be targeted more efficiently and effectively. A major part of this strategy involves the management, restoration or enhancement of the instream habitat where appropriate.

In conjunction with DCAL and the FCB, funding has been acquired through both the EU Peace Fund and the Financial Instrument of the European Economic Area (EEA), and habitat restoration and improvement works have been implemented in both the Loughs Agency and FCB areas. The EEA project was completed in 2007.

4.2.2 *Future Management Priorities*

FCB Area

- Complete in 2007 a review of the number of rivers in Northern Ireland selected as candidate Special Areas of Conservation (cSAC's) for Atlantic salmon under the EU Habitats Directive.
- Complete in 2009 a study of salmon passage at the Portna flood control gates inclusive of an assessment of the adequacy of the fish pass and recommend a revised gate opening regime and upgrade to the fish pass as appropriate.
- Design and commence a habitat refurbishment and enhancement scheme on the River Bush in consultation with stakeholders in 2008.
- Monitor fish population dynamics following the implementation of the EEA funded habitat improvement project completed in 2007.
- Seek and allocate funding from annual DCAL and partner budgets at every opportunity to deliver further habitat improvement projects as set out in the Salmon Habitat Action Plan.
- Continue annual surveys of physical habitat on all major salmon rivers and tributaries in the FCB area to inform the Salmon and Catchment Management Plans and develop the GIS databases.
- Continue to inform the review of Area Development Plans urging their completion by 2012.
- Publish River Basin Management Plans as required by the EU Water Framework Directive containing programmes of measures (POMS) by Dec 2009, and make POMS operational by 2012.
- Enforce the requirements of the Nitrates and Phosphate regulations and develop agri-environment schemes by 2012 that assist farmers to protect river corridors and salmon habitat.

Loughs Agency Area

The agency has detailed plans in place to undertake habitat restoration / enhancement works on the following systems in 2008:

- Ballykelly River
- River Deelee
- Fintona/Seskinore River
- River Derg

- River Dennett
- River Faughan
- River Roe

This will cost in the region of £180,000 -£200,000.

The agency in co-operation with RAPID (Rural Area Partnership in Derry) and the Faughan Anglers Association aim to spend in the region of £80,000 on in-stream works in 2008. These works form part of an ongoing plan in this area for example in 2008 it is planned to spend £200,000 on similar schemes in the catchments.

4.3 *MANAGE AQUACULTURE, INTRODUCTIONS AND TRANSFERS*

4.3.1 *Aquaculture and Fish Health*

Current approach

Under the provisions of the Fisheries Act (Northern Ireland) 1966, as amended, it is an offence to operate a salmon farm without a fish culture licence or in breach of any of the conditions subject to which a licence is granted. In the case of marine sites, producers may also apply for an additional licence, a marine fish fishery licence, which is optional and gives the licence holder the exclusive rights to cultivate salmon within a specified area and at the same time provides the licence holder with legislative protection for his/her operations.

The licensing process provides a demonstratively open, participative and effective system of control for developing the salmon farming industry. It also affords regulators the opportunity of assessing potential environmental impacts and considering appropriate mitigation measures.

Fish culture licences are granted subject to specific conditions to promote transparently good standards of practice in relation to husbandry, hygiene, fish welfare, disease prevention and control and environmental impacts. The Department of Agriculture and Rural Development (DARD), which is the responsible authority for granting licences and the Competent Authority in relation to implementing the requirements of the EU fish Health regime, carries out regular checks to ensure that:

- Wild fish and farmed fish sampling protocols are in place to monitor and identify diseases and infections.
- Codes of practice regarding medicines are adhered to.
- Fish disease regulations are implemented.

Northern Ireland has been declared disease free in respect of the parasite *Gyrodactylus Salaris* (GS) under Commission Decision 2004/453/EC and therefore any imports of susceptible species into Northern Ireland must comply with the additional guarantees laid down in the model health certificate set out in the Decision.

