Agenda item 7.2
For information

**COUNCIL**

**CNL(06)31**

**EU-UK(SCOTLAND): REPORT OF IMPLEMENTATION PLAN FOR MEETING OBJECTIVES OF NASCO RESOLUTIONS, AND AGREEMENTS.**

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## 1 Introduction

**1.1** This first report to NASCO on the development of an Implementation Plan for the management of Atlantic salmon and the fisheries dependent on salmon in Scotland is necessarily detailed. The first three sections of this report provide an overview of the current situation with regard to the status of Atlantic salmon, the fisheries that depend on them, and the management structures in place in Scotland in 2006. In section 4, details are given of how management is currently implemented and projections for future development of that management.

### 1.2 *Aim*

***To ensure sustainable fisheries for Atlantic salmon throughout Scotland.***

### 1.3 *The Resource*

Data presented for the NASCO Salmon Rivers Database indicate that there are:

- 363 rivers supporting salmon populations which are designated as not being threatened with loss. Many of the larger rivers support multiple populations.
- 5 rivers where salmon populations have been restored
- 1 river where salmon exist as a result of maintenance programmes
- 11 rivers where salmon are threatened with loss
- 2 rivers where salmon populations have been lost.

A total of 17 rivers have been designated as Special Areas of Conservation (SACs), 11 with salmon listed as a primary interest, under the EU Natura 2000 system. These rivers are:

Tweed
Tay
South Esk
Dee (Aberdeenshire)
Spey
Berriedale and Langwell
Thurso
Naver
Little Gruinard
Grimersta (Langavat)
Bladnoch
Endrick*
Teith*
Moriston*
Oykell*
Borgie*
North Harris*

* - denotes rivers where Atlantic salmon are included as a species of interest, but where the site was not designated primarily for salmon.

Salmon enter the larger rivers throughout the year, with the earliest running multi-sea-winter (MSW) salmon entering freshwater up to 12 months before they will spawn. In many of the smaller west coast rivers, entry may be more restricted to periods when discharge is sufficient to permit entry and ascent. Although a small number of west coast rivers produce early-running MSW salmon, the majority of the fish returning to these rivers are grilse.

Smolt age is generally from one to four years old, with two and three year old smolts predominating. One-year old smolts are relatively more common in the southern rivers, while northern rivers may produce a few smolts as old as five or six years.

### 1.4 *The Fishery*

All salmon fishing rights in Scotland, including in the sea, are private, heritable titles, which may be held separately from any land. Salmon fishing rights in the sea extend out to 12 miles, but in practice the primary and subordinate legislation in place regulating fishing methods restricts fishing in the sea to methods operated from and attached to the coast. It is an offence for any person to fish for or take salmon unless they have the legal right or written permission from a person having such right.

The permitted methods of salmon fishing differ inside and outside estuary limits. Estuary limits have been fixed for most rivers either by byelaws made in 1865, or by Regulation as provided for in section 36 of the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. Where no such estuary limits have been fixed, as may be the case where smaller streams enter the sea, the estuary limits are the natural limits which divide a river (including its estuary) from the sea.

- Inside estuary limits: the permitted methods of fishing for salmon are:

a) - rod and line, and
b) - net and coble (sweep net).

In certain locations, the use of cruives, certificated fixed engines and haaf nets may be used. Cruives are trap fisheries for which certain historical rights remain in existence. There are currently no cruive fisheries in operation, and a right of fishing may be exercised if, and only if, it was in existence before 10 May 1951. It is not anticipated that any cruive fisheries will be brought into operation, and no new cruive rights will be granted.

Certificated fixed engines exist only in the Solway in south west Scotland, and the term means a fixed trap net certificated as privileged under section 5 of the Solway Salmon Fisheries Commissioners Act 1877.

The use of haaf nets is also restricted to fisheries in the Solway, and a right of fishing by this method may be used if, and only if, it was in existence before 10 May 1951.

- Outside estuary limits: the permitted methods of fishing for salmon are:

a) - rod and line,
b) - net and coble, and
c) - bag net, fly net or other stake net (known as fixed engines).

A drift net fishery for salmon started in the early 1960s, but was prohibited in 1962, and the ban remains in force. Subsequent legislative measures were introduced to prohibit other methods of salmon fishing, including trolling, trawling, long lines etc, so that the permitted methods specified above remain the only lawful ways of fishing for and taking salmon.

Rod and line means single rod and line (used otherwise than as a set line or by way of pointing, or by striking or dragging for fish) with such bait or lure as is not prohibited by regulation made under the relevant sections of the 2003 Act. It is prohibited to use fish roe, fire or light as bait or lure. Baits and Lures Regulations prohibiting variously the use of worms, shrimps, prawns and other baits, and the use of lures bearing multiple sets of hooks and barbed hooks have been made for a number of salmon fishery districts. No person may sell in Scotland any salmon that has been caught by rod and line.

Netting is regulated by the Salmon (Definition of Methods of Net Fishing and Construction of Nets) (Scotland) Regulations 1992, as amended in 1993 and 1994. These Regulations describe how net and coble and fixed engines may be operated. In the case of fixed engines, no part of any net except mooring warps and anchors shall extend seawards beyond 1300m from the mean low water mark. The Regulations also specify that no leader of any fixed engine may be longer than 300m, and that the hanging ratio shall be at least 66%.

For all nets, no part of any net shall be designed or constructed for the purpose of catching fish by enmeshing them, and no monofilament netting shall be used in the construction of any net used in fishing for or taking salmon. No net may have a mesh size of less than 90mm knot-to-knot (stretched mesh), and the minimum permitted twine thickness is 0.9mm.

Both net and rod fisheries are subject to weekly and annual close times.

The weekly close time applies throughout Scotland and extends from 6pm on Friday until 6am on the following Monday. No fishing for salmon is permitted on a Sunday. Fishing by rod and line is permitted during the weekly close time except on Sunday.

The annual close time for fishing for salmon in Scotland (except in the Tweed district) is a continuous period of not less than 168 days and applies to all methods of fishing, except to the extent that provision is made for periods during the annual close time during which it is permitted to fish for and take salmon by rod and line. In practice, most annual close times extend from about the beginning of September until early or mid-February in the following year. Rod fishing is permitted in some salmon fishery districts until the end of October, and starts in some districts in mid-January.

In the case of the Tweed, the annual close time is a continuous period of not less than 153 days from mid September until mid-February in the following year. The periods during the

annual close time when fishing by rod and line is permitted extend until 30 November, and from 1 February.

Fisheries legislation is enforced by the police and by water bailiffs employed by district salmon fishery boards or appointed by the Scottish Ministers. In the case of unlawful fishing at sea in Scottish waters, in addition to the police and water bailiffs, the Sea Fisheries Protection Agency enforces measures relating to fishing for or landing salmon made under sea fisheries legislation.

