KYLE OF SUTHERLAND FISHERIES MANAGEMENT PLAN

2015 – 2018

A joint plan prepared by the Kyle of Sutherland District Salmon Fishery Board and Kyle of Sutherland Fisheries Trust

DRAFT Version 1.0

Contents

1 INTRODUCTION

The Kyle of Sutherland fish populations represent an important economic, cultural and ecological resource. An independent economic survey commissioned in 2007 concluded that recreational angling in the Kyle district contributes £3.73m annually and employs 86 full time equivalent posts. A number of watercourses in the district have international designations, including the Habitats Directive, in respect of species such as Atlantic salmon and freshwater pearl mussels.

The following plan has been jointly prepared by the Kyle of Sutherland District Salmon Fishery Board (KSDSFB) and Kyle of Sutherland Fisheries Trust (KSFT). For simplicity both organisations are collectively known as Kyle Fisheries although they are distinct entities. The following plan identifies a number of issues that potentially impact on the fish populations within the fishery district and where appropriate suggests remedial actions that may be taken in respect of these issues. Additionally issues such as monitoring and research requirements are also considered.

A fishery management plan was previously produced for the period 2008-2012 but has now lapsed. This plan therefore represents a second iteration of the planning process for the Kyle of Sutherland district as a whole. Historically, plans had been formulated for individual rivers on an *ad hoc* basis. This plan covers the period 2015 to 2018. A relatively short period has been chosen in the first instance to ensure that the plan remains valid and up to date. The plan has been published following a wide ranging public consultation with interests including proprietors, anglers, angling associations and Government and non-Government agencies.

2 AIMS & OBJECTIVES

The overall aim of this fisheries management plan is to provide a framework for the protection and enhancement of fish populations within the Kyle of Sutherland district and to ensure that the exploitation of such populations by either commercial or recreational fisheries is undertaken in a sustainable manner. The plan relates to all native and naturally occurring fish species within district area, with a particular focus on salmon, trout and sea trout due to their economic importance. Other species, such as European eels and freshwater pearl mussels, which have a high conservation value are also considered in the plan where appropriate.

The lifespan of this plan is anticipated to be three years commencing on the 1st May 2015 and ending 1st May 2018. The success of the management plan will be evaluated on an annual basis with a full review undertaken at the end of the three year planning period. These objectives relate to the contribution that the plan is making to key life stages of fish and their contribution to local socio-economics, as outlined below:

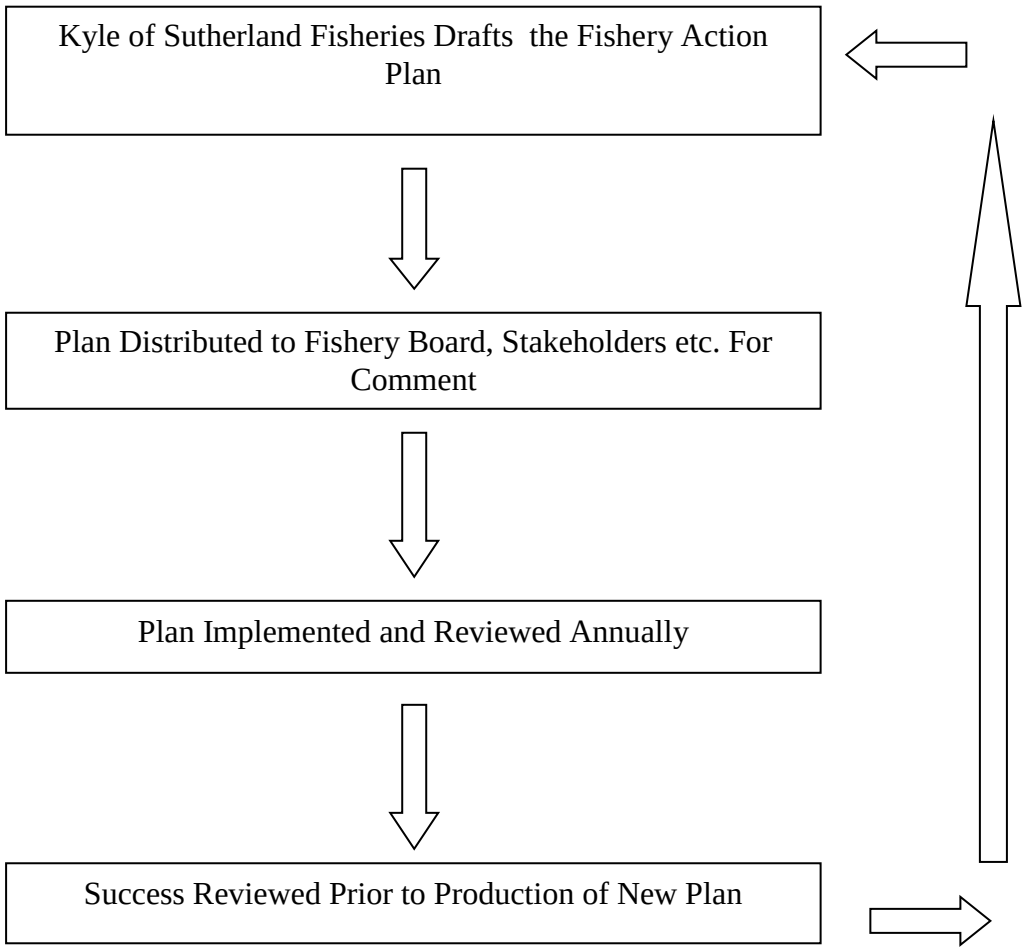
- Maintain or enhance the density and distribution of juvenile fish populations.
- Stabilisation or enhancement of the number of resident or returning adult fish.
- An increase in the socio- economic value of fisheries within the district.

These objectives will be achieved through information gathering, the assessment of the key pressures on particular fish populations and the delivery of priority actions required for mitigating such pressures. At all stages of plan delivery an evidence based approach will be adopted.

It is envisaged that the framework provided by the plan will be flexible and will evolve during the timescale covered. The planning process is likely to be iterative in nature with an assessment of the success and failures of the present plan being incorporated into future planning cycles.

The plan does not incorporate a number of important activities undertaken by Kyle Fisheries which include the provision of education activities and the promotion of the various fisheries available within the district. These activities are considered important, and are expected to develop over time, but the emphasis within the present plan is the fish and associated fisheries themselves and how they are managed.

Figure 2.1 Fishery Management Planning Cycle



3 CURRENT FISHERIES MANAGEMENT STRUCTURE

3.1 KYLE OF SUTHERLAND DISTRICT SALMON FISHERY BOARD

KSDSFB is the statutory body responsible for the protection and enhancement of salmon and sea trout fisheries in the district. It takes its remit from the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 which states that a District Salmon Fishery Board may do such acts, execute such works and incur such expenses as may appear expedient for:

- The protection or improvement of the fisheries within their district;
- The increase of salmon (and sea trout); or
- The stocking of the waters of the district with salmon (and sea trout).

KSDSFB finances its work by levying a rate on the salmon fishery owners in the district. This fishery assessment is assessed at such uniform rate as is determined for all fisheries in the district by the board and shall be exigible according to the valuation of a fishery as entered onto the valuation roll.

Elected representatives of those salmon fishery owners provide the core of the membership of the Board, together with representatives of salmon anglers, salmon netsmen and other parties who may have an interest in salmon stocks or fisheries in the district. Board members are all volunteers and are non-remunerated for their time and effort. The primary function of KSDSFB in the district is the policing of the relevant fisheries legislation largely in relation to salmon and sea trout and to this end a team of water bailiffs is employed. Additional project work, if considered to be of benefit to salmon and/or sea trout, is undertaken usually in conjunction with KSFT.

3.2 KYLE OF SUTHERLAND FISHERIES TRUST

KSFT is an environmental charity which was established in 2000 but became fully functional in 2003. Initially the remit of the Trust extended only to salmon but this has subsequently been amended to encompass all fish species native to the catchment. Core activities of KSFT include the collection of data on fish stocks within the area as well as the physical characteristics of the catchment. The gathering of this data facilitates the provision of informed advice to KSDSFB and other relevant agencies. KSFT has a history of undertaking scientific research projects into key issues such as salmon genetics as well as commissioning reports on issues such as the economic value of the fisheries in the area.

3.3 OTHERS

Fisheries within the district are managed on a day to day basis by a number of proprietors, proprietorial groupings, river managers, ghillies and collective organisations such as angling associations. Each of the main rivers in the area that support a fishery (i.e. Carron, Cassley, Oykel, Shin and Evelix) have functioning proprietors groups which in turn are represented on KSDSFB. Most of the lochs, rivers and the estuary area (Kyle of Sutherland) in the district is managed to a greater or lesser extent. A number of other organisations play an important role in the management of the fisheries in the area. These include governmental organisation such as Marine Scotland Science (MSS) and Forestry Commission Scotland (FCS), executive non-departmental public bodies such as Scottish Natural Heritage (SNH) and Scottish Environment Protection Agency (SEPA) as well as commercial companies such as SSE. Kyle Fisheries liaises closely with such organisations on both a formal and non-formal basis.

4 THE KYLE OF SUTHERLAND DISTRICT

4.1 INTRODUCTION

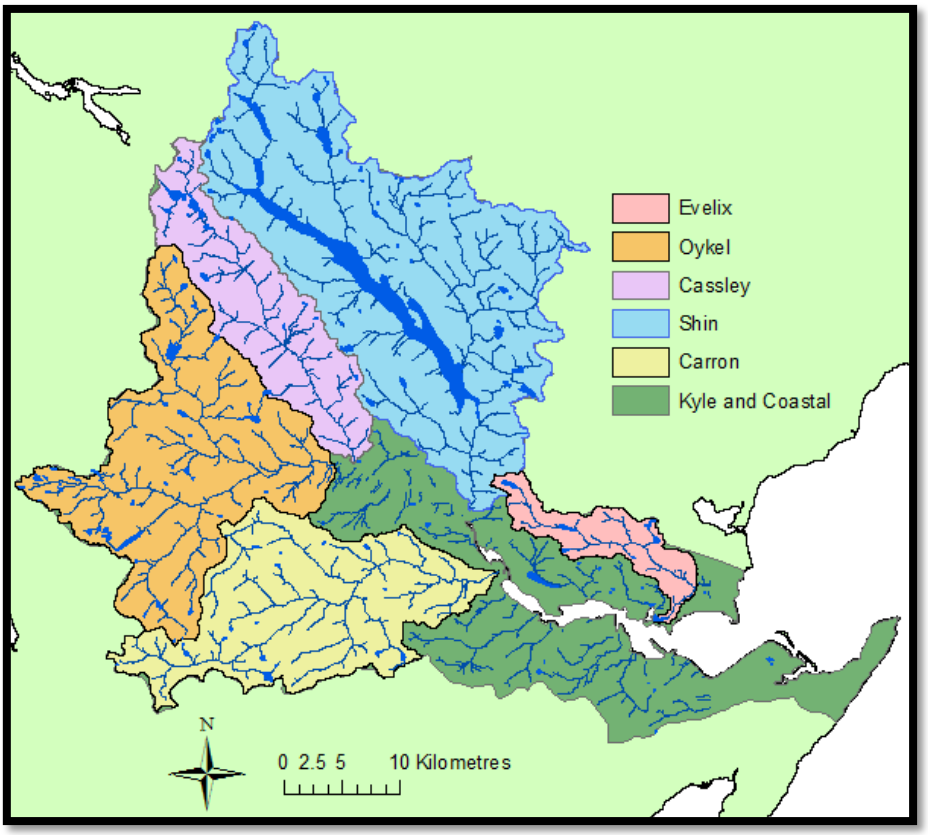
The 2008-2012 Kyle of Sutherland management plan identified that the Kyle of Sutherland district drains circa 163,647 hectares and encompasses circa 46miles of tidal zone, 70 miles of principle river, 61 freshwater lochs and lochans and numerous small watercourses. The catchment is particularly complex in nature with specific issues raised by the tidal Kyle of Sutherland. Whilst all of it is tidal in nature, a salinity gradient exists which results in a considerable section of the Kyle being entirely freshwater.