DARD has a contingency plan in place to deal with any suspected or confirmed outbreak of GS in Northern Ireland and has powers under the Diseases of Fish Act (NI) 1967 to control the disease. In the event of a disease outbreak the objective will be to contain the disease and, where possible to eradicate it, however it is recognised that eradication may not be possible.

Future Management priorities

- Escape prevention

Bio-security is a priority of the consenting authority. DARD's policy is to reduce opportunity for an escape and thus have an established programme of

supervisory inspections at the sea sites, with each cage being examined by the authority's technical officers with a Remotely Operated Video on a monthly basis to check integrity of nets, selvedges, and the anchoring grid structure.

In addition the farm have in place a contracted diver service and a maintenance schedule which is appropriately logged and checked by the consenting authority.

Nets are appropriately identified, are subject to a maintenance programme which addresses fouling, and protocol requires these to be individually removed annually and properly cleaned before reuse.

To prevent possibility of fish being washed out of cages, all cages containing fish are enclosed with netting above the water surface.

Given the complexities of legal protection given to salmon in the sea, contingency arrangements for escapees are not straight forward; however arrangements exist to recover fish from the marine environment and the adjacent river in the event of a major escape.

The introduction of new legislation (*Foyle and Carlingford Fisheries (Northern Ireland) Order 2007* and the *Foyle and Carlingford Fisheries Bill (ROI) 2007*) provides for the introduction of a new aquaculture regulatory system in the Foyle and Carlingford areas and for the transfer of existing aquaculture licensing powers in the Foyle and Carlingford areas from the two Departments (DARD and DCENR) to the FCILC. The two Departments currently license aquaculture in the Foyle and Carlingford Areas. The new aquaculture regulatory system will be managed by the Loughs Agency. The Agency is currently developing regulations for the licensing of aquaculture in both Loughs and will be in a position to start the licensing process in early 2009 subject to the appropriate assessments.

➤ Disease and parasite prevention

Should there be an increase in lice infestation, DARD will assess if the farm should obtain an authorisation to enable treatment along with appropriate derogation from the Soil Association (as the farm has organic status).

Full consideration shall be given to refresh the GS contingency plan following the conclusions and recommendations of the NASCO GS Working Group in 2007.

DARD shall continue to implement bi-annual inspection and monitoring protocols using powers under the Diseases of Fish Act (NI) 1967 to control disease as necessary.

4.3.2 *Introductions and transfers*

Current approach

Introductions of salmon from outside Northern Ireland are strictly controlled under EU and domestic fish health legislation by the Department of Agriculture and Rural Development (DARD).

Work is underway to develop a stocking policy for Northern Ireland to pull together the strands currently applied to regulate and advise stocking activities. This will aim to reinforce and implement the principles of the Williamsburg resolution and seek to establish a key tenet of future stock re-building programmes (SRP's). The policy will reflect the local situation in each of Northern Ireland's salmon producing rivers and shall reference scientific evaluation of stocking programmes undertaken in recent years underpinned by research in this area at the River Bush Salmon Station and elsewhere, including that on genetic structure of populations. It is planned to involve stakeholders fully in the development of the policy.

Future management priorities

- Introduce new policy on stocking for Northern Ireland by end of 2009.

4.4 ACTIONS TO BE TAKEN IN RELATION TO OTHER INFLUENCES

Current approach

The River Bush Salmon Project is an ICES index river assisting assessment of salmon stocks at international level, through the ICES, and assists NASCO in determining marine survival levels. Whilst direct involvement in the SALSEA project is constrained by scale and thus resource, every effort is made to inform the project with work and expertise at the River Bush Salmon Station. Work to contribute to the genetics baseline of Irish salmon populations will flow into this strand of the SALSEA project.

Future Management Priorities

- The Stage 2 Review of Public Administration announcement on 21 March 2006 confirmed that the functions of the Fisheries Conservancy Board NI (FCB) would transfer to the Department OF Culture Arts and Leisure.