Proprietors and occupiers of salmon fisheries have been required to report their catches since 1952, and these figures are published annually in Statistical Bulletins published by the Scottish Executive. Annual catches have declined from over 600,000 salmon and grilse in the late 1960s to less than 95,000 in recent years (Annex A). Net catches have dropped significantly since records began in 1952. There has been a reduction in netting effort, both in the net and coble and the fixed engine fisheries, of around 90% since the early 1950s. This reduction has been achieved by a combination of buy-outs, voluntary closures and reductions in the numbers of gear units used at fisheries remaining in operation. Rod and line catches have remained more stable, except for the decline in catches of early-running MSW salmon. Catch and release has increased steadily since records were first made in 1994, and currently some 50% of the total number of salmon and grilse caught by rod and line are released after capture.

**Comment [T1]:** Deleted is

The report "The Economic Impact of Game and Coarse Angling in Scotland", produced for the Scottish Executive by Glasgow Caledonian University and Cogentsi Research International Ltd and published in March 2004, estimated that the average annual number of angler days associated with fishing for salmon and sea trout in Scotland was 545,048. Anglers visiting Scotland accounted for 47% of the total number of angler days. Total angler expenditure in salmon and sea trout fishing amounted to £73.5M, which translates into 2,200 full-time job equivalents, most of which are located in rural, and often remote, areas. Salmon angling is, thus, of great importance to the Scottish economy.

### 1.5 *Management*

The primary legislation regulating salmon fishing and management in Scotland is the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003, which came into force on 1 April 2005. This Act repealed and replaced provisions in Scottish legislation dating back to the Theft Act 1607.

Mainland Scotland and its islands are divided into 57 salmon fishery districts (Annex B). Each salmon fishery district is the area within coastal limits set by byelaws in 1865 or as a result of designation orders made subsequently which have amalgamated former districts and abolished them. There were originally more than 100 salmon fishery districts. Each district extends seaward for 5km from mean low water springs, and landward to include the catchment area of each river which flows directly or indirectly into the sea within the coastal limits of the salmon fishery district. In each district, a line across each river is specified to divide the owners of salmon fishing rights into "Upper" and "Lower" proprietors, which correspond generally to angling and netting fisheries respectively. Most of the larger east coast salmon fishery districts are centred on a major river, such as the Tay, Dee, and Spey, although smaller rivers are also included between the coastal limits. Since the mid-1980s,

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there has been a number of amalgamations of districts, particularly in western Scotland and the Outer Hebrides, where there were historically districts including only very small, single river catchments. Nevertheless, the structure effectively allows for river-by-river management.

Where proprietors of salmon fishery districts form an association for the purposes of the protection or improvement of the fisheries in their district and elect, in accordance with the provisions of the 2003 Act, a committee to act for them, that committee becomes a District Salmon Fishery Board (DSFB). The DSFB may do such acts, execute such works and incur such expenses as may appear to them expedient for the protection or improvement of the fisheries within their district, the increase of salmon, or the stocking of the waters of the district with salmon. A DSFB must appoint a person to act as Clerk to the Board, and may appoint water bailiffs to enforce the legislation and undertake management work as required. Training courses for water bailiffs have been developed by the Association of Salmon Fishery Boards and the Institute of Fisheries Management.

A DSFB comprises representatives of upper proprietors elected from among themselves, representatives of lower proprietors elected from among themselves, co-opted representatives of tenant netsmen operating in the district and co-opted representatives of anglers. The total number of co-optees must be less than the number of proprietors. If there are no tenant netsmen or anglers in a district, a board may comprise representatives of proprietors only. The minimum number of elected representatives of proprietors is three. As soon as possible after the elections and co-options, the members of the DSFB must elect a convener from among the representatives of proprietors. Formation of a DSFB must be undertaken at three yearly intervals.

Each DSFB must produce an annual report and a statement of accounts, which must be audited, and present it at an annual meeting of proprietors, tenant netsmen and anglers. The funding required by a DSFB to finance its work is derived principally from a fishery assessment imposed on the proprietor of each salmon fishery in the district. This levy is assessed at a uniform rate throughout the district, and each fishery is charged according to its rateable value. A DSFB may also borrow an amount not exceeding twice the amount of the total fishery assessment for the district collected in the twelve months immediately prior to the date of the decision to borrow. However, a DSFB may borrow a higher sum if this action is approved by the proprietors whose fisheries have a combined value of 80% of the total rateable value of the fisheries in the district.

Thus, river-by-river management is undertaken by DSFBs, financed locally by the owners of salmon fishing rights, working within a legal framework specified in statute law.

Sound management is dependent upon high quality information. Fisheries Research Services (FRS) provides a national salmon and freshwater fisheries research resource, providing advice to the Scottish Ministers, the Scottish Executive (SE), DSFBs, and owners and occupiers of fisheries. In addition, under the Rivers and Fisheries Trusts of Scotland (RAFTS), there is network of fisheries trusts employing biologists throughout Scotland (Annex C). These biologists are able to provide detailed monitoring, surveillance, and advice on fishery and habitat management to DSFBs and fishery owners. All RAFTS biologists work in accordance with standard protocols developed by the Scottish Fisheries Coordination Centre (SFCC), an organisation comprising representatives of fisheries trusts, DSFBs, FRS, SE, and others involved in fisheries data collection and use. SFCC has developed training

**Comment [T3]:** First time "FRS" used

courses for biologists, water bailiffs and others engaged in electro-fishing and habitat surveys.

## 2 Status of Stocks

### 2.1 *Abundance*

Data available from investigations undertaken by FRS, DSFBs, and Fisheries Trusts and Foundations suggest that for the majority of the salmon rivers in Scotland (363 of the 382 identified salmon rivers), juvenile salmon production remains healthy. However, comparing the number of adult salmon returning to home waters with estimates of smolt production from two monitored sites, the North Esk and the Girnock Burn (a tributary of the River Dee in Aberdeenshire), suggests that the marine survival of salmon has declined substantially over the period since 1952, when salmon catch statistics were first collected.

This decrease in marine survival has led to lower numbers of salmon returning to the Scottish coast. Although this has undoubtedly had an impact on salmon catches in the net fisheries, particularly those located on the coast, the substantial reductions in netting effort, both in fixed engine and net and coble fisheries (around 90%), have allowed a greater proportion of returning salmon to enter rivers. As a result, there has been a relatively stable number of fish available both for the rod fisheries and, assuming stable rod exploitation over time, as spawning escapement.

However, the long term decline in the total rod catch of early-running MSW salmon suggests that the populations associated with this stock component may be particularly vulnerable.

### 2.2 *Diversity*

Scottish fisheries exploit a wide range of salmon types that can be categorised according to the time of year at which they enter rivers. The range extends from early-running (or spring) MSW salmon at the beginning of the year to late running grilse which become available for exploitation just prior to the start of the spawning season near the end of the year. Based on this run-timing diversity, sustainable fisheries operate in Scotland for 11 months of the year.