For the purpose of this management plan, the district has been split into distinct management units. This has been done to better highlight particular issues relevant to individual areas and also largely reflects the proprietorial group management structure as outlined in section 3.3. It should be noted that the management units are somewhat arbitrary in nature and may not accurately reflect the biological complexity of the fish populations present. For example, genetic research has highlighted that a number of distinct salmon populations exist within the district and it is likely that as more powerful genetic techniques are developed understanding of the population structure of the fish species present in the district will increase. Where appropriate information is currently available relating to population structure then management will be undertaken based on biological units; where information is lacking a precautionary stance will be adopted e.g. any salmon stocking that is undertaken will assume population structuring is likely to exist even if no evidence is currently available in relation to the nature of that structure. It should also be noted that a number of issues, e.g. climate change and illegal fishing activity, are generic across the whole catchment.

The management units utilised for this plan are:

- **Carron**
- **Cassley**
- **Oykel**
- **Shin**
- **Evelix**
- **Kyle of Sutherland and Coastal Area**

Figure 4.1 Kyle of Sutherland Management Units



4.2 TOPOGRAPHY

The topography of the Kyle of Sutherland district is particularly varied with areas of low altitude in the coastal district contrasting with typically upland areas in the western extremities of the catchment. Historically salmon are known to have occupied areas of the catchment in excess of 300m in altitude. Trout are likely to occupy the bulk of the watercourses independent of altitude.

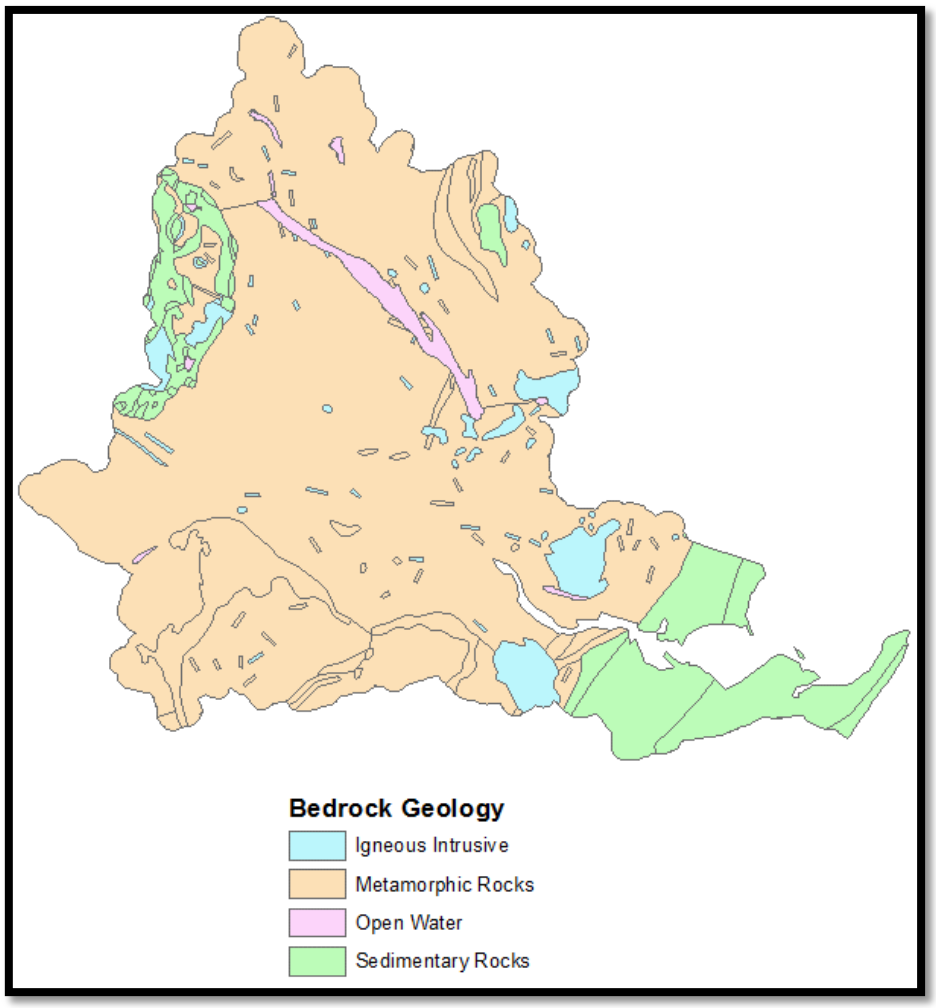
4.3 GEOLOGY

The area is characterised by a dissected plateau underlain by Moinian rocks of semi-pelitic granulites and granite with some schists, gneisses and quartzites. The area is fringed to the east by Old Red Sandstone - mainly sandstones and conglomerates with some shales. Sedimentary

rocks are also a feature of the western periphery of the Oykel catchment. Soils in the Kyle of Sutherland basin are of the Arkaig Association formed from drifts derived from the underlying rock. Typically organic in nature, soil types of the watershed range from brown earths to peats

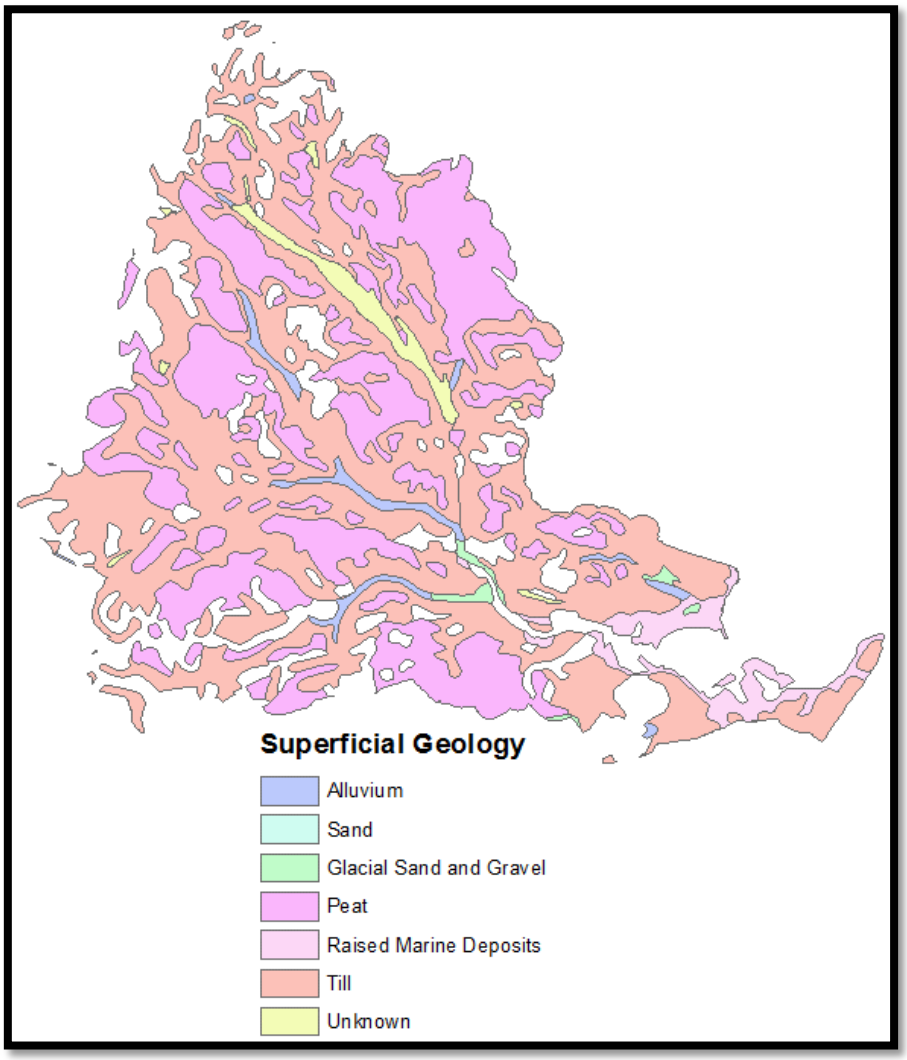
The bedrock geology of the area is illustrated in **Figure 4.3** below.

Figure 4.3 Kyle of Sutherland Bedrock Geology



Bedrock data, Digital Geological Map of Great Britain 1:625 000 (DiGMapGB-625), British Geological Survey (2003), © and database right NERC.

Figure 4.3 Kyle of Sutherland Superficial Geology



Superficial Deposits data, Digital Geological Map of Great Britain 1:625,000 (DiGMapGB-625), British Geological Survey (2003), © and database right NERC

4.4 CLIMATE

The Kyle of Sutherland district covers a large geographical area and as such there are considerable variations in climatic regime. For illustrative purposes Table 4.1 provides summary statistics of averages from two Met Office weather stations, one of which is close to the sea and is within the catchment (Tain Range) and one of which is inland and just to the south of the Kyle of Sutherland catchment (Glascarnoch).

Table 4.4 Met Office Summary Data 1981-2010

Station	Temperature		Frost (Days)	Rain (mm)	Days >1mm Rain	Wind (Knots)
	Max °C	Min °C				
Tain Range	12.1	4.7	54.1	646.4	140.8	9.1
Glascarnoch	10.7	3.3	84.5	1766.6	207.3	8.9

4.5 HYDROLOGY

SEPA gauging stations currently operate at number of locations within the catchment: Shin at Inveran; Carron at Sgodachail; Cassley at Rosehall; Oykel at Bailey Bridge; Oykel at Easter Turnaig; and at Loch Ailsh (Oykel system). It would appear that stations have typically operated over different time frames. Examination of the National River Flow Archive data holdings suggests that long term data sets are available for the Carron (1974-2013), Cassley (1979-2013), Oykel at Easter Turnaig (1977-2013) and Shin (1981-2011). The National River Flow Archive also has data for the Shin at Lairg for the period 1953-1957 which presumably relates to the construction of the hydro-electric schemes in that area.

4.6 WATER QUALITY

Sampling of water quality within the catchment is undertaken by SEPA on a regular basis. Typically water quality is of a high standard. However, pollution incidents do occur on occasions and Kyle Fisheries remains vigilant in ensuring that any incidents are reported and addressed.

4.7 LAND USE

Land use within the catchment is typified by sporting estates in the upland areas, often utilised for deer stalking, and extensive areas of commercial forestry. Native tree forests are also important in some areas and, for example, Amat Estate which is situated within the Carron catchment maintains an important remnant of the Caledonian Forest. Rough grazing is also available for both cattle and sheep. Arable farming is largely restricted to more coastal areas. The largest conurbations in the area are Dornoch, Ardgay, Bonar Bridge, Edderton, Tain, Rosehall and Lairg although much of the catchment is sparsely populated.