There are two main facets to the task to be completed by end 2008:

- a) Ensure the existing functions are taken into the Department seamlessly
 - b) Bring about an orderly wind down of the FCB.
- Contribute to the SALSEA project by maximising opportunity to annually tag and release smolts from the Rivers Bush, Faughan and Finn.
 - Utilise long term monitoring datasets collected on the River Bush Salmon Station to investigate correlation with climatic factors in the context of climate change prediction scenarios, reporting by 2014.
 - Monitor cormorant predation, particularly on the River Bush smolt runs, and take appropriate action, annually if required, to deter birds in so far as their conservation status allows.

5. EVALUATION

5.1 SUMMARY OF MONITORING AND EVALUATION ACTIVITIES THAT WILL BE USED TO ASSESS STATUS OF STOCKS AND THE EFFICACY OF MANAGEMENT MEASURES.

FCB Area

A Salmon Management Plan has been established to monitor stock status and assess the effectiveness of conservation and management measures in a number of index catchments around the FCB area. The plan is composed of several core conservation databases which including spawning run enumeration via fish counters, GIS based habitat inventories to assess habitat quality and calculate conservation limits, juvenile electric fishing surveys to monitor recruitment success (currently at over 400 sites) and a carcass tagging and logbook scheme to tabulate exploitation.

At present, river specific fish counters are available on five index rivers and have provided information on run strength to monitor compliance against conservation limits. A finalised conservation limit has only been established for the River Bush with provisional limits estimated for another 5 index rivers since 2002. However, it is anticipated that habitat survey work on these three rivers will be fully completed in 2008, (see section 2.1 above) leading to the availability of full conservation limits in all present index catchments. Additionally work is progressing to extend the number of index catchments in the FCB area.

A Carcass tagging and Logbook scheme was introduced in 2001. This programme sought to inhibit illegal catch of salmon and quantify the commercial and recreational landings of salmon in the FCB area, and over 130,000 tags are now distributed annually. No TAC has been established in the FCB area. However, in 2002 a voluntary buyout of salmon netmen in the FCB region reduced the commercial exploitation of stocks by over 75%.

Independent monitoring of EEA funded habitat restoration works will be followed by electrofishing surveys.

Under the auspices of the EU Water Framework Directive, all fish species will be investigated at over 90 sites across N Ireland (through a EHS led 'Fish in Rivers' project). Many of these sites are located in the FCB jurisdiction, and the remainder are within the Loughs Agency area. The sampling strategy will follow agreed best practice methodology, and further sites may be added to the roster.

Loughs Agency Area

As outlined above, a spawning target based management system has been operating in the Foyle fishery area for many years. Associated management targets are operated on the basis that, if, at certain dates during the season, target

numbers of fish have not been achieved at fish counters on Sion Mills Weir (River Mourne), and at two other rivers (River Faughan & River Roe) then specified closures of the angling and/or commercial fisheries take place. Conversely, if the in-season management targets have been met by the normal end of the commercial netting season, an extension is granted. No extensions or closures were initiated in 2005.

A GIS based habitat inventory is being developed, and the Loughs Agency is in the process of using this to establish conservation limits and compliance monitoring for the other rivers that have counter sites within the catchment, including the R. Finn and the Glenelly/Owenkillew rivers.

A microtagging programme on River Finn and River Faughan smolts has been implemented to assess local and interceptory exploitation of this mixed grilse and MSW stock.

Spawning and redd surveys and an extensive electro-fishing programme is in place in the FCILC area at approximately 500 sites which are assessed annually.

A genetic programme is also in place to evaluate population structure and use this in a real time management regime for the exploitation of identifiable stock complexes.

A study on PFA was initiated in 2005 and is due to report at the end of 2008.

As detailed above, fish surveys under the Water Framework Directive are being undertaken within the area at approximately 40 sites. These will be carried out in consultation with the Central Fisheries Board (CFB) and AFBI and will be reported to the EU through EHS and CFB / Environmental Protection Agency.

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