Investigations by FRS continue to provide information how this diversity is maintained. To briefly summarise the current understanding of the emerging population paradigm:-

a) most river stocks in the larger rivers consist of a number of somewhat discrete populations
b) run-timing is heritable and varies among populations
c) there is a link between run-timing and spatial location at spawning
d) populations maintain their discreteness through precise homing
e) the abundance and dynamics of populations can vary independently
f) these differences pervade all aspects of salmon biology and management
g) on a national scale, functional independence among populations generates some of the most important issues for management.

### 2.3 *Threatened or Endangered Stocks*

Of the 382 identified salmon rivers, 11 are considered to be threatened with loss of salmon. Threats include the results of changes in land use, habitat issues and pollution. In some cases, impacts of aquaculture may have exacerbated the situation. Fishing mortality is not thought to have been the root cause of the problem in any of the rivers under threat.

## 3 Threats to Stocks, and Current Management Measures

### 3.1 *Fisheries*

As a result of enforcement of the fisheries legislation by water bailiffs, police and the Scottish Fisheries Protection Agency, catches taken in illegal fisheries are regarded as likely to be low and unlikely to pose any significant threat to stocks.

Nevertheless, there is a concern about the status of populations associated with the early-running MSW salmon stock components in Scottish rivers. Measures such as the voluntary deferment of net fishing until 1 April by members of the Salmon Net Fishing Association of Scotland, and the widespread voluntary practice of catch and release in the rod fishery have served to reduce levels of exploitation in the early months of the year. Salmon Conservation Regulations in the Annan and Esk Salmon Fishery Districts introduced in 2005 have required all anglers to return fish caught by rod and line between the start of the fishing season (February) and 1 June. The Regulations in the Esk district also capped netting effort during the month of May to the average level recorded in the past 10 years. A change to the annual close time in the Esk district prevents fishing by net until 1 May.

### 3.2 *River and estuarine habitats*

River and estuarine conditions in Scotland are mostly good, and improving. For example, principally as a result of improved water quality, largely due to the decline in industries such as ship building and steel production, salmon are returning in increasing numbers to the River Clyde and its tributaries. There are some areas of the country where the freshwater habitat has been compromised, although in almost every case the situation is improving.

*Obstructions*

Rivers have long been used to provide power to drive mills. In many instances, dams or weirs were constructed, and lades excavated to divert water from the dams to the mills. The earliest of these mills were probably built to produce flour and oatmeal. Such mills were common throughout southern, central and eastern Scotland. During the Industrial Revolution, textile mills and sawmills were built, particularly in the Borders and in the Central Belt. Schedule G to the Salmon Fisheries (Scotland) Act 1868 required each mill dam constructed to be provided with a fish pass, and each lade to be provided with a sluice to control the amount of water abstracted and screens to prevent smolts and adult salmon entering.

**Comment [T4]:** A inserted

The development of hydro-electricity in Scotland really started in the 1930s on the River Dee in Kirkcudbrightshire in south west Scotland. During the 1940s and 1950s, there were

further developments in the Highlands, notably in the Tay, Lochy, Beauly, Conon and Shin systems. In each case, the provision of a fish pass and screening arrangements were statutory requirements. The Fisheries Committee, established under the Hydro-Electric Development (Scotland) Act 1943, provides advice to the power companies and to the Scottish Ministers on the impacts on fish of power stations driven wholly or principally by water. Any proposed hydro-electric scheme with an installed capacity of more than 1MW must be examined by this Committee.

All other dams, including mill dams and hydro-schemes of less than 1MW are subject to the provisions of the Salmon (Fish Passes and Screens) (Scotland) Regulations 1994.

Dams may not only cause physical obstruction to salmon movements. Flow regimes may be altered by the storage of water, and each hydro-electricity development has also required the establishment of compensation flow arrangements. In addition, the flooding of spawning and juvenile nursery areas has reduced the productive capacity of some rivers. In some cases, compensation agreements have been reached, in others this may involve the establishment of hatcheries.

Not all impoundments are associated with the generation of power. A number of lochs in Scotland have been dammed to form reservoirs for potable water supplies. Fish passes have been required in these cases. As with hydro-schemes, there have been concerns about alterations in flow regimes in affected rivers. However, because of the small size of its population, the pressure on Scotland`s river systems as sources of potable water are relatively low. So far as major salmon rivers are concerned, the highest levels of abstraction for human consumption are from the upper Tweed and the lower Spey, Dee (Aberdeenshire) and Tay. The effects of this abstraction are closely monitored by both SEPA and the FRS Freshwater Laboratory.

*Water Quality*

Water quality remains high throughout most of Scotland; 36,500 km of rivers (72% of total length) have been designated under the Fresh Water for Fish Directive (78/659/EEC), of which over 98% comply with mandatory water quality standards.

The EU Water Framework Directive, implemented in Scottish legislation by the Water Environment and Water Services Act 2003, provides an opportunity to take a step forward in the way that environmental problems affecting Scotland's rivers, lochs (lakes) and coastal waters are tackled. It sets the framework for an holistic approach to planning the protection and improvement of water resources based on natural river basins. This Directive updated and replaced some of the older Community water legislation, including the Fresh Water for Fish Directive, and will provide a framework for the operation of others, such as the Nitrates and Urban Waste Water Treatment Directives. Management plans must be drawn up with co-ordinated programmes of measures designed to ensure good status of both surface and ground waters within a specified timetable. Stakeholders must be involved in the whole process, with comprehensive consultation.

The most seriously polluted Scottish river systems tend to be in the Forth/Clyde valley where most of the human population and industrial development is concentrated. Widespread improvements in effluent treatment and changes in the structure of Scottish industry have

combined to increase water quality in the Forth/Clyde valley. Reduced oxygen levels at head of tide, which threatened smolt and adult survival in the Forth system and effectively excluded salmon from the Clyde and Kelvin, are no longer the problem they were. As a result, the salmon population of the Forth is now more robust than it was in 1980, and the Clyde and Kelvin now have increasing salmon populations of their own.

The Don (NE Scotland), which suffered severely from industrial pollution at head of tide until some 20 years ago, is no longer affected in this way and is again an important salmon river. The Ythan system, also in NE Scotland, is currently suffering from enhanced nitrate levels from agricultural sources. However the river still supports a salmon population and nitrate inputs are being controlled as a requirement of the EEC Nitrate Directive.

Pollution in Scottish rivers is being reduced. Between 1980 and 1995, SEPA noted a 41% reduction in river length classified as polluted or seriously polluted and a 47% reduction in estuaries.

Surface water acidification from airborne sources is a problem in areas of Scotland where the receiving geology has low buffering capacity. Many such areas are also favoured for the planting of conifer forests. Mature conifers are effective collectors of airborne acidifying pollutants and therefore have the potential to increase surface water acidification in sensitive catchments. Salmonids are particularly affected by increasing acidity (declining pH) and associated increases in the levels of toxic forms of aluminium.