5 FISH AND FISHERIES OF THE KYLE OF SUTHERLAND DISTRICT

5.1 INTRODUCTION

Electro-fishing surveys within the catchment provide extensive data in respect of the distribution and abundance of fish species within the flowing water of the main river systems. Data is also available for some of the smaller coastal burns although survey coverage is patchy in nature. Information on the status of fish stocks is generally lacking for most of the lochs and lochans in the area. Data is also lacking for the tidal Kyle of Sutherland although seine netting was undertaken on a trial basis in 2014. A key aim of future management activities will be to reduce knowledge gaps as much as possible.

The subsections below provide a description of the key fish species known to be present in the Kyle catchment and their status, distribution and exploitation. Electro-fishing data utilised in the maps below relate to that held on the Scottish Fisheries Coordination Centre (SFCC) database only. Other species, typically more marine in nature, such as flounder and pollack are also known to be present in the tidal areas of the Kyle of Sutherland but are not specifically covered by this plan.

5.2 ATLANTIC SALMON (*SALMO SALAR*)

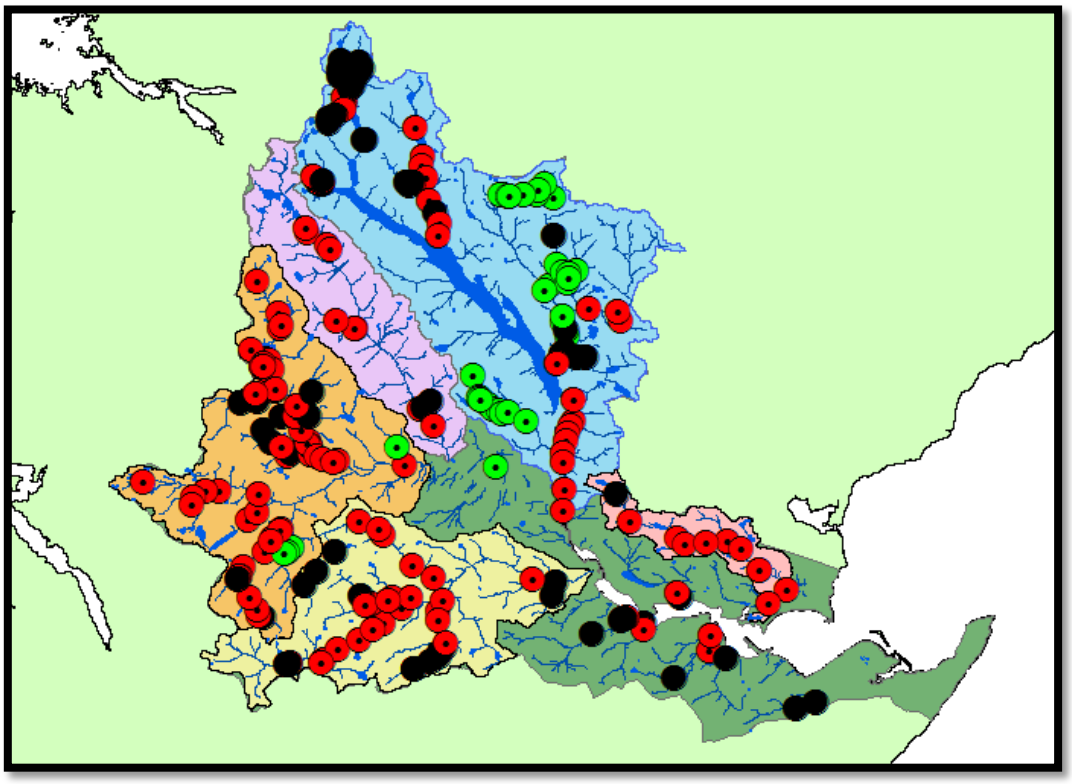
Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List. Economically salmon are the dominant species within the district and have supported both commercial and recreational fisheries for many years. In the independent economic survey previously noted, £3.5m of the £3.7m income resulting from fisheries in the area was estimated to be derived from salmon based expenditure.

5.2.1 DISTRIBUTION

The current distribution of juvenile salmon within the fishery district is likely to be broadly similar to historical distributions except for a number of notable exceptions. The exceptions are largely the result of hydro-electric developments, e.g. the upper reaches of parts of the Carron, or the construction of other potential barriers such as dams and bridge culverts.

Figure 5.2.1 Juvenile Salmon Captured in Electro-fishing Survey

Figure 5.2.2 Known distribution of juvenile salmon across the Kyle catchment. Red dots represent sites at which juvenile salmon have been captured, black dots represent sites at which no salmon have been captured and green dots represent sites at which salmon have been captured within areas artificially stocked with juvenile salmon



5.2.2 FISHERY PERFORMANCE

A number of sources of information are available in respect of the abundance and exploitation of salmon. Catch records are available for some individual river beats from estate records and extensive records of the net fisheries within the district are also available in some instances. The most comprehensive data set that is available is the 1952-2014 rod and net catch records held by Marine Scotland Science (MSS). Additionally some fish counter data is available from two locations within the area, namely Duchally Dam on the River Cassley and Shin Diversion Dam on the River Shin. Both fish counters are owned and operated by SSE.

Please note that the data used throughout this section are Crown copyright, used with the permission of MSS, who are not responsible for interpretation of these data by third parties.

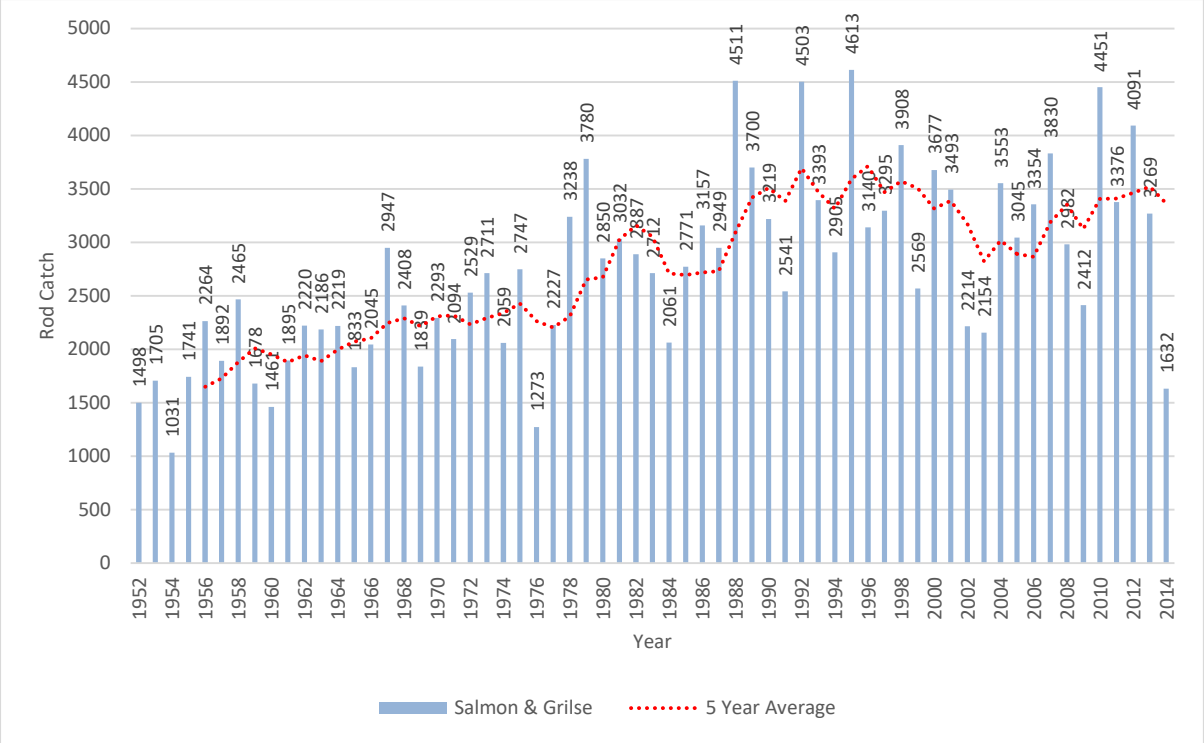
5.2.2.1 NET CATCHES

Historically the Kyle region has supported important net and trap fisheries both in the inner tidal areas of the Kyle of Sutherland district and in the surrounding coastal communities for many hundreds of years. Various methods such as yairs, net and coble and bag nets have been used to catch salmon. In the nineteenth century the combined catch of the various types of commercial fisheries could be in excess of 30,000 salmon and grilse per annum. Until relatively recent times commercial catches could be in excess of 20,000 per annum. Many of the most productive netting operations operated in the Bonar Bridge area and have been the subject of buyouts in order that their operation be discontinued. However, a number of netting stations still operated, particularly coastal bag nets in the Portmahomack area, albeit with fishing effort considerably reduced compared to historical levels. Typically, netting stations currently operating tend to do so for a short period in the summer months. For the last year that full figures are available from Marine Scotland (2013) a total of 96 salmon and grilse were captured by the remaining net and coble and fixed engine fisheries.

5.2.2.2 ROD CATCHES

Annual rod catches (salmon and grilse combined) over the period 1952-2014 as collected by MSS are presented in **Figure 5.2.3** below. It should be noted that 2014 catch data as collected by KSDSFB have been included in the graph for illustrative purposes although official catch statistics for the 2014 season had yet to be released by MSS at the time of writing the management plan. The mean rod catch for the Kyle catchment within that period is 2,739. The lowest rod catch recorded in that period was 1031 in 1954 whereas the highest was 4,613 in 1995. Due to the way that the catch statistics have been compiled by MSS it is not possible to separate out the catches for individual rivers within the catchment in a satisfactory manner. As such, catch statistics are presented for the district as a whole. Kyle Fisheries does have access to records from individual rivers and beats within the catchment which can be utilised as and when required for more detailed analyses, however.