Monitoring of surface water acidity by the FRS Freshwater Laboratory has shown a fourfold reduction in non-marine sulphate deposition in SW Scotland (one of the principal areas affected by surface water acidification) with accompanying improvements both in surface water acidity and salmonid survival.

No major salmon river in Scotland is seriously compromised by surface water acidity but parts of the upper Spey and Dee (Aberdeenshire) and Forth systems are affected as are a number of minor rivers in Arran and SW Scotland, including the Cree and Fleet.

*Land use*

The productive capacity of rivers supporting salmonid and other freshwater fish may be affected by such activities as agriculture, forestry, and estate management. The types of problem that may be experienced include diffuse pollution, erosion and siltation. Nevertheless, remarkable progress has been made in recent years, particularly as a result of introducing practices such as the use of buffer strips beside water courses; set-aside land (land taken out of agricultural use); planting of native, broad-leaved trees beside water courses; and fencing stream banks to limit access by livestock. In some upland areas, damage to fragile land in river valleys and to riverbanks may still occur as a result of the numbers of sheep and deer present.

*Transport*

There is a clear need for good road and rail systems throughout any country. However, even a cursory glance at a map of Scotland shows that nobody can ever be far from a river, stream,

loch or pond. Scotland has over 50,000km of rivers and more than 30,000 lochs and ponds. Roads and railways must cross these watercourses. Problems associated with roads and railways include pollution as a result of run-off from hard surfaces and the possible obstruction of fish passage at badly designed culverts and bridge aprons. This has been addressed in Scotland by the publication by the Scottish Executive Development Department in 2000 of 'River Crossings and Migratory Fish: Design Guidance'. This guidance was produced to emphasise to engineers the need to take the requirements of fish into account when designing bridges and culverts, and to describe methods to facilitate fish passage at river crossings.

A number of other codes have been produced by local fishery management organisations for their particular areas – notably in the Tweed and Spey catchments.

### 3.3 *Impacts of aquaculture*

In many areas of Scotland, the only index of stock abundance available is that provided by catch statistics. In many rivers in the areas of Scotland where fish farming is practised, it is clear that catches, and stocks, of both salmon and sea trout have declined in the past couple of decades. The decline started before the salmon farming industry developed, and in some areas well before it began. Nevertheless, it is likely that impacts of aquaculture, and most probably the effects of sea lice infestation and escapes of farmed fish, have acted to exacerbate the situation, and may have slowed recovery of stocks in some rivers.

Fish farming in Scotland generates approximately £500M annually, much of it directed to remote and rural areas. The industry is, therefore, extremely important to the Scottish economy.

Aquaculture also includes enhancement activities. It is an offence for a person to introduce salmon or salmon eggs into waters in a salmon fishery district for which there is a DSFB without the prior permission of the DSFB, unless the waters are a fish farm, in which case separate legislation applies. FRS have produced a guidance document, "Salmon and Sea Trout – To Stock or Not?", to assist fishery owners and managers decide in what circumstances stocking may be appropriate, what methods are available, and what alternatives to stocking may be considered.

### 3.4 *Other Influences*

In a number of salmon fishery districts, predation by birds and mammals (particularly seals) has been identified as a cause for concern. Where a case can be made that serious damage to fisheries is occurring, or evidence indicates that it will occur if no action is taken, licences to shoot birds or seals may be issued. In the case of piscivorous birds, licences are issued to shoot as an aid to scaring to provide point defence to salmon at particularly vulnerable times in their life cycle, and at places where they are particularly vulnerable. Licences to shoot seals are issued to allow for the removal of seals that are causing damage. No licence is issued to permit culling of predators for the purpose of population control.

When an application for a licence is received, the Scottish Executive consults FRS and Scottish Natural Heritage (SNH) on the merits of the case. Where an application is for a

**Comment [T5]:** First time "SNH" used

licence to shoot seals, the Sea Mammals Research Unit is also consulted, and where an application for a licence to shoot birds is received, the Scottish Agricultural Science Agency is consulted.

Invasive non-native species may also impact on fish and fisheries. Mink that escaped from fur farms during the 1960s, before the industry closed, are known to predate on juvenile and spawning adult salmon and kelts in some areas. An increasing problem is the spread of North American Signal Crayfish in Scottish rivers. These crayfish have been introduced unlawfully to a number of Scottish rivers and, in addition to predating on juvenile salmon and competing with them for food and space, cause significant damage to river banks and river beds.

## 4 Management Approach

**The Implementation Plan involves principally a continuation of the many programmes already in place, with extensions as local initiatives come on line. The following provides information on how and where such programmes are in operation and developing.**

### 4.1 *Management of Fisheries*

Many salmon producing countries have adopted a river-by-river management structure whereby a forecast pre-fishery abundance is judged against a Conservation Limit (CL) to determine whether there is an exploitable surplus and thus whether fisheries can operate. In a Scottish context, the relative abundance of populations is more clearly linked between the analogous parts (populations) of different rivers than among different populations within the same river catchment. A river by river approach is therefore inappropriate and rational management in Scotland must take into account sub-catchment population structuring in order to conserve and promote the diversity of seasonal salmon runs on which so much of the value of the fishery depends.

At present, fishery management in Scotland is based on catch information. This dataset is particularly valuable in:

a) achieving near-total coverage of all Scottish fisheries [1952-present],
b) being spatially explicit down to ca. 10km scales and
c) being categorised by month.

The data have been intensively examined and reasoned argument leads to the conclusion that catch data can be used to estimate overall abundance with useful accuracy. It has also been determined that rod catch trends, treated by month, are adequate indicators for in-river abundance, and resolve at spatial scales that approximate to populations.

Examination of trends in the monthly components (ie different run-timing groups equating to different populations) of different rivers reveals similar changes on a Scotland-wide basis and, at present, the early months show steeply declining trends. It has been concluded that fishery management action is required to protect early-running populations of salmon and ensure maximal spawning escapement, and this has been enacted on a generally voluntary basis in both net and rod fisheries. Net fishery exploitation in the early part of the year is now very low and catch-and-release is widely advocated and practised, especially for the early fishery components of most of the rod fisheries.

Populations are the productive units which drive the fisheries. Mixed stock fisheries can be variously defined and, arguably, almost all of the Scottish rod fisheries can be classed as mixed stock (ie. mixed population). It has not yet been possible to assess the impact of mixed stock fisheries on all impacted stocks. However, it is clear that as the early-running populations of salmon have experienced the greatest decrease in abundance, it will be these same populations that will be at most risk from mixed stock fisheries. As described above, a major, voluntary decrease in exploitation on these populations has been achieved by management. As a consequence, the rod fisheries remain viable and sustainable judged against historical standards. Indeed, rod catches in some monthly sectors of the rod fishery are greater now than before and, because of increased in-river abundance coupled with catch and release, spawning escapement is estimated to be correspondingly greater than previously for these sectors.