Figure 5.2.3 Total Salmon and Grilse Catches for Kyle District (1952-2014)

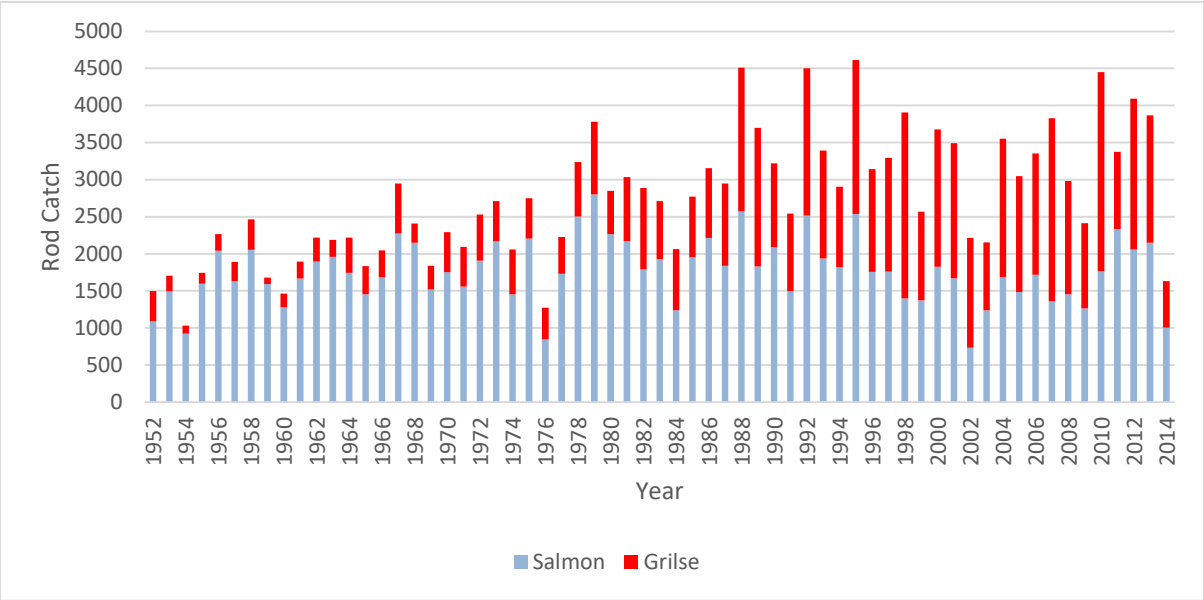


Examination of the rod catch figures would suggest that rod catches over the time period have been robust. However, it should be noted that no effort statistics are available for the rod fishery to assess if effort has altered over time. Additional compounding factors in relation to using rod catch data as a proxy for overall abundance include the reduction in effort in the commercial salmon fishery and the widespread adoption of catch and release during the latter part of the time series which may mean that individual fish are captured – and thus counted as part of the total catch – on more than one occasion. Additionally, as the catches are aggregated as a whole for the district, declines in abundance in some rivers may be masked by increases in others. A similar scenario may also apply to various stock components within each river system.

MSS data is split into salmon (classed as a fish that has spent two or more winters at sea) and grilse (classed as a fish that has spent a single winter at sea) components. In the absence of detailed scale reading analyses the demarcation points in respect of weight, length etc. between salmon and grilse may be somewhat arbitrary in nature. Kyle Fisheries is currently undertaking a scale reading programme of rod caught fish, particularly on the River Oykel, to obtain a better understanding of the various stock components and their size and age structure. However, grilse and salmon catches as described by MSS data are illustrated in **Figure 5.2.4** below. It would appear that there has been a general trend for increasing grilse catches within the second half of the period for which official figures have been available although there has been considerable variance in annual catches. It is not known whether this is as a result of a general increase in abundance of grilse or whether the

decrease in exploitation by the commercial sector in the region has facilitated increases in the number of grilse available for exploitation by the rod fishery, or some combination of the two factors.

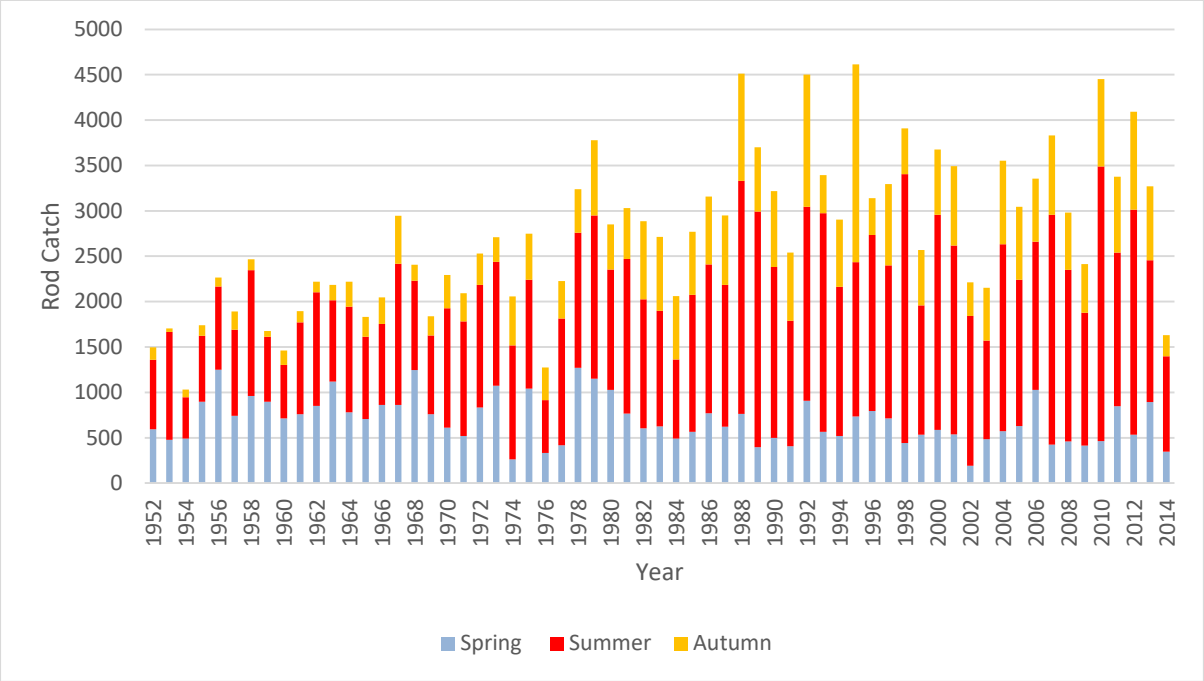
Figure 5.2.4 Rod Catch by Salmon and Grilse Component for Kyle District (1952-2014)



Salmon enter the Kyle of Sutherland rivers from the sea over the bulk of the calendar year. The variation in run timing displayed by individual fish is likely to result from a combination of genetic and environmental factors although the precise mechanisms underlying this are relatively poorly understood. This variation is important economically as well as ecologically as it gives rise to a relatively long rod salmon fishing season (January 11th – September 30th) which in turn helps to support full time employment and the viability of fisheries and ancillary businesses such as hotels. There is a perception that the earliest running component of the overall salmon stock complex in the Kyle district is disproportionally important economically given that it supports the tourist sector at a time when visitor numbers would otherwise be at a low ebb. Evidence suggests that within Scotland, and indeed elsewhere, there have been considerable temporal shifts in abundance of salmon probably as a result of natural cycles. For illustrative purposes the MSS rod catch data has been split up into three component parts: spring (January-May); summer (June-August); and autumn (September, plus October in 1954, 1986, 2008, 2009 and 2010). Although somewhat arbitrary in nature (river entry date may predate capture date by an unknown amount) these time periods correspond to those utilised for the NASCO rod catch assessment tool in assessing the health of individual components of the overall stock complex within the Kyle of Sutherland district. **Figure 5.2.5** below delineates the catches for each of the components in question. Examination of the

catches suggests that the proportion of the overall catch derived from the summer and autumn time periods has increased compared to the spring. However, as effort data is not collected as part of the statistics it is not known how effort may have altered in relation to exploitation of the spring, summer and autumn stock components over the time series. Equally it is not known if the concurrent decline in netting effort during the time series may have disproportionally affected the numbers of fish available to the rod fishery at different times of year.

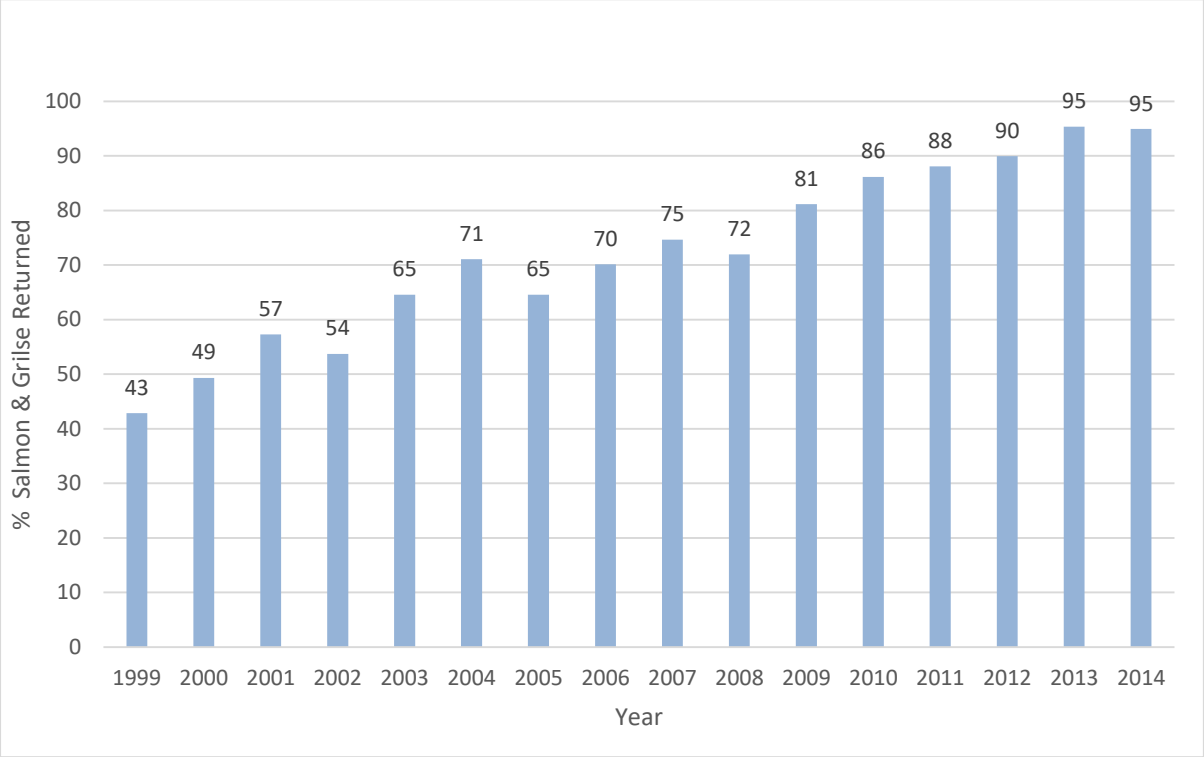
Figure 5.2.5 Kyle District Catches by Spring, Summer and Autumn Component (1952-2014)



5.2.2.3 CATCH AND RELEASE

In response to perceived declines in abundance, catch and release of salmon has become increasingly prevalent since the early 1990s. Its use has been particularly applied in the early months of the year. Cooperation from the fisheries in the district has resulted in current catch and release levels of circa 95%. This has been a major success (see **Figure 5.2.6** below).

Figure 5.2.6 Percentage of Salmon and Grilse Released (1994-2013)



5.2.3 FISH COUNTER DATA

Fish counter data is currently available from two locations within the district, one on the Shin system and one on the Cassley system. The counters are of the resistivity type and are owned and managed by SSE. Both are housed within fish passes in dams. It is anticipated that a third counter, on the Evelix system, is likely to be operation in 2014. In contrast to the SSE counters, the Evelix counter utilises infrared technology and will be located in a fish pass in the lowermost reaches of the river. The counter is privately owned but is hoped that data will be made available to Kyle Fisheries for interpretation and to assist in the management of the River Evelix. Historical data for the SSE counters was not available to Kyle Fisheries for the production of this management plan although it is hoped that the data will be made available in the future.

Figure 5.2.7 Adult salmon passing through the counting flume at Shin Diversion Dam (photograph courtesy of SSE)

5.3 BROWN/SEA TROUT (*SALMO TRUTTA*)

Trout in both juvenile and adult form are widely distributed within the Kyle of Sutherland catchment. Brown trout (*Salmon trutta*) are a United Kingdom Biodiversity Action Plan (UKBAP) species and therefore deemed to be of national importance. Both brown trout and sea trout maintain important fisheries in the area and are particularly important for local angling clubs and a number of hotels. The independent economic survey undertaken in 2007 identified that 2,959 angler days resulted annually from the trout fishery in the district with associated expenditure of over £182,000.

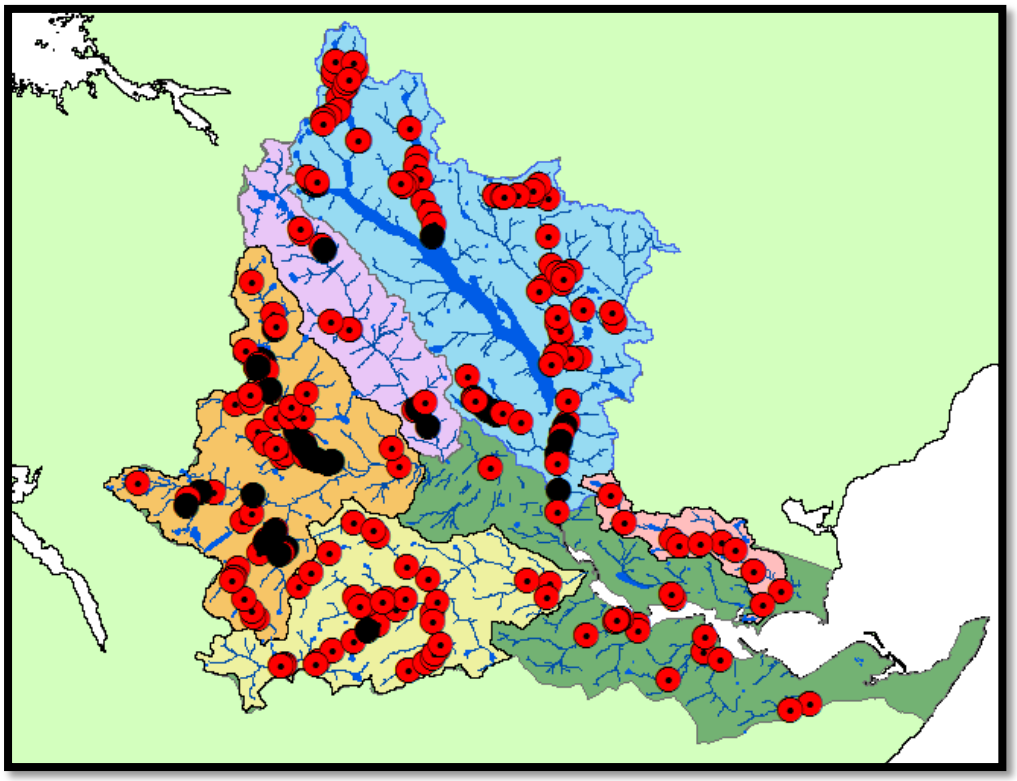
Figure 5.3.1 Juvenile Brown Trout

Figure 5.3.2 Adult brown trout from Loch Eye (top) and adult sea trout caught in the Kyle of Sutherland (bottom)

5.3.1 DISTRIBUTION

Brown trout and sea trout are the most widely distributed fish in the Kyle district. It is present in all of the management units in both rivers, lochs and estuary areas.

Figure 5.3.1.1 Known distribution of juvenile trout across the Kyle catchment. Red dots represent sites at which trout have been captured and Black dots represent sites at which trout were not captured



5.3.2 FISHERY PERFORMANCE

The Kyle of Sutherland district has supported both brown trout and sea trout fisheries for a considerable amount of time. In respect of sea trout, Marine Scotland catch figures are available from 1952 onwards (see **Figure 5.3.2.2**). Official catch returns for the 2013 season are included in the chart for illustrative purposes due to the fact that that the catch figure will likely be revised upwards in the future due to an issue with a catch return from a major sea trout fishery. It should be noted that finnock (immature sea trout) catch statistics were only collected from 2004 onwards and that data for sea trout returned as against sea trout retained is only available from 1994 onwards. As with salmon rod catch data, effort metrics associated with the sea trout fishery have not been collected and an unknown factor relates to the level of recaptures of sea trout that have previously been released by anglers.

Figure 5.3.2.1 Total Kyle District Sea trout Catches (1952 to 2013)

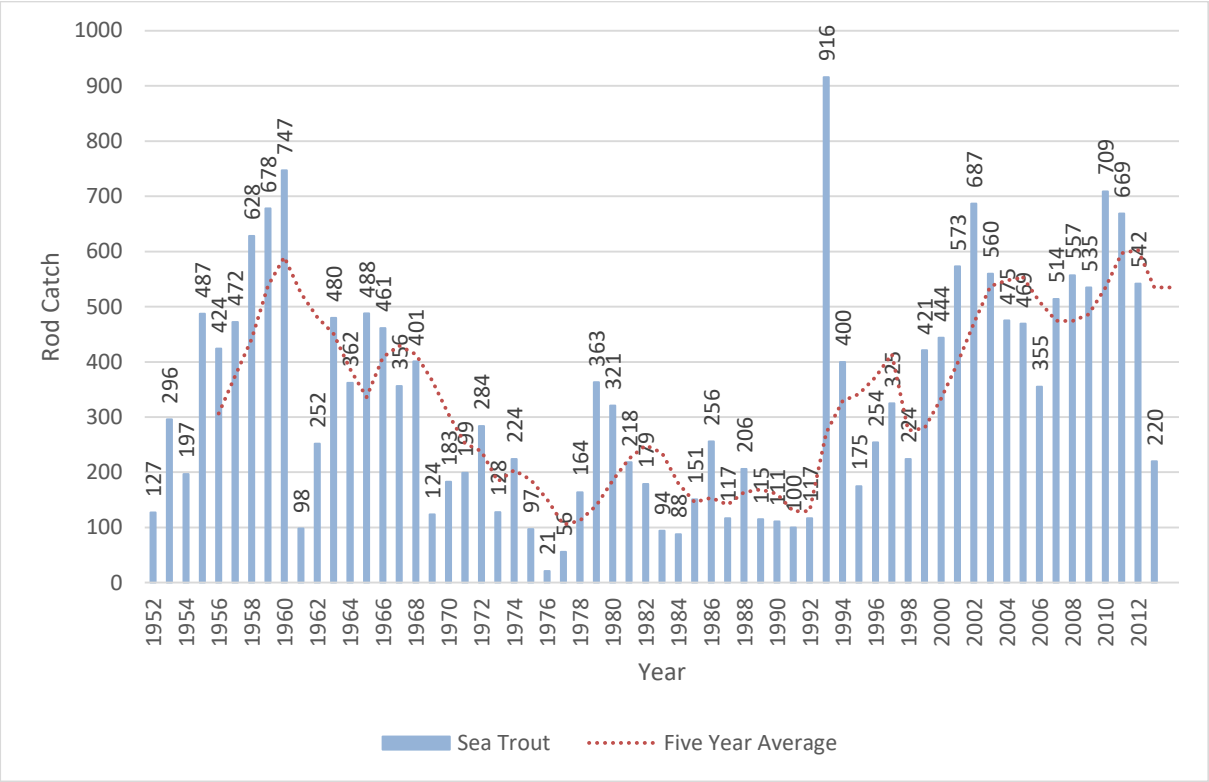


Figure 5.3.2.2 Total Kyle District Finnock Catches (2004 to 2013)

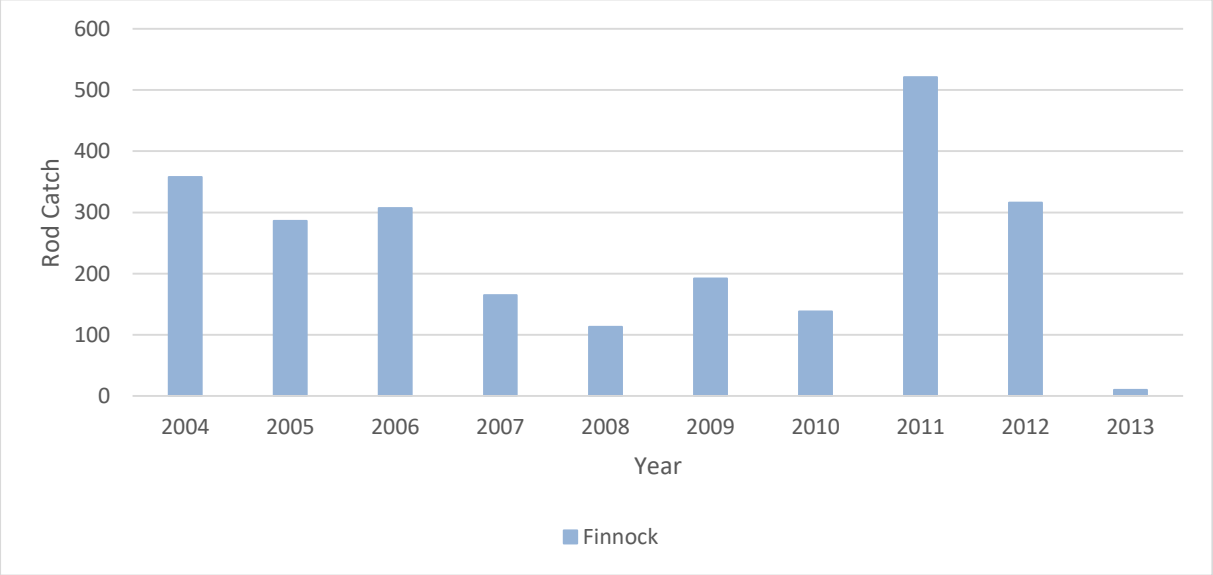


Figure 5.3.2.3 Sea Trout Release Percentage (1994 to 2013)