**Comment [T6]:** Insert all

These arrangements are based on an understanding of trends in catches and trends in pre-fishery abundance. A problem common to all fishery management structures is the lack of accurate forecasts of future abundance on an annual basis. However, in slow-growing, age structured populations, such as those that are prevalent in Scotland, where the majority of the resource emigrates from freshwater at ages of 2+ and 3+, retrospective estimation of abundance provides adequate time for compensatory management measures (eg. reduced exploitation) directed at subsequent fisheries in following years.

Current research and the development of management protocols is currently targeted on

a) refining catch data analysis,
b) assessing the place of CL-based approaches in the complex Scottish context and
c) constructing assessment methods based on juvenile performance that can be applied strategically at the appropriate local scales, while also adding value to data gathering by electrofishing, which is widespread through the Scottish rivers.

Expanding on these areas in turn,

a) FRS has embarked upon a collaborative exercise with regional biologists which will combine catch information collected by FRS with local insights on exploitation and unreported catch levels. This will be used to derive retrospective trends at the regional level, in pre fishery abundance, returns to homewaters and spawning numbers. In particular, it is hoped to separate abundance indices for 1SW and MSW in the period when both classes are represented in the fishery; currently this is not possible. The resulting abundance indicators will be used to inform management processes.

b) With regard to assessing the use of CLs as a management tool, a map based model has been derived for the transfer of CLs among catchments on the basis of a useable wetted area. Future development will concentrate on assessing the appropriateness of derived CLs in the Scottish context, at both whole river catchment and sub catchment scales.

c) With respect to juvenile performance, recent research analysis of data derived from a single monitored site has formalised changes in growth, age-at-smolting and age structure among the residual juvenile salmon population in relation to adequacy of spawner escapement. Because of non-stationarity in the stock-recruitment

**Comment [T7]:** ???

relationship, marginally inadequate spawning is not associated with reductions in juvenile abundance which are large enough to be detected using standard electrofishing protocols. However, marginal inadequacy can be detected by analysis of individual growth performance. Work is in progress, to extend this work to a wide range of sites, with a view to developing protocols for general use in a range of habitat/ environments, using a process-based understanding to isolate density-dependent aspects of juvenile growth and performance from those driven other factors, such as temperature.

If this work is successful, future fishery management plans in Scotland will be informed by assessments based on analysis (trends and annual values) of adult catch data coupled with juvenile performance data – both at the population or near-population scale.

Scottish DSFBs and Fisheries Trusts have been developing and working to fisheries management plans over some years. These plans take a variety of forms and vary in detail from relatively modest 3-5 years plans, through the scale to full scale catchment management plans.

Much of the management remains in the hands of the fishery owners. In the case of the net fishery, effort is regulated by the number of locations within any fishery where a net may be set, by the labour resources available for operating the fishery, and by the fishery owners' perceptions of the availability of fish. In many cases around Scotland, net fisheries have closed as a result of private buy-out initiatives.

In the case of the rod fishery, effort is regulated by the numbers of permits issued by the owners of the fishery, and the times when fishing is permitted. Many fishery owners apply conditions to their permits such that anglers may only use certain methods. In 19 salmon fishery districts, Regulations prohibiting certain baits and lures have been made by Statutory Instrument, and failure to comply with these regulations is an offence.

Where the Scottish Ministers deem it necessary or expedient for the conservation of salmon, Salmon Conservation Regulations may be made, such as those made in respect of the Annan and Esk Salmon Fishery Districts.

Since July 2004, the Scottish Executive has engaged with the principle stakeholders involved in salmon and freshwater fisheries in Scotland in the Scottish freshwater Fisheries Forum and its Steering Group. This organisation has been involved in the development of policy for a forthcoming Bill to address issues relating to, amongst other things, angling methods, movements of fish, *Gyrodactylus salaris*, and with respect to aquaculture, the treatment of diseases and parasites and containment of farmed fish. The Forum and Steering Group will continue to meet to develop proposals for future management structures for salmon and freshwater fisheries.

### 4.2 *Protection and Restoration of Salmon Habitat*

It is important to make a distinction between a fishery management plan (FMP), which is likely to be produced by a DSFB/Trust and focus on fish and fisheries issues, and a catchment management plan (CMP), which will involve a wider range of stakeholders and agencies and will deal with the full complexity of catchment management planning issues.

Whilst fisheries management planning is in a relatively early stage of development, the Scottish Fisheries Co-ordination Centre (SFCC) is in the process of developing a standard protocol for the development of FMPs and this work is ongoing (Annex D). We therefore would expect to see over coming years both a much more comprehensive network of FMPs on all major systems in Scotland as well these plans taking shape within a formal and agreed structure.

The following catchments are operating to Fisheries/Catchment management plans:

| | |
|---|---|
| Tweed | |
| Tay | |
| South Esk (in prep) | |
| Dee | |
| Deveron | |
| Spey | |
| Conon | |
| Kyle of Sutherland | |
| West Sutherland – | Hope |
| | Polla |
| | Rhiconich |
| | Inver |
| | Laxford |
| | Badna Bay |
| | Bhadain Daraich |
| | Duart |
| | Culag |
| | Kirkaig |
| | Garvie |
| | Keodale Limestone Lochs |
| Wester Ross - | Kanaird |
| | Dundonnell |
| | Balgy |
| | Ling |
| | Gruinard |
| | Ewe |
| | Broom |
| | Carron |
| | Ullapool |
| Western Isles | Hamnavay |
| | Creed |
| | 22 low level management plans |
| Argyll | Upper Loch Fyne Rivers Strategic Plan (Aray/Fyne/Kinglass) |
| | Loch Awe Strategic Fishery Management Plan |
| | Rivers Awe and Orchy Management Plan |
| Solway | Bladnoch SAC Management Plan |
| | Cree LIFE Rivers project Management Plan |

Throughout Scotland, DSFBs and fishery owners, on the basis of advice received from Fisheries Trusts and Foundations, retained biologists and the Scottish Environment Protection

**Comment [T8]:** first time "SEPA" used

Agency (SEPA), SNH and FRS, have undertaken widespread habitat surveys to establish the status of spawning, nursery and adult holding significant projects to maintain, restore or enhance in-river and bankside habitat for salmon and other fish species. Such activities include:

- Reduction in grazing pressure
- Reduction in bank erosion by livestock
- Coppicing to reduce shading
- River bank protection
- River bed stabilisation
- Land drainage/siltation reduction programmes
- Re-alignment of river to original course
- Provision of holding pools for adults salmon
- Improvement of juvenile salmon habitat
- Installation of fish passage facilities
- Removal of dams/man-made obstructions/log jams
- Creation of riverbank buffer strips
- Restoration of natural riparian woodlands
- Removal of non-native, invasive species
- Provision of footpaths to reduce bankside erosion

Table 1 provides some examples of where these activities have been put into effect. A number of fishery management bodies in other areas have proposals being developed to implement similar activities.