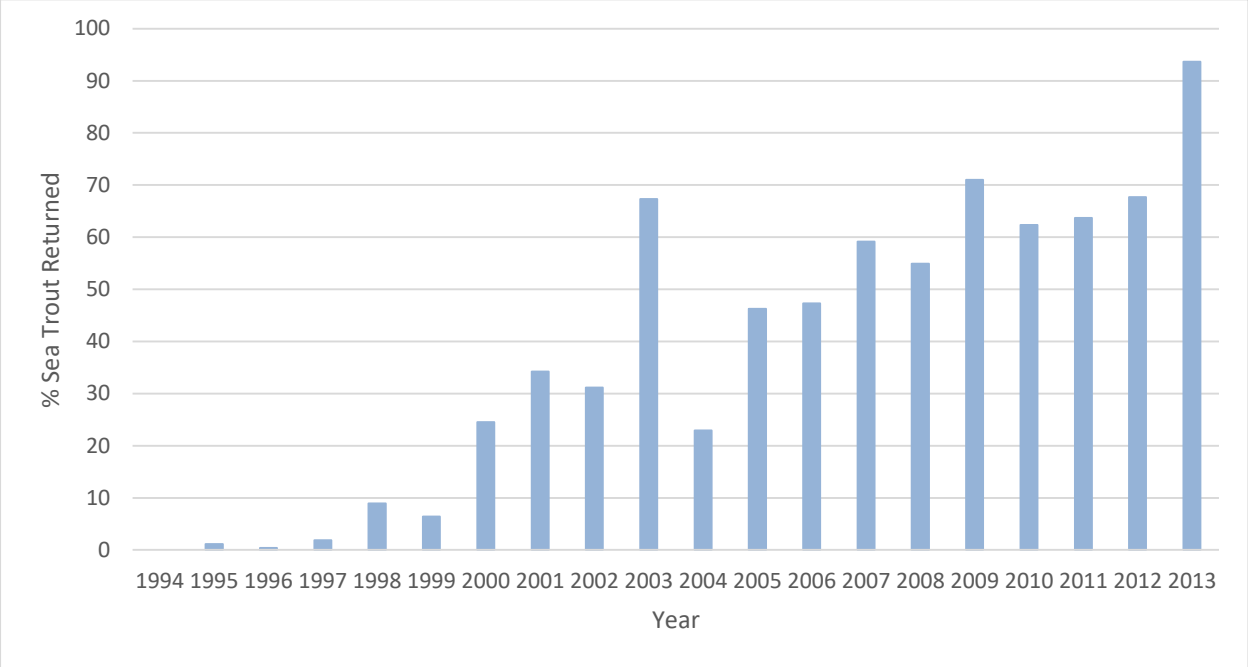
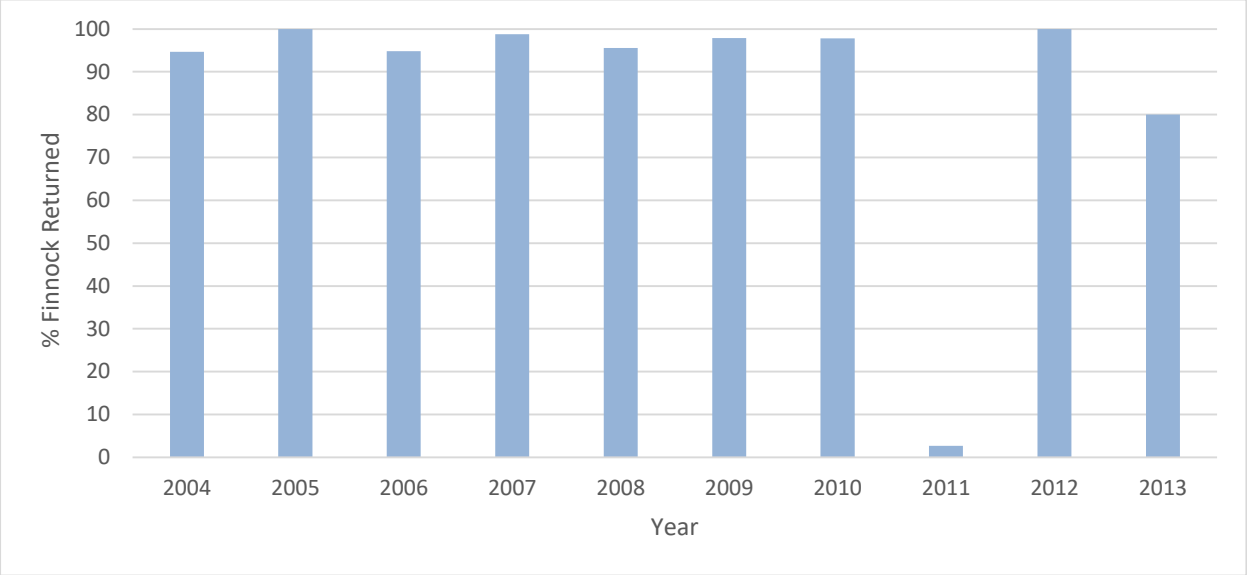


Figure 5.3.2.4 Finnock Release Percentage (1952 to 2013)



A number of significant fisheries exist in lochs in the district. In particular Loch Shin supports a renowned fishery which provides income to Lairg AC and Overscaig Hotel. A number of lochs are significant contributors to the overall fishings provided by Oykel Bridge Hotel and Loch Eye is a noted brown trout fishery in the southern part of the catchment. At present information regarding catches etc. is not available for analyses. It is recognised by Kyle Fisheries that this is a significant barrier to the successful management of the resource. It is likely that some information exists in the form of

angling association and hotel records but at present no attempt has been made to access this information. Some scale analyses of trout captured in Loch Shin has recently become available via the Moray Firth Trout Initiative.

5.4 EELS (*ANGUILLA ANGUILLA*)

Reports suggest that the number of elvers (young eels) migrating into European rivers has fallen to less than 5% of 1980s levels. The exact reason for its decline is not known, but it is likely to be a combination of factors including climate change, habitat loss and obstruction of waterways. This widespread decline has led the European Commission to develop an Eel Recovery Plan (Council Regulation No 1100/2007). This aims to return European eel stocks to sustainable levels. Each Member State is required to establish national Eel Management Plans, with an Eel Management Plan for Scotland developed by Marine Scotland Science in 2008. The European eel was also added to the UKBAP Priority Species List in 2007.

Within the Kyle district eels are known to be present, particularly in the lower reaches of the rivers and in the Kyle of Sutherland itself. Historically eel fisheries have existed both for yellow/silver eels (usually in the Kyle itself) and elvers on the rivers flowing into the Kyle. Due to the decline in eel numbers and introduction of new legislation no fisheries for eels are currently prosecuted.

Figure 5.4 Small Eel Captured in an Electro-fishing Survey

5.4.1 DISTRIBUTION

Examination of the SFCC electro-fishing database suggests that little information is currently held on eel distribution by Kyle Fisheries. However, it is likely that some information is held on historical paper records and has not been transferred to records held in electronic format.

5.4.2 FISHERY PERFORMANCE

No information is available to Kyle Fisheries in relation to the historical performance of the eel fishery.

5.5 ARCTIC CHARR (SALVELINUS ALPINUS)

The majority of Arctic charr populations in Scotland occupy still waters and are not found to occupy rivers, although there are exceptions to this. Currently, Arctic charr are a conservation feature in five Sites of Special Scientific Interest (SSSI) and are present in a number of water bodies protected for other purposes, either under the Natura 2000 network or the National Nature Reserve series. The conservation value of Arctic charr within the UK has been further recognised by their addition to the UKBAP Priority Species List in 2007. This considers them as 'threatened or declining in range' due to such factors as global warming, land use changes and species introductions. A register of waters in which charr are known to be present or for which historical information extsis regarding their presence is maintained by Glasgow University and is periodically updated.

Figure 5.5 Arctic Charr Captured in a Rotary Screw Trap, Merkland River

5.5.1 DISTRIBUTION

Charr are known to populate the Loch Shin, Loch a' Ghriama and Loch Merkland catchment in particular. On occasion charr are captured in the rotary screw trap operated by Kyle Fisheries at the exit of Loch Ghriama into Loch Shin. Other lochs for which historical evidence exists for the presence of charr populations are Loch Fiag, Loch Mor, Crom Loch, Loch Sruban Mora and Loch a' Bhith.

5.5.2 FISHERY PERFORMANCE

No fishery specifically targets charr within the Kyle District although the Overscaig Hotel reports that charr occasionally feature in catches of anglers primarily targeting trout.

5.6 LAMPREY SPECIES

The lampreys belong to an ancient order of vertebrates, the Agnathans or 'jawless fishes'. The skeletons of lampreys are of strong flexible cartilage and it is not comprised of bone. A round, sucker-like disc surrounds the mouth which, in adults, carries rasping teeth. Most, but not all, species of lamprey are parasitic on other fish.

Three lamprey species present in UK: brook lamprey (*Lampetra planeri*), river lamprey (*Lampretra fluviatilis*) and sea lamprey (*Petromyzon marinus*). All three species are afforded protection within conservation legislation:

- Brook Lamprey Annex II of the EU Habitats Directive Appendix III of the Bern Convention.
- River Lamprey Annexes II and V of the EU Habitats Directive Appendix III of the Bern Convention and are on the UKBAP Priority List.
- Sea Lamprey Annex II of the EU Habitats Directive Appendix III of the Bern Convention and are on the UKBAP Priority List.

Figure 5.6 A juvenile brook lamprey, or ammocoete captured during an electric fishing survey on the River Ness

All three species of lamprey spawn in fresh waters. After hatching, the young elongated larvae, known as ammocoetes, swim or are washed downstream by the current to areas of sandy silt in still water where they burrow and spend the next few years in tunnels (Maitland, 2003). The standard methodology for sampling lamprey species involves assessment of populations of these ammocoetes.

5.6.1 DISTRIBUTION

It is likely that all three species of lamprey are present within the Kyle district. Anecdotal evidence suggests that adult lampreys are frequently seen in the district. No electro-fishing records presently exist for lampreys in the district. However, it would appear that no surveys targeted specifically at lampreys have been undertaken within the district.

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5.6.2 FISHERY PERFORMANCE

No fishery prosecuted within this district.

5.7 MINNOWS (PHOXINUS PHOXINUS)

The minnow (*Phoxinus phoxinus*) is the smallest member of the cyprinid family. It is a slender fish with brown and greenish barred back and sides, giving the appearance of a black stripe along the flank (see **Figure 5.7** below). It is found in shoals in lochs, small burns and fast rivers.

Figure 5.7 A typical example of a minnow

Minnows are believed to be an invasive non-native species (native to England and Wales but not to parts of Scotland) that compete with salmonids for food and space and feed on salmonid eggs and fry. It is thought that they were originally introduced after being used as live bait and then discarded into water bodies. The use of live vertebrates as bait was prohibited by the Aquaculture and Fisheries (Scotland) Act 2007.

5.7.1 DISTRIBUTION

Minnows are likely to be widely distributed within the catchment. However, Examination of the SFCC electro-fishing database suggests that little information is currently held on minnow distribution by Kyle Fisheries. However, it is likely that some information is held on paper records and has not been transferred to records held in electronic format.

5.7.2 FISHERY PERFORMANCE

No fishery prosecuted within this district.

5.8 THREE SPINED STICKLEBACK (*GASTEROSTEUS ACULEATUS*)

The three-spined stickleback is the smallest of all British freshwater fish. It is easily recognisable by the three large spines on its back, well developed pectoral fins and the ventral fins reduced to spines (see **Figure 5.8** below).

Figure 5.8 Three-spined Stickleback

In the sea it is confined to coastal waters. In freshwater, it prefers to live in small streams but also occurs in a variety of habitats including lakes, lochs and large rivers. It inhabits shallow vegetated areas, usually over mud or sand. Juveniles move to the sea (anadromous populations) or to deeper, larger water bodies such as lochs (freshwater populations) in July-August, forming large feeding schools. They feed on worms, crustaceans, larvae and adult aquatic insects, drowned aerial insects, and small fishes. Eggs are found in nests constructed from plant material.

5.8.1 DISTRIBUTION

Three-spined sticklebacks are present in the Kyle district, particularly in the Kyle of Sutherland itself. Examination of the SFCC electro-fishing database suggests that little information is currently held on stickleback distribution by Kyle Fisheries. However, it is likely that some information is held on paper records and has not been transferred to records held in electronic format.