Funding sources have included EU-LIFE funding, Heritage Lottery Fund, Charitable Trusts, public funding through e.g. SNH, and significant amounts provided by the fishery owners themselves.

In addition to the work being done on the ground, a number of initiatives to increase awareness of the need for habitat protection and restoration have been established. Programmes such as "Salmon in the Classroom", and its many local derivatives, have been introduced in schools throughout Scotland by the Fishery Trusts, Foundations and DSFBs.

In many areas, DSFBs liaise closely with and provide advice to construction companies and road building contractors on the potential impacts of these activities on rivers and the fish they support.

A number of DSFBs throughout Scotland augment natural salmon production by the use of hatcheries, using local wild salmon as broodstock.

### 4.3 *Management of Aquaculture, Introductions and Transfers*

The Tripartite Working Group (TWG), comprising representatives of wild salmon fishery interests, the fish farming industry and the Scottish Executive has developed a system of Area Management Agreements (AMA) implemented by Area Management Groups (AMG) to address issues such as sea lice monitoring, management and control, containment of farmed fish, and minimisation of disease risks. The TWG has targeted 20 areas for the formation of

AMAs. A total of 18 AMGs have been established and, to date, 14 AMAs have been signed. In areas where these Agreements have been implemented, there are clear signs of improvement in local wild salmon stocks.

In March 2006, the Scottish Salmon Producers Organisation launched their Code of Good Practice. This Code, which has been developed in consultation with both farming and wild salmon interests, provides detailed advice on all aspects of fish farming operations, including treatment of sea lice and containment. All members of the Scottish Salmon Producers Organisation, accounting for 90% of the industry by production, are bound to implement the Code.

The forthcoming Aquaculture and Fisheries Bill, to be introduced to the Scottish Parliament in the summer of 2006, contains a number of proposals for the statutory regulation of the fish farming industry. The provisions will address issues such as containment, parasite control (specifically sea lice), data collection, and movements of fish between farms. The provisions in the Bill will provide legislative underpinning to the industry's Code of Good practice.

### 4.4 *Actions to be taken in relation to other influences*

A Working Group to address issues related to the possible introduction of *Gyrodactylus salaris* (Gs) to Scotland was established during the summer of 2005, and its report will be presented to the Scottish Ministers in the summer of 2006. The issues addressed included measures that may be taken to prevent the introduction of the parasite, diagnostic techniques, gene banking considerations, and development of a Contingency Plan to be implemented on suspicion of an outbreak. The Scottish executive has also commissioned an environmental impact study to assess the implications should Gs be introduced to Scotland.

The Working Group included representatives of not only wild and fish farming interests but also other interested parties, including the potable water supply industry, the main hydro-electricity producers, the Scotch Whisky industry, other water sports organisations as well as SportScotland, VisitScotland, Local Authorities, SNH, SEPA and the Scottish Executive.

**Comment [T9]:** "SEPA…."already used

The Moray Firth Seal Management Plan is a pilot scheme for improving the management of interactions between seals and salmon fisheries within a regulatory framework in one local area. It involves a more co-ordinated approach to seal management within a conservation context, in close association with research and data collection on seal/salmon interactions. It is increasingly important to balance the conservation of both seals and salmon, whilst seeking to limit damage to salmon fisheries, where seals are known to eat salmon. The existence of adjacent SACs for both seals and salmon means that this requires focussed management supported by research and data collection in a well-regulated context.

## 5 Evaluation

The work programmes established by Fisheries Trusts and Foundations, and the DSFBs include monitoring and evaluation systems to assess the efficacy of the activities undertaken. Data collected by Trusts and Boards are collated and quality assured by the SFCC and FRS. These data relate to specific sampling sites that are being used to build up time series of data on fish abundance, distribution and diversity, and habitat status.

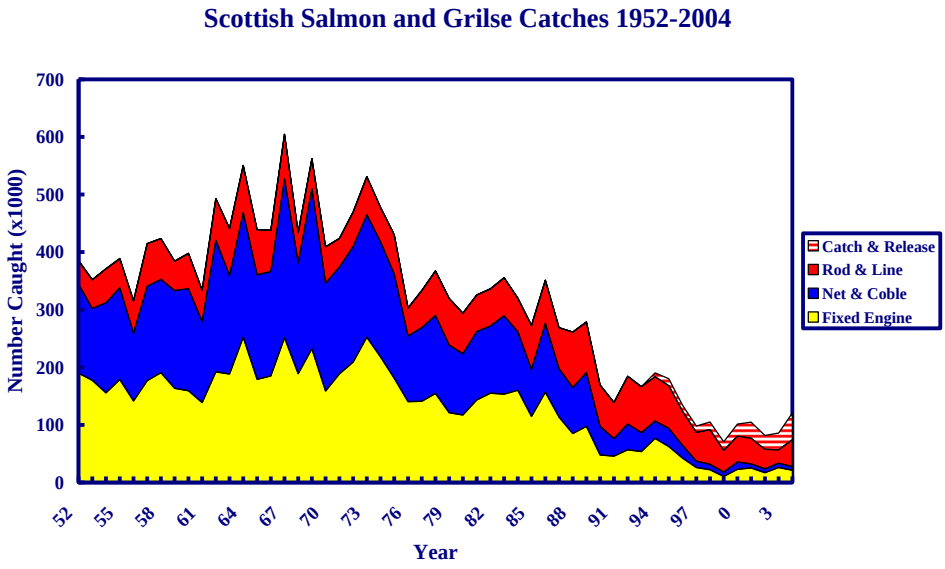
**Comment [T10]:** "SFCC….." already used

Salmon and sea trout catch statistics have been collected annually from all identifiable fisheries since 1952. As noted above, FRS are developing models to use these data, in conjunction with data on juvenile abundance and growth, to provide more detailed fishery management plans.

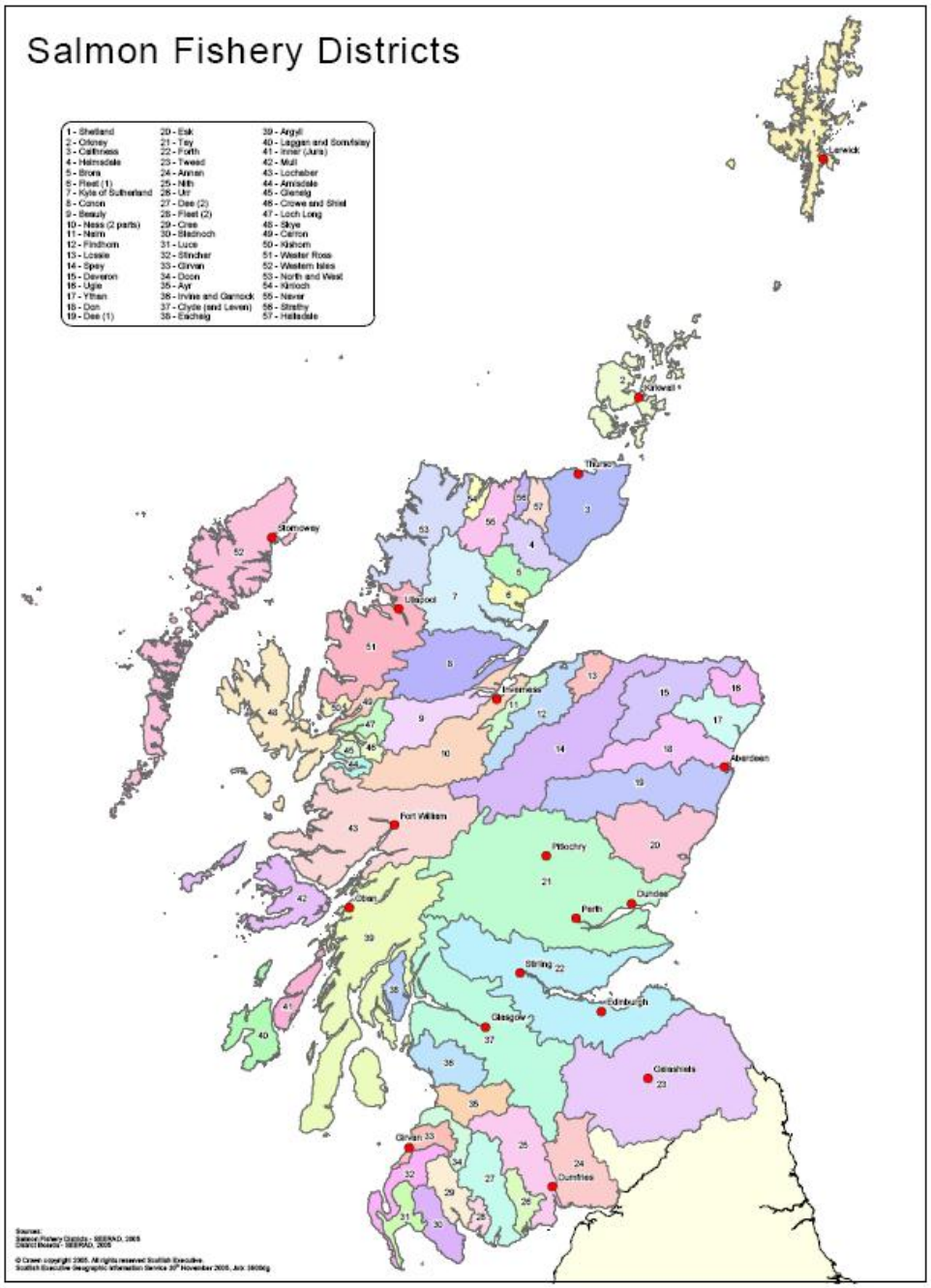
**Table 1 Examples of habitat management activities in Scotland.**

| Activity | River Catchment |
|---|---|
| Reducing grazing pressure | Findhorn, Tweed, Dee (Aberdeenshire), Nith, Kanaird, Dundonnell, Little Gruinard, Beauly, Conon, Esk |
| Reducing bank erosion by livestock | Findhorn, Tweed, Dee (Aberdeenshire), Deveron, Nith, Kanaird, Dundonnell, Little Gruinard, Beauly, Conon |
| Coppicing | Deveron, Dee (Aberdeenshire), Tweed |
| River bank protection | Halladale, Deveron, Tweed, Nith, Kanaird, Dundonnell, Little Gruinard, Beauly, Conon, Esk |
| River bed stabilisation (reducing braiding) | Halladale, Tweed, Esk |
| Land drainage/siltation reduction programmes | Conon |
| Re-alignment of river to original course | Findhorn |
| Provision of holding pools for adult salmon | Halladale, Tweed, Esk |
| Improving in-stream juvenile salmon habitat | Halladale, Dee (Aberdeenshire), Findhorn, Tweed, Conon, Esk |
| Installation of fish passage facilities | Deveron, Tweed |
| Removal of dams/man-made obstructions/log jams etc | Deveron, Tweed, Nith, Beauly |
| River bank buffer strips | Deveron, Dee (Aberdeenshire), Nith, Kanaird, Little Gruinard, Dundonnell, Ewe, Conon |
| Removal of alien vegetation | Halladale, Tweed, Carron |
| Removal of alien animals | Tweed, Clyde, Esk, Tay |
| Restoration of natural riparian woodlands | Tweed, Dee (Aberdeenshire), Findhorn, Nith, Kanaird, Ewe, Beauly, Conon, Lochaber, Esk |
| Provision of footpaths to reduce bank erosion | Tweed, Dee (Aberdeenshire), Findhorn |

**ANNEX A**

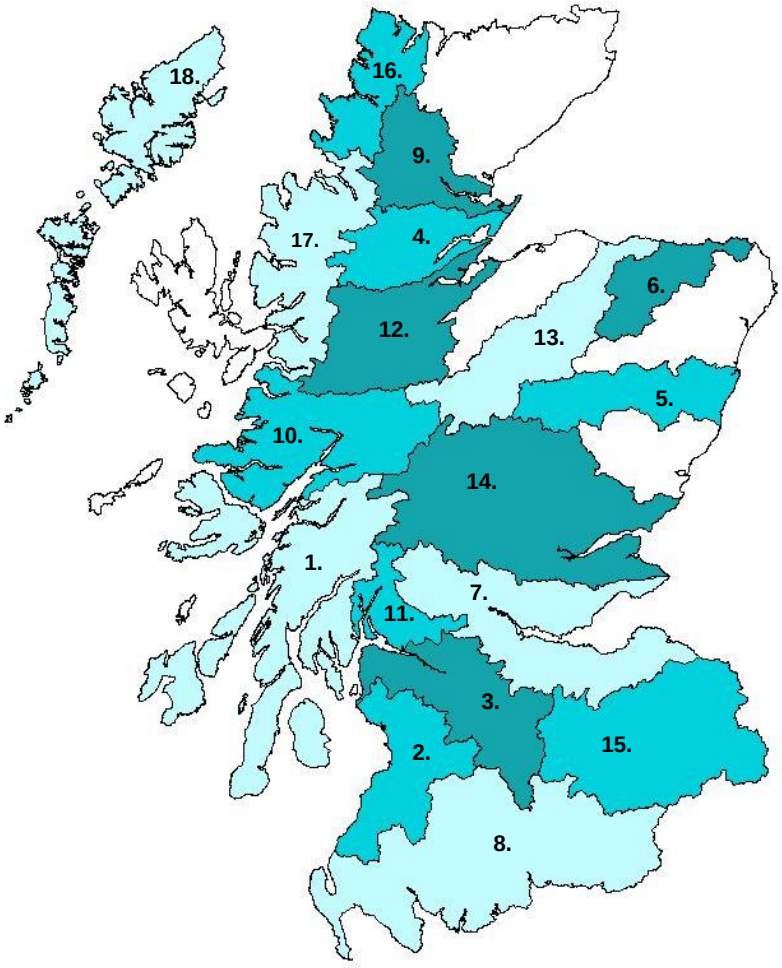

Scottish Salmon and Grilse Catches 1952-2004
Number Caught (x1000)
700
600
500
400
300
200
100
0
52
55
58
61
64
67
70
73
76
79
82
85
88
91
94
97
0
3
Year
Catch & Release
Rod & Line
Net & Coble
Fixed Engine