5.8.2 FISHERY PERFORMANCE

Three-spined sticklebacks are not targeted by sport anglers or commercial fishermen.

5.9 STONE LOACH (*BARBATULA BARBATULA*)

The stone loach is a small fish believed to have been introduced to the catchment by anglers in a similar manner to minnows. Stone loach are believed to be an invasive non-native species that compete with salmonids for food and space and feed on salmonid eggs and fry. It is thought that they were originally introduced after being used as live bait and then discarded into water bodies. The use of live vertebrates as bait was prohibited by the Aquaculture and Fisheries (Scotland) Act 2007.

Figure 5.9 Stone Loach From River Tirry

5.9.1 DISTRIBUTION

At present stone loach are believed to be restricted to the Shin catchment upstream of Lairg Dam. However it is possible that they have spread to other parts of the Shin catchment – and potentially beyond – without being detected in electro-fishing surveys.

5.9.2 FISHERY PERFORMANCE

No fishery for stone loach is prosecuted.

6 FACTORS POTENTIALLY LIMITING FISH PRODUCTION

6.1 INTRODUCTION

Fish production in any system is limited by the availability and access to good quality spawning and nursery habitat, together with the impacts of a range of anthropogenic factors. For the purposes of this plan, emphasis will be placed on anthropogenic factors which are likely to have exacerbated natural constraints.

The Kyle of Sutherland area has been subjected to some anthropogenic alteration. This is likely to have significantly lowered its productive potential. It is also recognised that many of the fish species present in the system are migratory in nature (e.g. salmon, trout and eels) and therefore factors affecting the marine environment, both natural and anthropogenic, are also an important consideration.

This section of the Fisheries Management Plan identifies and describes key factors that have the potential to significantly limit fish production in the area either alone or in combination.

6.2 IMPOUNDMENT AND WATER ABSTRACTION

Water impoundment and abstraction is a significant issue in the district.

6.2.1 HYDRO-POWER

Large scale hydro-electric schemes have been a feature of the Kyle of Sutherland area for many years. Several large dams were built in the 1950's. The effect that these schemes have on salmon stocks has been debated over the years. The presence of hydro installations and dams on a river system has the potential to be detrimental to fish populations in a number of ways. The potential impacts of large scale hydro schemes include:

- Lack of access for migratory fish to historically available habitat.
- Alterations to hydrological regimes;
- Changes in water chemistry and nutrient status;
- Lack of sediment transfer;
- The creation of 'pinch points' for the predation of both migrating juveniles and adults;
- The transfer of water between rivers which may alter migration patterns.

Small scale hydro power schemes have become increasingly popular over the last decade. One of the main environmental challenges associated with these developments relates to both upstream and downstream fish passage. The presence of several small generating stations on the same river may also introduce cumulative impacts.

6.2.2 PUBLIC AND PRIVATE WATER SUPPLY

Scottish Water impounds or abstracts water in a number of locations within the catchment, particularly the Evelix and coastal burns. Domestic water supplies also have the potential to reduce flows on burns, particularly during drought conditions although this is likely to have limited impact in most cases.

6.2.3 MAN-MADE OBSTRUCTIONS

Dams, weirs, road culverts, bridge aprons and other constructions can reduce the available habitat for many fish species; particularly those adopting an anadromous or catadromous life history.

Figure 6.2 Dam at Diebidale, River Carron

Many of these obstructions/potential obstructions have been identified in habitat surveys within the Kyle of Sutherland catchment.

6.3 PREDATION

Fish species are removed from the Kyle system by a suite of predators. For migratory species predation can occur in both freshwater and marine environments. Predation pressures may well be exacerbated by the presence of structures such as dams etc. which can create 'pinch points'. Of particular concern is predation on migratory fish during stages of their life cycle after which density dependent compensation for losses is likely to be exhausted e.g. salmon and sea trout smolts and returning adults.

6.3.1 PISCIVOROUS BIRDS

Significant numbers of goosanders, mergansers, herons and cormorants frequent the Kyle District. These birds predate on a wide range of fish species, with juvenile salmon and trout forming a major component of their diet (see **Figure 6.3.1** below).

Figure 6.3.1 Salmon smolt regurgitated by a cormorant showing beak damage (photograph courtesy of Chris Conroy)

Sawbills are known to take advantage of 'pinch points' or 'bottlenecks' during smolt migrations. Cormorants will take larger prey items than sawbills including adult trout and even small grilse. They are also known to cause damage to larger fish that they attack but are too large to swallow.

6.3.2 PREDATORY FISH

A number of fish species are known to predate on juvenile fish. Of particular concern in respect of salmon and sea trout smolt predation in the Kyle of Sutherland area are large trout and a range of sea species such as cod and bass. The interactions between such species are presently poorly understood.

6.3.3 SEALS

The Moray Firth supports populations of grey seals (*Halichoerus grypus*), common or harbour seals (*Phoca vitulina*) and salmon. The interaction between these well-known protected species causes a conservation and economic dilemma. Although salmon are likely to form a small part of the seal's overall diet their impacts on salmon stocks has the potential to be significant, particularly at migratory pinch points or 'bottle necks' (see **Figure 6.3.3** below).

Figure 6.3.3 Rod caught salmon exhibiting signs of seal damage

Historically there was a great deal of conflict between various interests regarding how to best to manage seals in order to protect salmon. In the early 1990's both the number of salmon returning to rivers in the area (particularly the 'spring' component) and harbour seals declined significantly.

Given the presence of SACs for both species in the area and obligations to ensure 'favourable status'

of the key interest features, local district salmon fishery boards, the Scottish Executive, Scottish Natural Heritage and other stakeholders negotiated the Moray Firth Seal Management Plan (MFSMP) in 2005. This aimed to restore the favourable conservation status of seal and salmon SACs whilst reducing the shooting of harbour seals and seal predation on salmon.

The MFSMP has led to a greater understanding of seal biology amongst fishery managers and raised awareness of the competing needs of seals, salmon and their importance to the local economy of the Moray Firth. The experience gained also fed into The Marine (Scotland) Act 2011 which was introduced on 31 January 2011. This states that any fishery or fish farm in Scotland that requires to manage seals at any time of year, to prevent serious damage to fisheries or fish farms or to protect the health and welfare of farmed fish, will need an annual Seal Management Licence.

6.4 NON-NATIVE SPECIES

The Kyle of Sutherland has not experienced levels of invasive plant species that has been witnessed in many other Scottish catchments However, the catchment does contain a number of species that are not native to the Highlands of Scotland. This may increase levels of predation (e.g. mink), competition for food and habitat (e.g. minnows and stone loach) or reduce the quality of available habitat (e.g. Japanese knotweed and Himalayan balsam).

American mink (*Neovison vison*) are a member of the mustelid family whose other members include weasel, otter and badger. They were brought to the UK in the early 20th Century to be bred on farms for their fur. The first farm opened in Scotland in 1938 and in the same year they were recorded in the wild. American mink continued to escape or were intentionally released. The last fur farm closed in the UK in 1993 and in 2003 the industry was made illegal.

Since their introduction America mink have been shown to have negative effects on a broad range of wildlife species of both conservation and economic value including fish species. They are classed as opportunistic, generalist predators able to switch between prey sources when one food source becomes scarce. Because of their high metabolic rate, American mink have to eat approximately one third of their body weight every day to sustain themselves.

Mink are known to be widely distributed further south than the Kyle of Sutherland catchment and small numbers have been observed and, on occasion captured, within the catchment. Kyle Fisheries are a key partner of the Scottish Mink Initiative which aims to secure multiple adjacent river catchments as areas free of breeding American mink, thus protecting native wildlife such as water voles and ground nesting birds, as well as economically important populations of fish and game birds (see **Figure 6.4** below).

Figure 6.4 A typical mink raft designed to monitor activity and assist trapping as part of the Scottish Mink Initiative

This Initiative is highly collaborative in nature and has input from numerous fishery trusts and boards, SNH, Forestry Commission Scotland, Scottish Wildlife Trust, University of Aberdeen and Oxford University in addition to gamekeepers and members of the public.

In addition to the non-native species already present, a number of species not currently present in the catchment pose significant risks to the terrestrial and aquatic ecology. A biosecurity plan is in place in order to mitigate the possible risks of introductions as much as possible. Eradication /control programmes are in place for a number of non-native plant species although control is lacking in some areas.

6.5 FORESTRY

Large areas of the Kyle of Sutherland catchment contain commercial and non-commercial forestry. Forestry may have both positive and negative impacts on fish production. Negative impacts are likely to include silt inputs, altered hydrological regimes, acidification and over-shading of watercourses. Positive impacts include the provision of shade, nutrient inputs via leaf litter and increased inputs of terrestrial insects. Projects aimed at increasing levels of native riparian tree cover and improve forestry practices have been undertaken in recent years and it is expected that additional projects will be developed in future years.

6.6 CLIMATE CHANGE

An emerging and episodic influence on fish production is the apparent increase in severe weather conditions, particularly flood episodes. There is an increased probability of redd washout etc. as a result of this factor. Linked to this are increased numbers of proposals for hard engineering, gravel removal etc. in respect of flood defence schemes all of which have the potential to damage fish stocks. It is also possible that climate change is influencing marine survival of fish such as sea trout and salmon although the exact mechanisms for this are currently poorly understood.

6.7 POLLUTION

Diffuse and point-source pollution occurs in various locations within the catchment although overall water quality appears to be good.

6.8 AGRICULTURE/ LAND USE

Agricultural practices are likely to have lowered the quality of habitat in many lowland areas via pollution, increased sediment inputs and inappropriate physical alterations to watercourses. However, effects of this appear to be restricted to a few isolated areas. Historical land drainage in upland areas may have altered hydrological regimes.

6.9 ILLEGAL FISHING

Illegal fishing has the potential to reduce the amount of fish available for legitimate fishing and may also reduce the number of adult fish available for spawning. Water bailiffs patrol the catchment using a variety of different methods to try and reduce the impact of illegal fishing.

6.10 AQUACULTURE INTERACTIONS

Escapes of salmon smolts from fish farms have the potential to interact with wild salmon and other species in a number of ways. These include competition for space and food resources and genetic introgression.

7 PROPOSED MANAGEMENT ACTIONS

7.1 INTRODUCTION

The following tables delineate the proposed management actions for each of the management units. It should be noted that management actions will be periodically reviewed during the life of the plan and it is likely that new actions will be added or existing actions altered in response to new information becoming available.