**ANNEX B**


Salmon Fishery Districts
1 - Shetland
2 - Orkney
3 - Caithness
4 - Helmsdale
5 - Brora
6 - Fleet (1)
7 - Kyle of Sutherland
8 - Conon
9 - Beauly
10 - Ness (2 parts)
11 - Nairn
12 - Findhorn
13 - Lossie
14 - Spey
15 - Deveron
16 - Ugie
17 - Ythan
18 - Don
19 - Dee (1)
20 - Esk
21 - Tay
22 - Forth
23 - Tweed
24 - Annan
25 - Nith
26 - Urr
27 - Dee (2)
28 - Fleet (2)
29 - Cree
30 - Bladnoch
31 - Luce
32 - Stinchar
33 - Girvan
34 - Doon
35 - Ayr
36 - Irvine and Garnock
37 - Clyde (and Leven)
38 - Eachaig
39 - Argyll
40 - Laggan and Sornbay
41 - Inner (Jura)
42 - Mull
43 - Lochaber
44 - Arnisdale
45 - Glenelg
46 - Crowe and Shiel
47 - Loch Long
48 - Skye
49 - Carron
50 - Kishorn
51 - Wester Ross
52 - Western Isles
53 - North and West
54 - Nirloch
55 - Naver
56 - Strathy
57 - Helladale
Lerwick
Kirkwall
Thurso
Stornoway
Ullapool
Inverness
Aberdeen
Fort William
Pitlochry
Dundee
Perth
Oban
Stirling
Edinburgh
Glasgow
Galashiels
Girvan
Dumfries

**ANNEX C**

# RIVERS & FISHERIES TRUSTS OF SCOTLAND




1. Argyll Fisheries Trust
2. Ayrshire Rivers Trust
3. Clyde River Foundation
4. Cromarty Firth Fisheries Trust
5. River Dee Trust
6. Deveron, Bogie and Isla Rivers Charitable Trust
7. Forth Fisheries Foundation
8. Galloway Fisheries Trust
9. Kyle of Sutherland Fisheries Trust
10. Lochaber Fisheries Trust
11. Loch Lomond Fisheries Trust
12. Ness & Beauly Fisheries Trust
13. Spey Research Trust
14. Tay Foundation
15. Tweed Foundation
16. West Sutherland Fisheries Trust
17. Wester Ross Fisheries Trust
18. Western Isles Fisheries Trust

**ANNEX D**

The following framework has been developed by the SFCC to provide guidelines for the production of fish and fishery management plans. The framework is intended to be flexible to allow the production of plans for a variety of species and fisheries. The main chapter headings describe the thought process underlying the plan, whilst sub chapters can be added or deleted as necessary.

# SFCC Fish and Fishery Management Plan Framework

Abstract/Summary

Introduction

Includes description of fishery management bodies involved in the development and implementation of the plan and the role of SFCC.

Should also describe the management planning process and include flow diagram to show the rationale behind the plan and how the plan will evolve into future phases of planning.

1) Aims and Objectives

¨ Set out the scope, duration and objectives of the plan.

¨ Should describe how it relates to other plans or as part of a larger Integrated Catchment Management Plan.

¨ Other plans likely to be considered are Local Structure Plans, Local Biodiversity Action Plans, NASCO guidelines and any legal designations.

¨ Should describe the area / catchments covered by the plan.

¨ Should set out aims and objectives for all fish species, both commercial and non-commercial.

¨ When developing aims and objectives, issues such as the sustainable development of fish populations and fisheries, prevention of deterioration of present stocks and the preservation of biodiversity and genetic fitness should be considered.

¨ Regard should be given to the precautionary approach.

2) Description of the Fishery and factors affecting it.

Detailed description of fishery, fish stocks, habitats, land use etc.

2.1 Description of catchment

Infrastructure
Geology and Hydrology
Topography
Climate
Water quality

2.2 Catchment use

Present land use
Historical land use

Include: Urban development, location of potential pollution sources, hydro development, forestry, agriculture, SSSI and other designations etc.

2.3 Description of fish stocks by species

Species distribution present and historical may include sub stocks.
Status of stocks: include counter data, juvenile abundance.
Description of habitat: include distribution and suitability of habitat, location of obstructions to migration, location of degraded habitat etc.

2.4 Description of fisheries

Exploitation: include rod catches, net catches and exploitation rates.
Economic value present and historical.

2.5 Fish propagation and hatchery influences present and historical

2.6 Predators and competing species

3) Analysis and evaluation

This section could include discussion of opportunities, bottlenecks and constraints.

3.1 Assessment of stock and fishery performance, (may include sub-stocks).

3.2 Limiting factors

3.2.1) Limiting factors in marine phase
3.2.2) Limiting factors in freshwater.

3.3 Opportunities / constraints

3.4 Economic impact of fisheries, future potential consequences of management and or lack of management

Wide range of analytical tools may be used in stock assessment. Improved tools should be sought and applied as the plan is reviewed and updated.

Tools that may be applied include;

Development of conservation plans.
Use of trapping and counter data.
Comparison with a variety of historical data, this may be on catchment, regional or national basis.
Juvenile stock data recent and historical.
Development of models.
The use of quartile analysis over a variety of scales.

An inventory of gaps in knowledge will also help to guide research programmes both locally and nationally.

4) Prescriptions

A detailed list of prescriptions for each sub-catchment and species and stock covered by the plan. Ideally they should be prioritised, timetabled and costed.

These prescriptions are likely to be in tabular form with column headings; issue, action, costing/timetable, funding/lead agency, priority, notes.

The numbered notes can then be presented at the end of the table.

5) Monitoring and review process

This ensures that the plan achieves the objectives detailed in the first section and is also sufficiently flexible to adapt to changing circumstances and new data. This is likely to take place annually or at key milestones in the implementation of the plan.

6) Appendices

Include the survey data on which the plan is based and relevant documents such as NASCO and other guidelines. May document where this data is stored rather than include in the plan.