7.2 GENERIC CATCHMENT WIDE ACTIONS

Time limited actions Ongoing actions

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Abstraction and Impoundment	Catchment Wide	A number of small scale hydro-electric schemes are in place or are proposed within the catchment. All have the potential to influence fish populations.	Develop protocols for responding to new applications for hydro-electric installations.	SEPA	Y			
Predation	Catchment Wide	Populations of mergansers, goosanders and cormorants predating on salmon parr and smolts.	Maintain accurate piscivorous bird counts to support annual management licence applications					
	Catchment Wide		Submit annual application for bird licence to Scottish Natural heritage in partnership with the Moray Firth Predator Group	Moray Firth Predator Group				
	Catchment Wide	Common and grey seals predating on smolts, adult salmon and kelts.	Review, maintain and implement the Moray Firth Seal Management Plan.					
Non-Native Species	Catchment Wide	Mink.	Maintain participation in Scottish Mink Initiative.	Scottish Mink Initiative				
	Catchment Wide	Invasive species are a threat to biodiversity and their ecological impacts and economic consequences can be severe.	Maintain high levels of awareness and encourage the development of preventative biosecurity measures for anglers and other river users.	River Workers, SNH				
Illegal Fishing		Illegal fishing deprives fishery owners and management organizations of revenue and is potentially ecologically damaging.	Develop and implement a strategy for the effective policing of the Kyle District.	Neighbouring District Salmon Fishery Boards				
Forestry	Catchment Wide	Forestry has the potential to damage or improve fish populations.	Continue to influence forestry design plans when consulted.	Forestry Commission Scotland, Estates, Private Forestry contractors				
Pollution	Catchment Wide	Point source pollution occurs periodically.	Maintain vigilance and report incidents to SEPA.	SEPA				

7.3 CARRON

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Abstraction and Impoundment	Diebidale	Dam at Lochan with inadequate fish pass.	Apply for funding for scoping/costing of remedial action. Develop plan for restoration of fish population to upper reaches of Diebidale Burn.	SEPA	Y			
	Glen Beag	Dam with no fish pass. Water abstracted as part of the Conon hydro-electric scheme.	Continue to liaise with SEPA and SSE to ensure that all practical actions are being undertaken to mitigate for losses as far as possible.		Y			
	Glen Beag	Dam with no fish pass. Water abstracted as part of the Conon hydro-electric scheme.	Assess feasibility of installation of fish counter upstream of Glencalvie Falls to better understand utilisation of habitat upstream.		Y			
	Glencalvie Falls	Debris in location of Glencalvie Falls may hinder fish passage.	Develop protocols for annual assessment of Glencalvie Falls and *ad hoc* assessments when required.	River Carron Proprietors Group				
Non-Native Species	Braelangwell, Gruinairds	Control of Japanese Knotweed.	Continue, if required, to support river workers in controlling remnant populations of Japanese knotweed.					
Climate Change	Catchment Wide	Changes in water temperature may influence fish production.	Investigate potential network of temperature monitoring probes for long term monitoring.	SNH	Y			
Agriculture/ Land Use	Catchment Wide	Land use may influence hydrology and fish production.	Assess hill drainage and other land uses for possible remedial action.		Y			
	Braelangwell	Re-aligned section of significant tributary.	Assess if restoration action could be eligible for Water Environment Fund.	SEPA				

7.4 CASSLEY

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Abstraction and Impoundment	Duchally	Downstream of dam may have issues associated with sediment loss.	Assess distribution and abundance of juvenile salmon populations downstream of Duchally Dam. Consider investigation into status of sediment.	SEPA, SSE	Y			
Climate Change	Catchment Wide	Changes in water temperature may influence fish production.	Investigate potential network of temperature monitoring probes for long term monitoring.	SNH	Y			
Agriculture/ Land Use	Catchment Wide	Land use may influence hydrology and fish production.	Assess hill drainage and other land uses for possible remedial action.	SNH	Y			

7.5 OYKEL

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Non-Native Species	Lower Oykel	Control of Himalayan Balsam.	Continue, if required, to support river workers in controlling remnant populations of balsam.					
Forestry	Upper Oykel	Forestry has the potential to damage or improve fish populations.	Improve riparian habitat, increase native trees in riparian corridor hydrology and remove commercial trees from areas where they have been inappropriately sited.	Pearls in Peril Project, SNH, Forestry Commission Scotland, Lower and Upper Oykel groups.				
Climate Change	Catchment Wide	Changes in water temperature may influence fish production.	Utilise existing network of temperature probes and increase coverage of the network.	Marine Scotland Science, Lower Oykel Proprietors Group.				
Agriculture/ Land Use	Catchment Wide	Land use may influence hydrology and fish production.	Assess hill drainage and other land uses for possible remedial action.	Forestry Commission Scotland, SNH	Y			

7.6 SHIN

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Abstraction and Impoundment	Loch Shin	Smolt passage through Loch Shin is compromised.	Continue with trials to assess passage rates of Tirry and Fiag smolts and potential remedial action.	SSE, SEPA	Y			
	Loch Shin	Dams have altered hydrological regimes, sediment transfer etc.	Continue to liaise with SEPA and SSE to ensure that all practical actions are being undertaken to mitigate for presence of dams.		Y			
	Catchment Wide	Hatchery use is currently primary mitigation for SSE activities	Assess efficacy of maintaining a hatchery operation to mitigate for SSE activities.		Y			
	Grudie	Smolt trap used for mitigation of area utilised in	Assess costs of replacement of trap against cost of removal.		Y			
	Grudie	Dewatered section of Grudie is currently not screened.	Liaise with SSE	SSE, SEPA				
Aquaculture	Loch Shin, Loch Merkland	Suspected escaped farm smolts are routinely captured in rotary screw trap operations.	Continue to report suspected escapes to Marine Scotland Science. Continue to develop genetic screening of wild fish populations for potential genetic introgression.	Marine Scotland Science, University of Highlands and Islands	Y			
		Species such as charr and resident trout can be affected by presence of aquaculture facilities.	Improve knowledge base of charr and trout in Loch Shin	Lairg Angling Association, Overscaig Hotel, Moray Firth Trout Initiative.	Y			
Non-Native Species	River Tirry	Stone loach are present in Tirry catchment.	Continue to monitor spread of stone loach in the catchment.					

7.7 EVELIX

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Non-Native Species	Catchment Wide	Control of Himalayan Balsam.	Develop plan for the control of balsam within the catchment.	RAFTS, Evelix Proprietors Group.				
Forestry	Catchment Wide	Forestry has the potential to damage or improve fish populations.	Improve riparian habitat, increase native trees in riparian corridor hydrology and remove commercial trees from areas where they have been inappropriately sited.	Pearls in Peril Project, SNH, Forestry Commission Scotland.				
Abstraction and Impoundment	Evelix Tributary	A small section of burn has been diverted for watering cattle.	Assess if alternative arrangements could be made to reduce abstraction and restore original course of burn.	Landowner.				
Illegal Fishing	Catchment Wide	Currently there is considerable confusion regarding legal aspects of various activities.	Increase dissemination of information to proprietors and anglers.	Evelix Proprietors Group.				
Pollution	Lower Evelix	Ongoing concerns regarding water quality in Evelix tributary.	Investigate current status of water quality and present sampling regime.	SEPA				

7.8 COASTAL

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	2015	2016	2017/18
Non-Native Species	Catchment Wide	Kyle Fisheries is aware of small pockets of non-native plants at various locations	Develop plan for the control of non-natives within the catchment.	RAFTS				
Abstraction and Impoundment	Spinningdale Burn	Unused hydro-electric lade is not screened for ingress by migrating smolts.	Fit appropriate screen to lade entrance.	Moray Firth Trout Initiative.				
Agriculture / Land Use	Loch Eye	Loch Eye feeder burns may require remedial action.	Assess if burns would benefit from habitat improvement.	Moray Firth Trout Initiative				

8 MONITORING AND RESEARCH REQUIREMENTS

8.1 INTRODUCTION

Currently there are a number of monitoring actions undertaken within the catchment by a number of different organisations and individuals. Types of research undertaken or data collected includes:

- Electric fishing survey data;
- SSE fish counter data;
- Privately operated fish counter data;
- River habitat survey data;
- Fish barrier assessments;
- Water quality assessments;
- Fish health investigations;
- Population genetic structuring research;
- Analysis of annual catch returns from rod and net fisheries;
- Net surveys of transitional water areas;
- Catch data from individual fisheries, angling associations etc;
- Scale reading surveys.

8.1.1 JUVENILE SALMONID MONITORING PROGRAMME

A time series of electro-fishing data has been established at a number of sites within the Kyle catchment. Typically the focus of the surveys have been salmon abundance and, to a lesser extent, trout abundance. Other uses of electro-fishing have been to assess the distribution of salmon in relation to natural and manmade obstacles to migration.

At all sites the number of salmon and trout and their fork lengths (to the nearest millimetre) are recorded. Scale samples are taken from a representative batch of fish in order to determine their ages and the size range of each year class.

Figure 8.1.1 Counting and recording the fork length of salmon parr captured during a survey

8.1.2 OTHER FISH SPECIES

To date limited information has been collected with regard to species other than salmon and trout. It is recognised that this lack of information hinders management of such species. It is recognised that increased levels of data will be required going forward.

Figure 8.1.2 Counting the catch from a seine survey in the Kyle of Sutherland

8.1.3 ADULT SALMON AND SEA TROUT ABUNDANCE

Currently there are two primary sources of information in respect of adult salmon and sea trout abundance. Probably the most reliable time series is the SSE dataset from the fish counters placed in their dams on the Cassley and Shin. However, as these are situated a considerable distance upstream of their respective river mouths they do not provide whole river counts. In the spring of 2015 a new fish counter was installed in the lower reaches of the River Evelix which should provide information on most or all of the fish entering and exiting the river system. The other long term datasets readily available relate to rod and net catches as collected by Marine Scotland Science. Typically these are used as a surrogate for adult abundance when utilising tools such as the NASCO Rod Catch Tool although there are a number of difficulties associated with rod catch data. These include the effects of recaptures as a result of the adoption of catch and release on rod catch totals, changes in effort on both the rod and net fisheries and the effects of weather and other fishing conditions. Some of these difficulties can be resolved via research and monitoring activities. As a

result of the Wild Fisheries Review it is likely that greater emphasis will be placed on the development of conservation limits for individual rivers and an annual assessment as to whether the numbers of returning salmon and sea trout are sufficient to meet the conservation limits. This will place greater emphasis on a greater understanding of stock composition, distribution of juvenile fish, numbers of fish returning to their natal rivers etc. Table 8.1. below summarises monitoring and research requirements within the Kyle District in the immediate future.

Table 8.1 Monitoring and Research Actions

	Monitoring / Research Action
Juvenile Distribution	Target electro-fishing at improving knowledge of all fish species distribution including the coastal region of the district and main stem river sites.
	Improve knowledge of usage of areas such as transitional waters e.g. the Kyle of Sutherland.
Juvenile abundance	Investigate expansion of smolt trap network or varying location of deployment. Improve understanding of trap efficiency via mark-recapture experiments.
Adult abundance	Investigate further utilisation of fish counters.
	Investigate use of genetic tools for reconstruction of run size.
	Examine records of tagging studies (e.g. River Oykel) to assess recapture rates in relation to total rod catch. Consider use of tagging programmes on other rivers to provide similar information.
	Obtain catch data and records from lochs.
Stock Structure	Continue to develop juvenile and adult scale reading programme to improve understanding of stock structure and associated characteristics. Utilise genetic tools as technological advances permit.
Habitat Availability	Improve and extend information relating to the abundance and quality of habitat information available. Utilise GIS platforms to integrate habitat, fish and other data.

9 REVIEW OF PLAN

9.1 ANNUAL REVIEW

A review of the management actions section of the plan will be undertaken on an annual basis. It is not envisaged that the bulk of the information within the plan will be altered on an annual basis however alterations will be made were required.

9.2 THREE YEAR REVIEW

A more thorough review of the plan will be undertaken after a period of three years with all proposed management actions assessed and key information such as fish distribution updated.